PRELIMINARY REPORT OF NRC TWIN OTTER OPERATIONS IN THE 1997 SOUTHERN GREAT PLAINS EXPERIMENT

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SUMMARY

From June 18 to July 17, 1997, the NRC Twin Otter atmospheric research aircraft was operated from Oklahoma City, U.S.A., in the Southern Great Plains 1997 (SGP97) Hydrology Experiment. The primary role of the aircraft was to measure the vertical fluxes of sensible and latent heat, $C0_2$, ozone and momentum in the atmospheric boundary layer, along with supporting meteorological and radiometric data. Approximately 400 flux runs and 100 soundings were flown in 27 project flights over rural areas near Oklahoma City. This preliminary report documents the flight program, lists the instrumentation aboard the aircraft, and presents a summary of run-averaged data from each flux run. *These data are from the in-field analysis and must be considered preliminary.* A re-analysis incorporating updated calibrations is planned for the fall of 1997 followed by a more comprehensive technical report.

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1.0 INTRODUCTION

The Southern Great Plains 1997 (SGP97) Hydrology Experiment was motivated by the wide-spread interest among hydrologists, soil scientists and meteorologists in the problems of estimating soil moisture and temperature states at the continental scale and the coupling between the land-surface and the atmosphere (Ref. 1). The main objective was to develop algorithms using remotely sensed microwave data to measure soil moisture at scales expected from future satellite-based systems. Three remote sensing aircraft participated in SGP97; the NASA P-3 employing ESTAR (Electronically Scanned Thinned Array Radiometer), the Ontario Government Navajo Chieftain carrying the CASI imaging spectrometer, and the U.S. Dept. of Energy Cessna Citation fitted with TIMS (Thermal Infrared Multispectral Scanner). Ground truthing was achieved through a variety of surface-based programs, as detailed in the SGP97 Experiment Plan (Reference 2).

The objective of the boundary layer component of SGP97 was to determine the influence of soil moisture on the local surface energy budget and the effect of mesoscale variability on the development of the convective boundary layer. Several flux towers were used to make near-surface measurements over rangeland and winter wheat crops. The NASA P-3 operated the Lidar Atmospheric Sensing Experiment (LASE) which remotely sensed the atmospheric water vapour and aerosol profiles. The NRC Twin Otter was one of two 'immersion-sensing' aircraft that made measurements of the energy fluxes in the convective boundary layer throughout the experiment. The second was the Long-EZ operated by the Atmospheric Turbulence and Diffusion Division of the National Oceanic and Atmospheric Administration (NOAA). The University of North Dakota (UND) Cessna Citation joined the project for three days in the last week of SGP97, primarily to conduct intercomparisons with the Twin Otter.

The Twin Otter flew 82.8 hours in 27 project flights, and a total of 105 hours including transit and tests. Nearly 400 flux runs were flown on tracks 15 to 30 km in length over rural Oklahoma, mostly west and north of Oklahoma City. Approximately 100 soundings were flown , characterizing the atmosphere from near the surface (30 m) to above the top of the mixed layer. Fourteen intercomparison runs were flown with the Long-EZ, and four with the UND Citation. Although the majority of the Twin Otter flights occurred around mid-day (10 a.m. to 3 p.m. local time), some flights were also devoted to the morning and evening transition periods.

This preliminary report consists mostly of tables produced during the field phase of the experiment. They list the instruments used on the aircraft and any operational problems encountered on each flight, summarize the entire flights as well as the individual flux runs and soundings, and tabulate the run-averaged data. In October or November, 1997, the Twin Otter data will be reprocessed at NRC, employing updated calibrations as well

as a Kalman filtering technique (Reference 3) that removes small biases (typically, up to 1 m s^{-1}) in the measured horizontal wind components. A more comprehensive Laboratory Technical Report will follow.

2.0 INSTRUMENTATION

Figure 1 is a schematic diagram of the Twin Otter showing the mounting locations of the instruments flown in SGP97. Table 1 lists the sensors, type of output signal, and the label of the associated variables in the aircraft software. Table 2 lists the parameters and their units recorded at 32 Hz on the aircraft's Digital-Audio-Tape (DAT) unit.

2.1 Air Motion

The Twin Otter is instrumented to measure the three orthogonal components of atmospheric motion over a frequency range from 0 to 10 Hz. The true air motion is derived from the vector difference between the air velocity relative to the aircraft and the aircraft 'inertial' velocity relative to the ground (strictly speaking, the rotating Earth is not an inertial frame of reference, but for ease of expression the term 'inertial' in this report will mean 'relative to the Earth').

Air motion relative to the aircraft is measured by a nose-mounted gust boom incorporating a Rosemount 858AJ28 5-hole probe. This device and the associated pressure transducers measure static pressure (altitude), dynamic pressure (airspeed) and the angles of attack and sideslip. A second altitude/airspeed system employs a separate set of pressure transducers connected to the fuselage-mounted pitot and static ports.

The primary system on the aircraft for the measurement of the inertial velocity vector is a Litton LTN-90-100 Inertial Reference System (IRS). For this project, the on-board VME-based microprocessor computed and recorded two sets of winds, differing primarily in the means used to determine the inertial velocity. They are the following:

> 1) **Litton winds:** The true airspeed (TAS) vector is resolved into earth-fixed axes using the attitude angles and heading from the LTN-90 IRS. The 3-axis inertial velocities from the IRS are then subtracted from the TAS components to derive the 3-axis winds. This is the method used on most atmospheric research aircraft. It is subject to approximately 1 m s^{-1} errors in the horizontal components due to IRS drift caused by the Schuler oscillation phenomenon. The NRC Flight Research Laboratory (FRL) has developed a Kalman filtering and smoothing technique that combines IRS data with redundant navaid data (e.g. GPS, VOR/DME) to correct the IRS velocity, position, heading and attitude data for these oscillations (Reference 3). This procedure will be applied in subsequent processing to correct the wind measurements for all of the Twin Otter SGP97 flights.

2) **Backup winds:** This uses a complementary filtering routine in which the low frequency contribution to the inertial velocity is provided by the Trimble GPS and pressure altitude, and the high frequency components are derived from an FRL-assembled package of accelerometers and rate gyros.

Secondary Back-up winds: In SGP97 the Twin Otter also carried a NovaTel RT-20 GPS system which measured position and inertial velocities to a greater accuracy than the Trimble GPS. These data are used in the ground-based playback system to compute another set of 3-axis wind velocities that appear to be more accurate than the back-up winds computed in flight (2 above) .

Further details on these wind computation methods are given in Reference 4, along with the equations used to derive the wind and gust components and the fluxes. In SGP97, the only operational problem affecting the Litton IRS occurred for three runs on Flight 01, in which the back-up winds were used; for ALL other runs, the Litton winds described in (1) above were used in the flux computations and data summaries.

2.2 Position

The Twin Otter carried a Trimble Model TNL-7880SR GPS/VLF/Omega navigation system, which was used for flying accurate tracks and for recording aircraft position. The system was operated in the GPS mode throughout SGP97, and position and velocity data were recorded at 32 Hz.

To fly the desired tracks for flux-measuring runs, GPS navigation was used, with heading and cross-track deviation fed to the pilot's flight director in the instrument panel. A second, more sensitive display, featuring track-angle error in addition to cross-track deviation, was mounted atop the coaming of the instrument panel, well within the pilot's heads-up scan. This display was driven by the airborne microprocessor and had a full-range deviation of +/- 0.5 nautical miles.

Aircraft position data were also available from the LTN-90 Inertial Reference System. This system is subject to the Schuler oscillation, in which the indicated position can drift in error up to approximately one nautical mile per hour. Finally, a third set of position data, including height above sea level, was provided by the NovaTel RT-20 GPS, which proved to be very accurate.

2.3 Temperature and Dew Point

The primary total temperature measurement was made by a Rosemount fast-response 102DJ1CG heated probe mounted on the port side of the aircraft nose (Fig. 1; TTF, Table 1). An alternative backup total temperature measurement was made by an

identical probe mounted on the starboard side of the nose (Fig. 1) and referred to as TTNB in Table 1 and the aircraft software. The airborne software routinely uses TTF in the calculation of static temperature and the true airspeed; but, in the event of a sensor problem, the alternative TTNB can be selected through use of function switch #5 on the computer control console in the cockpit. In the playback software, a sensible heat flux estimate is computed using data from each temperature; it is rare that these two flux estimates differ by more than 2 or 3 Wm^{-2}.

During SGP97, the signal from the port temperature probe had small noise spikes, or steps of about one degree, that resulted in errors in the standard deviation of its signal and in its sensible heat flux. Consequently, data from the starboard temperature probe were used for both the airborne wind and flux calculations and ground post-flight processing.

At this writing, the two temperature probes are being prepared for a wind tunnel test to verify their frequency response, as part of an investigation into possible under-estimation of sensible heat fluxes by aircraft when compared with flux towers (References 5 and 6). Computer simulations suggest that the sensible heat flux derived in the in-field analysis may be 20 percent low for runs flown at the lowest altitudes (30 m).

Dew point temperature was measured using an E, G and G Model 137 Cambridge dew point sensor mounted on the starboard side of the Twin Otter nose (Fig. 1).

2.4 Carbon Dioxide and Water Vapour

The fast-response concentration measurements required for the $C0_2$ and H_20 flux calculations were made by two separate systems on the Twin Otter during SGP97. The first of these, the ESRI infrared gas analyzer developed by Agriculture Canada (Reference 7), has been flown on the aircraft for about 13 years. The test section of the analyzer was mounted within a large duct that captured flow above the aircraft, entered the cabin through the roof, and passed through the rear of the cabin to exit through the floor (Fig. 1). The system had a flow rate of approximately 300 litres/sec. The duct was also instrumented for the measurement of the airspeed, temperature and density of the sampled air, in order to calculate the instantaneous $C0_2$ and H_20 mixing ratios. The ESRI analyzer had an effective frequency response of 15 Hz. When used in flux calculations, the time histories of the ESRI data must be advanced 1/4 second to account for the lag due to the longitudinal displacement of the instrument from the primary vertical gust sensor, the Rosemount 858 probe on the noseboom.

Data from the ESRI analyzer are suitable for use with the vertical gust velocity and the eddy correlation technique to derive fluxes. However, the analyzer is not well suited to the measurement of absolute concentrations of $C0_2$ and water vapour, for its sensitivity can change a few percent during flight because of dirt accumulation on its mirrors. For this reason, a slightly slower-response LI-COR LI-6262 $C0_2/H_20$ analyzer was also

mounted in the rear rack, with its sample air drawn from the duct via a 3/8-inch plastic tube. Recorded data from this analyzer are used in the data summary tables for mean $C0_2$ concentration in ppm. Fluxes are also calculated from the LI-COR data, after correcting for a lag of 1/2 second. Cospectra from low-altitude flux runs reveal that the slower-response LI-COR under-estimates the flux contribution at wavelengths shorter than 50 m when compared with the ESRI device (Fig. 4 of Ref. 6).

The ESRI device gave consistently larger downward $C0_2$ fluxes than the LI-COR unit. Only a fraction of this was due to frequency response. Reference 6 discusses possible instrument problems and a sensitivity to acceleration that likely caused the elevated $C0_2$ fluxes from the ESRI unit. The SGP flights indicate that some of these problems persist. Thus $C0_2$ flux data quoted in this preliminary report are derived from the LI-COR 6262 unit.

For SGP97, the aircraft was fitted with an airborne calibration system for the LI-COR $C0_2$ signal. On activation from the cockpit or cabin, two reference gases sequentially passed through the analyzer for 30 seconds each, the first with zero ppm of $C0_2$, the second with 450 ppm. The signals recorded during these calibration periods will allow the adjustment of the zero and span of the LI-COR $C0_2$ calibration for subsequent data processing. This has *not* been applied to the data listed in this preliminary report. Adjustments in mean $C0_2$ concentrations are unlikely to amount to more than approximately 3 percent, however.

For water vapour (latent heat) fluxes, the agreement between the ESRI and LI-COR 6262 devices was much better than for $C0_2$. In this preliminary report, the latent heat fluxes quoted were derived from the LI-COR analyzer. Calibration data indicate that the LI-COR H_20 signal was likely approximately 4 percent low for the first 5 flights of SGP97.

2.5 Ozone Analyzers

The Twin Otter carried two ozone analyzers in SGP97, one slow-response unit for mean concentrations and one fast-response analyzer to measure ozone fluxes and deposition velocities.

The Air Quality Processes Research Division of the Atmospheric Environment Service of Canada (AES) provided a TECO-49 UV-absorption ozone analyzer to measure mean absolute ozone concentrations on the Twin Otter. This was mounted on rack-3 in the aircraft cabin with sample air drawn from an inlet extending above the cabin roof. Its signal was digitally recorded to a resolution of 0.1 ppb per bit over a range of zero to approximately 200 ppb. The TECO operates using two cells, one a reference and one a sample cell. At an interval of 10 seconds, a new analysis reading is output and the cells trade functions. Consequently, the output signal only appears to update at an interval of 10 seconds. It is not useable for flux measurements.

The second ozone analyzer flown in SGP97 was a Scintrex LOZ-3 Ozone Detector, which detects the chemiluminescence produced when ozone encounters a surface wetted with a specially formulated solution of Eosin-Y. This unit has a time constant of about a second, and requires a lag adjustment of 2.6 seconds when used in a flux calculation on the Twin Otter. Cospectra shown in Figure 7 of Reference 6 show little contribution at wavelengths shorter than 50 m, so fluxes can be expected to be under-estimated at the lowest flight levels.

2.6 Radiometers

The incident solar radiation (RADUP) was measured with a Kipp and Zonen CM-11 pyranometer with a 305-2800 nm spectral range. This device was mounted on the aft fuselage of the aircraft (see Fig. 1) which is tapered. It is mounted so that its sensing axis is tipped forward 3 degrees relative to the IRS axis to compensate for the mean pitch angle of the aircraft in flight. In the data analysis routine, software has been developed to continuously correct the upward radiometer reading for its mounting alignment and for variations in the heading and the pitch and roll attitudes of the aircraft throughout each flight. The equations used are described in Reference. 4. The procedure utilizes the recorded GMT, pitch and roll attitude, heading, latitude and longitude. The only terminal input required is the sun declination angle from Table 169 of Reference 8. In the in-field analysis this procedure was not applied to all of the clear sky cases, but will be in the subsequent analysis.

There was no direct measurement of net radiation made on the Twin Otter. Rather, it was calculated at each 1/32 second using incident and reflected solar radiation (RADUP and RADOWN), with longwave contributions derived from PRT-5 surface temperature (Ts in deg K) and air temperature (Ta in deg K) in the following equation:

$$\text{NETRAD} = \text{RADUP} - \text{RADOWN} + [1.20 \bullet \sigma \bullet Ta^4 - 171.0] - [0.98 \bullet \sigma \bullet Ts^4] \quad (1)$$

where the last two terms represent estimated incident and reflected longwave components, using the Stephan-Boltzmann Constant $\sigma = 5.6924 \bullet 10^{-8}$ and a surface emissivity of 0.98. In past experiments, this computed value of net radiation has agreed quite well with tower measurements (eg., Reference 6).

Some difficulty was experienced in this project with the calibration of the radiometers, the probable result of a grounding fault. Consequently, the net radiation listed in the field-analyzed data summarized in this report (Table 6) is in error. It is approximately 10 percent too high for Flights 1-8, and approximately 20 percent high for Flights 9-16. For Flights 17-27 the net radiation listed is about 40 W m^{-2} low. In the re-analysis process this will be corrected to the latest calibrations.

For SGP97, the Twin Otter carried both an upward- and downward-looking Skye Industries Vegetation Greenness Indicator, which measures a ratio of near-infrared (730

nm) to red (660 nm) radiation. The downward reading can be correlated with the amount of vegetation beneath the aircraft. The upward-facing unit was installed to allow a possible normalization of the downward reading to remove small changes seen in past projects associated with the variations in total solar radiation, such as those encountered in the shadows of clouds. A grounding fault appears to have affected the calibration of the downward-looking greenness index, in particular the 660 nm signal, which was approximately 0.6 too low. In low-light or overcast conditions, the under-reading of the 660 nm signal resulted in an over-estimated Greenness Index (Green 730/Green 660). This will be corrected in the scheduled reprocessing of the data.

A downward-looking Exotech 100BX Satellite Simulator was installed in the port wing of the Twin Otter. This simultaneously measures reflected radiation over four wavelength bands, and can be configured to simulate two modes of LandSat operation (MSS and TM), as well as the French satellite SPOT (three channels only). It has a faster response than the other radiometers discussed above, and considerable flexibility in terms of viewing angles and output signal voltage ranges. For SGP97, it was configured with a 15 deg field of view and a gain of 5 and was operated in the Landsat MSS mode for all flights.

Surface temperature was measured by a downward-looking Barnes PRT-5 infrared radiometer. The PRT-5 operates over one of three selectable temperature ranges. The range that was used in this experiment had an upper limit of 57 deg C.

2.7 Flux Calculations

The program used to generate the flux estimates and numerous summary files for archive purposes was called ARCPOK97_NEW, which was run on the MicroVax-alpha computer used in the field and at the FRL in Ottawa. The principal equations used to compute wind components and fluxes from Twin Otter data are given in Reference 4, and will not be repeated here.

Three sets of fluxes were computed for the sensible and latent heat, $C0_2$, ozone and momentum; these used (1) raw, (2) linearly detrended, and (3) high-pass filtered time series at 32 Hz. The high-pass filtering routine used a third-order algorithm with a breakpoint set at 0.005 Hz, which corresponded to a wavelength of approximately 11 km at the usual flight speed of the Twin Otter of about 55 $m s^{-1}$. Only the linearly detrended fluxes are presented in this report.

On the Twin Otter, there is a physical displacement between the primary sensor for the vertical gust velocity at the tip of the noseboom, and the other sensors providing data for the flux calculations. In using the eddy correlation technique to compute fluxes, the data must be adjusted for the transport time for a parcel of air to pass from the noseboom to the other sensors. This adjustment is particularly important for runs at low altitude, where the spacing of the sensors can become a significant fraction of the typical

turbulent eddy size.

By means of an optional input in the playback software, the vertical gust velocity can be lagged a selectable number of data intervals prior to being multiplied by fluctuations in temperature, $C0_2$, H_20, and ozone signals to derive the fluxes. To verify the predicted time lags, data from low-altitude runs can be analyzed with a range of lags. The resulting computed correlation coefficients are then plotted versus lag, with the maximum of the curve defining the appropriate lag for use in the subsequent data analyses. Another benefit of this technique is that the lag derived is a combination of delays resulting from both the physical separation of the sensors and the differences in the response times of sensors. The lags used in the SGP97 field analysis are listed below:

Flux	Analyzer	Parameter (Table 2)	Lag 1/32 sec
Sensible Heat	Rosemount	pt_port,pt_stb	3
$C0_2$, H_20	ESRI	rC02_esri, rH20_esri	8
	LI-COR	rC02_licor, rH20_licor	23
H_20	Dew Point	rH20_dp	42
Ozone	LOZ-3	oz_loz	85
Momentum	Wind components	wind_nl, wind_el,wind_zl	0

3.0 EXPERIMENTAL SITES AND FLIGHT PATTERNS

In the first week of April, 1997, a flux aircraft flight planning meeting was held in Boulder, Colorado. The purpose of this meeting was to design flight plans, involving both the Twin Otter and Long-EZ, that would meet the objectives of the boundary layer component of SGP97. Working from aeronautical and land-use maps, candidate tracks were laid out that were within operational range of Oklahoma City, within the footprint of the ESTAR system on the NASA P-3, covered both rangeland and winter wheat, and were sufficiently extensive to cover the expected heterogeneity in soil moisture conditions. Since the flux aircraft were to be operated at low altitude (down to 100 feet) on these tracks, approval was sought from the Federal Aviation Administration in Oklahoma City. In early May, representatives from both the Long-EZ and Twin Otter flight crews flew these candidate tracks in a rented Cessna using a hand-held GPS to check their suitability for low-altitude flight. Several of the tracks were adjusted to avoid built-up areas, horse paddocks, etc., and the re-designed tracks were again submitted to the FAA. When SGP97 began on June 18, the track(s) chosen for a given flight were first flown at 500 feet, once again to check for conflicts. This led to some minor revisions to the navigation waypoints.

Figure 2 is a schematic diagram of the final tracks used by the flux aircraft aircrews in SGP97, along with a listing of the latitude and longitude of the waypoints used in the

aircrafts' GPS systems. The length of each track, in nautical miles (nm) and kilometers (km), is also indicated. Two of the lines used most often in the experiment were given names, by which they are known in the flight summary table (Table 6). The 'El Reno' line (RW-RE) was an east/west track 14.7 km in length that was the most frequently flown by the flux aircraft, principally because it overflew several of the flux tower systems operated in SGP97. The Twin Otter flew about half of its flux runs (202) on this track. The 'Kingfisher' line (ES-EN) was a north/south track 31.5 km in length that featured a significant discontinuity in vegetation at the Cimarron River, with mostly winter wheat in the southern 20 km, and rangeland in the 11.5 km north of the river. The winter wheat was harvested during the experiment, so that much of the land south of the river became ploughed. Another 61 of the Twin Otter's flux runs were flown on this track.

The east/west DW-DE track just north of the Kingfisher line proved to be a good contrast to the Kingfisher line, as it appeared to receive more rainfall. The Twin Otter made 34 flux runs on this track. The four tracks southwest of Oklahoma City, including the GW-GE and GS-GN tracks in the Little Washita watershed, proved to be unflyable by the Twin Otter at low altitude due to the number of buildings and cattle on the track. A few runs were done at 300 and 500 feet, and the Long-EZ made a significant number of runs on the GN-GS track on two flights. The GN waypoint was close to the NOAA flux tower.

The two long lines AS-AN and BS-BN were 108 km segments of two of the tracks flown by the ESTAR-equipped P-3 (their lines #2 and #3). These were flown on a few occasions. The southern half of the BS-BN was flown by the Twin Otter on two special flux budget investigations (Flights 21 and 23). The CS-CN line passed the ARM CART site, and was flown by the Twin Otter twice on Flight 05 and five times on Flight 17. This flight also featured 2 soundings at the CART site flown as an intercomparison with the tethersonde operated there, as well as 14 low-level passes of the University of Nebraska grassland flux tower located east of Ponca City.

4.0 SUMMARY OF FLIGHT OPERATIONS

The first Twin Otter flight for the SGP97 study was a test flight of 1.6 hours duration flown from Ottawa on June 11, 1997. This flight was primarily to test the wind and flux system, verify the position errors that apply to the pressure measurements, and check the operation of the laser and radio-altimeters. The aircraft departed for Oklahoma City on June 15, and arrived the next day after five flights and a total of 10.7 transit hours. SGP97 project flights began on June 18 and ended on July 17. A total of 27 project flights were flown, amounting to 82.8 flight hours. The return transit trip to Ottawa on July 18 and 19 again took 5 flights and 10.2 hours. A grand total of 38 flights and 105.3 flying hours were devoted to SGP97.

Table 3 presents a summary of all the flights. It lists the date, flight number, takeoff and landing GMT (local daylight time plus 5 hours), logged flight hours, a brief summary of weather conditions and boundary layer (BL) height, and the runs flown. Waypoints referred to in the last column are those given in Figure 2. Most of the flights were coordinated missions with the NOAA Long-EZ, either with both aircraft flying the same track at different altitudes (these are indicated as 2-plane missions in the right column of Table 3), or with the two aircraft working the same area sequentially. On most of these flights a formation intercomparison was flown by the two aircraft on one of the flux lines; these are indicated in bold in Table 3.

The flights referred to above could be considered the 'normal' flux flights of SGP97. In addition to these, there were some special studies flown. They are summarized below.

Date	Flight(s)	Description
July 02	13, 14	An all-day study to document growth and decay of boundary layer on the El Reno line. Long-EZ did first flight for morning transition, Twin Otter flew 09:30-13:47 local time, Long-EZ did 3rd flight in mid-afternoon, and the Twin Otter measured the evening transition, 18:03-20:35 CDT
July 05	17	Intercomparison with Long-EZ on BN-BS track, then Twin Otter flew the ARM-CART line, intercomp soundings against the tethersonde, and 14 runs past University of Nebraska grassland tower. Long-EZ did same in reverse order.
July 10	21	Advection/Budget study on south end of BS-BN line. Fluxes measured at 30 m and 0.8 Zi (height of mixed layer) in pattern advecting with the wind.
July 13	23	As above, with added runs on DW-DE line on completion of flux budget study.
July 14	24	Two runs on El Reno line with P-3 overflight, and four intercomparison runs on Kingfisher line with UND Citation.
July 16	25, 26	Late morning and evening transition flights on El Reno line; Long-EZ flew mid-afternoon flight.
July 17	27	Morning transition flight coordinated with Long-EZ and Citation, with P-3 overflights.

Figure 3 presents an example plot of the flight track for Flight 19, in which the Twin Otter worked the El Reno, Kingfisher and DE-DW lines. These types of plots are available for all 27 flights. The Twin Otter flew 101 soundings in SGP97, profiling the atmospheric wind and thermodynamic structure from about 30 m altitude to above the top of the mixed layer. Figure 4 is an example plot from one of these soundings from the evening transition flight on July 2.

Table 4 presents a flight-by-flight summary of the runs flown by the Twin Otter in SGP97 categorized by flux, intercomparison, soundings and other. The nearly 400 flux runs have been subdivided by altitude, showing that about half were flown at a nominal 100 ft altitude, and about another quarter were accomplished at 0.8 Zi, where Zi was the height of the top of the mixed layer.

Table 5 documents the Twin Otter instrumentation status throughout SGP97, with individual entries indicating instrumentation problems that may affect the quality of the data. This table should be consulted prior to working with the data from any given flight.

5.0 DATA SUMMARIES

Table 6 presents run-averaged flux and meteorological data for all of the Twin Otter flux runs in SGP97. *These run-averaged data are from the initial in-field analysis, and therefore are to be treated as preliminary data.* Similar tables will be produced when the data are reprocessed, after applying the final calibrations and the Kalman filtering to remove small biases in the wind measurements.

The fluxes and standard deviation values shown are those *computed from linearly detrended data*. These are considered to be the best estimates of the fluxes to date. The first page of this lengthy table serves as a legend for the column headings, explaining what data are shown in each column. Data on each table are grouped by the site flown, after which are presented two summary lines of data giving: (1) the averages for all the runs flown at that site, and (2) the Bowen Ratio and the standard deviation of the run-to-run variations in the flux estimates.

Refer to Section 2.0 above, as well as Table 5, for cautions regarding individual parameters or inoperative sensors on specific flights. The parameters most likely to have significant changes on the data reprocessing are net radiation and greenness index (the latter principally for cloudy cases). It is likely that the sensible heat flux, and possibly the latent heat flux, are under-estimated in Table 6 for runs at 30 m altitude. The mean wind direction and speed, and the rms of the three orthogonal wind components are unlikely to change much in the reprocessing. The Kalman filtering procedure does not affect the vertical wind component.

6.0 EXAMPLE SPECIAL STUDIES

It is not the intention of this interim report to present second-level analyses using the preliminary data -- the final report will accomplish that with reprocessed data. However, preliminary results from a couple of interesting example studies will be the subject of this final section of the interim report.

Figure 5 depicts the Bowen Ratio (sensible heat flux divided by latent heat flux) measured by the Twin Otter on 35-m runs on the three tracks flown most often. The Kingfisher line shows a significantly different time history during the experiment, despite its position between the El Reno and DW-DE lines, with its center about 40 km from the centers of each of the other two lines. The 'weather' column in Table 3 indicates that the main rain events during the experiment occurred on June 28 (day 179), July 3 (day 184), and July 10 (day 191). These records are not complete, however, and since the precipitation occurred in thunderstorms, it was known to be patchy. The interesting observation from Figure 5 is that the Bowen ratio for the El Reno run remains well bounded between about 0.25 and 0.45, despite periods of significant drying. The Kingfisher line has a much larger response to the drying after day 185 than the other two lines. This may be due in part to the harvesting and ploughing of the fields with winter wheat; the Kingfisher line appeared to have a greater proportion of bare fields near the end of the experiment than the other two lines. Further study is required, with examination of the rainfall records along with the NASA P-3 ESTAR data. The aircraft video-tape can be used to derive the proportion of each vegetation species on each flux line.

Two of the Twin Otter flights (# 14 and 26) examined the evening transition of the boundary layer. Figure 6 shows the measured fluxes of sensible and latent heat and $C0_2$ for the 35-m runs plotted versus local daylight time (GMT-5). The plots show very similar results for the two days with a reversal of the sign of the sensible heat flux near 7 p.m., accompanied by a change in $C0_2$ flux from a net uptake by the surface to respiration. The sun set about 7 minutes earlier for Flight 26. These low-altitude runs are complemented by a number of runs on the same track at higher altitude (4 for Flight 14, 8 for Flight 26) and soundings (2 and 5 respectively). These data, along with measurements made by both flux aircraft earlier on each day, should form the basis of an interesting boundary layer study.

Approximately 25 percent of the flux runs flown by the Twin Otter in SGP97 were flown at an altitude close to 0.8 Zi, where Zi is the height of the top of the mixed layer. This represents the greatest number of such runs in any project flown to date by the Twin Otter. These runs provide considerable data with which to examine entrainment processes at the top of the mixed layer. Figure 7, for example, illustrates the time-histories of the vertical gust velocity, potential temperature fluctuation from the run-mean, and water vapour mixing ratio for a Kingfisher run at 5000 feet on Flight 15. The large excursions in the bottom two traces represent incursions into the mixed layer of

warm, dry air from aloft. In this case, the computed fluxes of sensible and latent heat, using linearly detrended data, were -104 and +1307 W m^{-2} respectively.

7.0 REFERENCES

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TABLE 1:

TWIN OTTER SENSORS FOR SGP97

Category	Instrument	Type[1] Output	Parameter Labels	Description
Time	VME-167 computer	D	TIME	Recorded at millisec after midnight GMT
Position	Trimble GPS/VLF/Omega TNL-7880SR	D	LTD, LTM LGD, LGM	Latitude, degrees and minutes Longitude, degrees and minutes
	Litton 90-100 Inertial Reference System	D	LATL LONGL	Latitude, dec. degrees Longitude, dec. degrees
	NovaTel RT-20 GPS	D	LATN LONGN	Latitude, dec. degrees Longitude, dec. degrees
Inertial Velocity	Litton 90-100 Inertial Reference System	D	ULN,VLE,WZL GSL	3 Components of Velocity in Earth-axes Total Ground Speed
	Trimble GPS/VLF/Omega TNL-7880SR	D	UNGPS,VEGPS GS_GPS	Horizontal components of ground speed, Earth axes Total Ground Speed
	NovaTel RT-20 GPS	D	UNN,VEN,WZN GS_NOV	3 Components of Velocity in Earth axes Total Ground Speed
Heading	Sperry C-12 Gyro Compass	S	HDGM HDGT	Magnetic Heading True Heading (Uses Variation from GPS)
	Litton 90-100 IRS	D	HDGTL	True Heading
Attitudes	Kearfott T2109 Gyro	S	THETA, PHI	Pitch and Roll Attitude
	Litton 90-100 IRS	D	THETAL,PHIL	Pitch and Roll Attitudes
Acceler-ations	Systron-Donner 4211	A	AX,AY,AZ	Longitudinal, Lateral and Vertical Accelerations in Aircraft Axes
	Litton 90-100 IRS	D	AXL,AYL,AZL EAZL	" " Plus Vertical Acceleration in Earth Axes
Angular Rates	Smiths 402-RGA Rate Gyros	A	PRATE,QRATE RRATE	Roll, Pitch and Yaw Rates in Aircraft Axes
	Litton 90-100 IRS	D	PRATEL,QRATEL RRATEL	" "
Altitude	Sperry AA-200 Radio Altimeter	A	RALT	Height Above Terrain, to 2500 ft
	Riegl LD-90-3 Laser Altimeter	A	LASALT	Fast response height above terrain; resolution and frequency response programmable (set for 200 m max BOREAS-1996)
Tempera-tures	Rosemount 102DJ1CG	A	TTF	Fast Response Total Temp., Port side of Nose
	Rosemount 102DJ1CG	A	TTNB	Fast Response Total Temp., Starboard Side of Nose
	Rosemount 102DJ1CG	A	TTDUCT	Fast Response Total Temp in Duct
	Barnes PRT-5	A	PRT5C	Surface Temperature
	E,G and G Model 137-S10	A	DEWPTC	Dew Point Temperature
	LICOR CO_2 Analyzer Temp	A	LCTS	Temperature in LICOR used in calculation of ppm CO_2

TABLE 1 (Cont)

Category	Instrument	Type[1] Output	Parameter Labels	Description
Pressures	Paroscientific 1015A-02 Rosemount 858AJ28 Probe	D	PSNB	Noseboom Static Pressure, temperature compensated
	Paroscientific 1003D-02 Rosemount 858AJ28 Probe	D	PDNB	Noseboom Dynamic Pressure
	Paroscientific 1003D-02 Rosemount 858AJ28 Probe	D	PALPHA	Differential Pressure for Angle of Attack
	Paroscientific 1003D-02 Rosemount 858AJ28 Probe	D	PBETA	Differential Pressure for Angle of Sideslip
	Paroscientific 1015A-02	D	PSF	Alternate Static Pressure, Fuselage ports
	Rosemount 1221F1VL7A1B	A	PDF	Alternate Dynamic Pressure, Fuselage pitot
	Rosemount 1221F2VL7A1A	A	DPSDUCT	Pressure difference in duct between upstream and downstream of CO_2 analyzer
	Rosemount 1201F1B4A1B	A	PSDUCT	Static Pressure in Duct upstream of CO_2 analyzer
	Rosemount 1201F2A1A1B	A	PSLICOR	Static pressure in LICOR line
Analyzers	Agriculture Canada ESRI Gas Analyzer	D	CO2 H2O	Carbon Dioxide Concentration Water Vapour Concentration
	LICOR CO_2/H_2O Analyzer Model LI-6262	A	LCO2 LH2O	CO_2 concentration H_2O concentration
	Scintrex Ozone Analyzer LOZ-3	A	LOZ3	Ozone concentration, ppb, full signal
	TECO Ozone Analyzer Model 49	A	TECO	Ozone concentration, ppb, full signal
Radiometers	Kipp and Zonen CM-11	A	RADUP	Incident Shortwave Radiation, Top Fuselage
	Eppley Pyranometer	A	RADOWN	Reflected Shortwave Radiation, Under Fuselage
	Skye Industries Greenness	A	GRN660 GRN730 GRNRAT	Vegetation Greenness Index, (IR/R) Downward-looking
	Skye Industries Greenness	A	GRUP66 GRUP73 GREENU	Vegetation Greenness Index, (IR/R) Upward-looking
	Barnes PRT-5 radiometer	A	PRT5C	Surface temperature
	Exotech Inc. 100BX Satellite Simulator	A	SAT1,SAT2 SAT3,SAT4	Reflected radiation at four wavelengths to simulate SPOT or Landsat TM and MSS

[1] D- Digital S- Synchro A- Analog

TABLE 2: TWIN OTTER RECORDING BUFFER, SGP97

Name	Units	Description
date	-	Year * 10000 + Month * 100 + Day
time	ms	milli-seconds from midnight GMT (ie. Time * 1000)
event	bits	Event marker
leds	bits	Status of function switches, etc.
ps_nb	mb	Noseboom static pressure, uncorrected for position errors
pd_nb	mb	Noseboom dynamic pressure, uncorrected for position errors
p_alpha	mb	Noseboom angle of attack differential pressure
p_beta	mb	Noseboom angle of sideslip differential pressure
ps_fus	mb	Fuselage static pressure, uncorrected for position errors
psnbc	mb	Noseboom static pressure, corrected for position errors
pdnbc	mb	Noseboom dynamic pressure, corrected for position errors
psfc	mb	Fuselage static pressure, corrected for position errors
pdfc	mb	Fuselage dynamic pressure, corrected for position errors
pdfnb	mb	Dynamic pressure at noseboom calculated from fuselage dynamic pressure
heading	degT	Aircraft heading, C-12 compass, degrees true
pitch	deg	Pitch attitude from Kearfott gyro
roll	deg	Roll attitude from kearfott gyro
o3_teco	ppb	Ozone concentration, TECO slow-response reference unit
laser	m	Laser altimeter height above terrain
tt_port	deg C	Total temperature, port probe
tt_stb	deg C	Total temperature, starboard probe
pd_fus	mb	Fuselage dynamic pressure, uncorrected for position error
rad_alt	m	Radio-altimeter height above terrain
dew_point	deg C	Dew point temperature
p	deg/s	Aircraft roll rate from 3-axis gyro package
q	deg/s	Aircraft pitch rate from 3-axis gyro package
r	deg/s	Aircraft yaw rate from 3-axis gyro package
ax	m/s^2	Longitudinal acceleration, from 3-axis accelerometer package
ay	m/s^2	Lateral acceleration, from 3-axis accelerometer package
az	m/s^2	Vertical acceleration, from 3-axis accelerometer package
t_accel	bits	Temperature in accelerometer pack (ie. uncalibrated)
rad_up	W/m^2	Incident radiation
rad_down	W/m^2	Reflected radiation
prt5	deg C	Radiometric surface temperature
lco2	mv	LI-COR C02 raw signal, millivolts
ltemp	deg C	LI-COR temperature
lh2o	mv	LI-COR H20 raw signal
lps	mb	LI-COR pressure
ps_duct	mb	Duct static pressure, upstream of ESRI Analyzer
dps_duct	mb	Difference in duct pressure across ESRI C02 analyzer
g660_up	-	Greenness 660 signal, upward looking
g730_up	-	Greenness 730 signal, upward looking
g660_down	-	Greenness 660 signal, downward looking
g730_down	-	Greenness 730 signal, downward looking
o3_loz	ppb	Ozone concentration from LOZ-3 analyzer
sat_a	W/m^2	Satellite simulator, channel A
sat_b	W/m^2	Satellite simulator, channel B
sat_c	W/m^2	Satellite simulator, channel C
sat_d	W/m^2	Satellite simulator, channel D

Table 2 (cont) Recording Buffer

Name	Units	Description
tt_duct	deg C	Duct total temperature
elevator	deg	Elevator angle, positive trailing edge down
rudder	deg	Rudder angle, positive trailing edge left
lat_l	deg	Latitude from Litton IRS
lon_l	deg	Longitude from Litton IRS, west negative
gs_l	m/s	Ground speed from Litton IRS
track_l	degT	Ground track angle from Litton IRS
heading_l	degT	Aircraft true heading from Litton IRS
drift_l	deg	drift angle from Litton IRS
pitch_l	deg	Pitch attitude from Litton IRS, nose up positive
roll_l	deg	Roll angle from Litton IRS, right wing down positive
p_l	deg/s	Aircraft roll rate from Litton IRS, right wing down positive
q_l	deg/s	Aircraft pitch rate from Litton IRS, nose up positive
r_l	deg/s	Aircraft yaw rate from Litton IRS, nose right positive
ax_l	m/s^2	Longitudinal acceleration from Litton IRS
ay_l	m/s^2	Lateral acceleration from Litton IRS, positive to right
az_l	m/s^2	Vertical acceleration from Litton IRS, positive downwards
alt_l	m	Pressure altitude from Litton IRS
v_az	m/s^2	Vertical acceleration in earth axes, from Litton IRS
v_spd	m/s	Vertical speed in earth axes, from Litton IRS
ns_vel_l	m/s	Velocity to north from Litton IRS
ew_vel_l	m/s	Velocity to east from Litton IRS
lat_t	deg	Latitude from Trimble 7880 GPS
lon_t	deg	Longitude from Trimble 7880 GPS, west negative
gs_t	m/s	Ground speed from GPS
ns_vel_t	m/s	North velocity from GPS
ew_vel_t	m/s	East velocity from GPS
mag_var	deg	magnetic variation from GPS
xtrack	n. mile	Cross-track error from GPS
trk_err	deg	Track-angle error from GPS
date_t	-	Year * 10000 + Month * 100 + Day
time_t	ms	milli-seconds from midnight GMT (ie. Time * 1000)
balt_nb	m	Pressure altitude, using noseboom static pressure
balt_fus	m	Pressure altitude, using fuselage static pressure
ts_port	deg C	Static temperature, from port probe
ts_stb	deg C	Static temperature, from starboard probe
ts_duct	deg C	Static temperature in duct
pt_port	deg K	Potential temperature, from port probe
pt_stb	deg K	Potential temperature, from starboard probe
tas_nb	m/s	True airspeed, noseboom
tas_fus	m/s	True airspeed, fuselage ports
tas_duct	m/s	True airspeed in duct
alpha	deg	Aircraft angle of attack, corrected for upwash
beta	deg	Aircraft sideslip angle, corrected, positive sideslip right
alpha_l	deg	Aircraft angle of attack, derived from Litton IRS data
wind_nl	m/s	Wind component from north, primary system
wind_el	m/s	Wind component from east, primary system
wind_zl	m/s	Vertical wind component, primary system, positive up
wdir_l	degT	Wind direction, primary system
wspd_l	m/s	Wind speed, primary system

Table 2 (cont) Recording Buffer

Name	Units	Description
uair_l	m/s	North true airspeed component corrected to Litton IRS location
vair_l	m/s	East true airspeed component corrected to Litton IRS location
wair_l	m/s	Vertical true airspeed component corrected to Litton IRS location, positive aircraft down
wind_ng	m/s	Wind component from north, backup GPS system
wind_eg	m/s	Wind component from east, backup GPS system
wind_zc	m/s	Vertical wind component, backup complementary filtered system
wdir_g	deg	Wind direction, backup GPS system
wspd_g	m/s	Wind Speed, backup GPS system
uair_g	m/s	North true airspeed component corrected to accel. location, backup
vair_g	m/s	East true airspeed component corrected to accel. location, backup
wair_c	m/s	Vertical airspeed component corrected to accel. location, backup
wepf	m/s	Vertical wind component, high pass filtered
w_palt	m/s	Low-frequency vertical velocity derived from pressure altitude
vel_z	m/s	Aircraft vertical velocity, derived from backup system
g_index	-	Greenness index, downward-looking device
eddy	bits	Eddy accumulation signal (up, down and dead-band)
density_nb	kg/m^3	Air density, uses noseboom pressures
density_duct	kg/m^3	Density in duct at ESRI analyzer location
dry_density	kg/m^3	Density of dry-air component in duct
co2_esri	mg/m^3	ESRI $C0_2$ concentration
rco2_esri	mg/kg	ESRI $C0_2$ mixing ratio, mg $C0_2$ per kg dry air
h2o_esri	g/m^3	ESRI H_20 concentration
rh2o_esri	g/kg	ESRI H_20 mixing ratio, g H_20 per kg dry air
rh2o_dp	g/kg	H_20 mixing ratio, derived from dew point temperature
co2_licor	mg/m^3	LI-COR $C0_2$ concentration
lco2_ppm	ppm	LI-COR $C0_2$ concentration in ppm
rco2_licor	mg/kg	LI-COR $C0_2$ mixing ratio, mg $C0_2$ per kg dry air
h2o_licor	g/m^3	LI-COR H_20 concentration
lh2o_ppt	ppt	LI-COR H_20 concentration in parts per thousand
rh2o_licor	g/kg	LI-COR H_20 mixing ratio in g H_20 per kg dry air
terrain	m	Terrain height above sea level
net_rad	W/m^2	Net radiation
novlat	deg	Latitude from NovaTel GPS
novlon	deg	Longitude from NovaTel GPS
nov_hgt	m	Height above sea level from NovaTel GPS
nov_gs	m/s	Ground speed from NovaTel GPS
nov_trk	degT	Track angle from Novatel GPS
nov_vz	m/s	Vertical velocity from NovaTel GPS

TABLE 3: FLIGHT SUMMARY - Southern Great Plains, 1997

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jun 11	T1	1430-1552	1.6	warm, some cloud, smoke from forest fires, Altimeter 29.90/29.88	- 4 reciprocal runs for wind check, 5500' - Control inputs, 3 events - 4 runs on Larose forest at 500, 100, 300 and 300 ' - Descent over Lac Deschenes to check Radalt and laser altimeter - Acceleration/Deceleration over Lac Deschenes to check position errors, airspeeds
June 15	Tr-1		1.2		- Transit, Ottawa- Syracuse
	Tr-2		2.2		- Transit, Syracuse - Akron
	Tr-3		2.5		- Transit, Akron - Terre Haute
June 16	Tr-4		2.6		- Transit, Terre Haute - Lebanon
	Tr-5		2.2		- Transit, Lebanon - Oklahoma City
June 18	01	1552-1716	1.6	Clear, warm, southwest winds, Altimeter 30.02/30.01 BL 2700' msl at 1614 Z, BL 3800' msl at 1648 Z,	- *El Reno line* - Sounding 6500' msl - 300' agl - Flux run, 500', RE-RW (extended east) - Flux run 150 ', RW-RE (") Litton fails - 2 runs at about 0.8 Zi, 3300 and 3100' msl
June 19	02	1505-1806	3.2	Clear, hot, SSW wind 15 mps, Altimeter 29.98, BL 1900' agl at 1525 Z BL 2000' agl at 1535 Z BL 2300' agl at 1610 Z BL 2600' agl at 1638 Z BL 2700' agl at 1740 Z	- *El Reno, new line* - Sounding 4500'msl to 100' agl - **Intercomp with Long-EZ, 500'** - 4 runs at 0.8 Zi, 1550' agl - Sounding 4000' msl to 100' agl - 4 runs at 100' - Sounding 100' agl to 5000'msl - 2 runs at 0.8 Zi, 2100' agl - 4 runs at 0.5 Zi, 1300' agl - 1 run at 0.8 Zi, 2100' agl - Sounding, 5000'msl to 100' agl - **Intercomparison with Long -EZ, 500'**
June 20	03	1507-1749	2.9	Clear, hot with more humidity than previous day, Winds SSW 10 mps, BL hard to determine in flight, but 1500-1700' agl from plots, Altimeter 29.83	- *El Reno line again* - Sounding 5500' msl to 100' agl - 8 runs at 100' - 3 runs at 1300' agl, middle run an **intercomparison with Long-EZ** - Sounding 100' agl to 5500' msl - 6 runs near 0.8 Zi, first at 3500' msl, next five at 3200' msl - Sounding 5500' msl to 100' agl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
June 20	04	1913-2224	3.4	Clear, hot, humidity drops a lot to the north, windy and turbulent, Altimeter 29.81/29.76	- *AS-AN track* - Sounding near AS, from 6500' msl - AS-AN scouting run, three events, 800'agl - AN-AS , three events, 800' agl - 4 runs on southern 30 miles of AS-AN track, 600'; northbound runs a single event, southbound runs split in two events. - Sounding near AS, 5500' msl
June 21	05	1704-2000	3.1	Hot, strong southerly wind, some cumulus, haze, humid Altimeter 29.88	- *Recce flight with flux measurement* - BS-BN, split event, 500' agl - Two passes on CART track, CN-CS, CS-CN, 500' - BN-BS, first 30 miles in two events, 500' - DW-DE and DE-DW, 500' - Southern 1/2 of BN-BS in two events, 500'
June 22	06	1459-1812	3.4	Cooler, mostly overcast near edge of large complex in Texas, Winds SSE 9 mps, Altimeter 30.08	- *Recce flight with fluxes* - 2 passes on GN-GS line, 500' and 150' - GE-GW at 500' - FW-FE at 500' - FS-FN at 500' - 2 passes on ES-EN, 500' and 100' - EW-EE at 500' - EE-EW at 500', offset 0.3 n miles north - 4 passes on El Reno line, 100' - Sounding, 100' agl to 5500' msl
June 24	07	1519-1829	3.4	Warmer, some cloud at start, but clearing, very windy, 10-15 mps at 100', 20-25 at top of BL, Altimeter 29.98/29.96, BL 4100' msl at 1540 Z BL 4100' msl at 1548 Z BL 4200' msl at 1610 Z BL 4700' msl at 1640 Z BL 4100' msl at 1718 Z (?) BL 4700' msl at 1813	- *Plan E, 2 aircraft, El Reno* - 2 soundings at east end, 5500' msl to 100' agl, and climb back to 4500' msl) - One run at 0.8 Zi, westbound, 3500' msl - 2 runs at 100' agl, - Sounding at west end, 100' to 4500' msl - 2 runs at 0.8 Zi, 3600' msl - 2 runs at 100' agl - Sounding, 100' agl to 5300' msl, west end - 2 runs at 0.8 Zi, 4000' msl - 2 runs at 100' agl - Sounding 100' agl to 5500' msl at west end - 2 runs at 0.8 Zi, 4100' msl - 2 runs at 100' agl (**2nd one with Long-EZ, intercomp** - one run at 0.8 Zi, 4100' msl **(with Long-EZ in formation, intercomp)** - Climb to above BL, evented, 4100- 5600' msl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
June 25	08	1347-1640	3.0	High broken overcast and light winds, gradual clearing during study, BL higher to east probably, Altimeter 30.03/30.06, BL 1600' agl at 1400 Z BL 3800' msl at 1515 Z BL 3800' msl at 1538 Z	- *El Reno, early 2 plane* - Sounding east end 4000' msl to 100' agl - One run at 0.8 Zi, 1300' agl - 2 runs at 100' agl - Sounding at west end, to 4000' msl - 2 runs at 0.8 Zi, 1300' agl - one run at 100' (computer failure near end) **TAPE 2** - one run 100' - one run 0.8 Zi, 1300' agl - Sounding at east end, 100' agl to 5500' - one run at 0.8 Zi, 3300' msl - 2 runs at 100' agl - Sounding at west end, 100' agl to 4500' msl - 2 runs at 0.8 Zi, 3300' msl - 2 runs at 100' agl - one run at 0.8 Zi, 3300' msl - 2 runs at 100' **(Consider intercomparison with Long-Ez; first run 3 miles behind Long-EZ, 2nd joining with Long-EZ)** - Sounding to 5500' - Pitches and Yaws at 5500'
June 27	09	1543-1850	3.3	Clear at start with some light Cirrus, cumulus developing near end of flight based 5700', winds 210/13 kts, 30/22 at takeoff, Altimeter 30.07/30.06, BL 3300' msl at 1557 Z BL 4000' msl at 1635 Z	- *El Reno and Kingfisher* - Sounding to El reno, 5500' msl to 100' agl - 6 runs at El Reno, 100', clear - Climb sounding enroute to RE-ES, to 4500' - Descent sounding near ES, 4500' to 100' - 3 runs on Kingfisher line, ES-EN, 100' - Sounding near EN, 100' to 6000' - 3 runs on Kingfisher line, ES-EN, 100' - Climb sounding enroute ES-RE, 100' agl to 6000' msl (cloud based 5700' - 6 Runs at El Reno, 100', some cloud,
Jun 29	10	1254-1615	3.5	Clear and humid at start, 23/22, winds light then increasing at site, Good inversion, BL rising from about 1100' agl to about 2000' agl, Some mid cloud gives shadows in middle of experiment, then disappear, El Reno area has standing water due to 2-3 inches rain previous day, Altimeter 29.87/29.88	- *Plan E, El Reno* - Sounding east end, 4500' msl to 100' agl - Sounding east end, 100' agl to 3000' - one run at 0.8 Zi, west, 900' agl - two runs at 100' - Sounding at west end, 100' agl to 3000' msl - two runs at 0.8 Zi, 900' agl - 2 runs at 100' agl - one run at 0.8 Zi, 900' - **restart pattern**, Sounding east end 4000' to 100' agl - one run at 0.8 Zi, west, 1100' agl - one run eastbound at 100' --------- tape fails,unrecorded runs in brackets - (one run westbound at 100') - (Sounding west end 100' agl to 4000 ' msl) - (two runs at 0.8 Zi, 1100' agl)

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
10 (cont)					- (two runs at 100') - (start run 0.8 Zi), abort due to discovery of tape failure: restart computer, new tape ------ - **TAPE 2** - one run eastbound at 0.8 Zi, 1100' agl - **restart pattern again**, Sounding at east end, 4000' to 100' agl - one run at 0.8 Zi, westbound, 1100' agl - 2 runs at 100' agl - Sounding at west end, 100' agl to 4000' msl - two runs at 0.8 Zi, 1400' agl - two runs at 100' - one run at 1100' agl (accidently flown too low
Jun 30	11	1610-1948	3.8	Clear skies after major Cb passed north last night, wetting DW-DE more than Kingfisher line, warm and humid, winds south 20 kts, BL rose from 3500' msl to 4400' msl, Altimeter 29.95/29.92	- *Kingfisher and DW-DE lines in tandem with Long -EZ* - Sounding near ES, 5500' msl to 100' agl - 2 runs on ES-EN line, 100', alone - 3 runs at 600', LE at 100' agl - 4 runs at 100', LE at 600' agl - Sounding **with long-EZ** enroute to DW, 100' agl to 5000' msl - Descent sounding **with Long-EZ** near DW, 5000' msl to 600' agl - 3 runs on DW-DE track, 600', LE at 100' - 3 runs on same track at 100', LE at 600' - **Sounding with Long-EZ** 400' to 5000' - **Intercomp with LE**, EN-ES at 600 ft (Note, altitude not stable at start, skip first 2 minutes in intercomp analysis).

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 01	12	1603-1934	3.7	Clear and hot, Winds SSW 20 kt, BL 3800-4200' msl, Above mixed layer was dry with high ozone, Altimeter 29.87/29.86	- *Worked DW-DE line while Long-EZ did Kingfisher line* - Sounding enroute to ES, 4500' msl to 100' agl - one run on Kingfisher line, north, 100' - Climb sounding EN-DW, 100' agl to 4500' msl - Descent sounding at DW, 4500' to 100' agl - one run eastbound, DW-DE, 100, incomplete due to computer failure. TAPE 2 - one run westbound, DE-DW, 100' - one aborted run - 2 runs at 0.5 Zi, 2500' msl - 4 runs at 0.8 Zi, 3600' msl - 2 runs at 0.5 Zi, 2700' msl - 2 runs at 100' agl - Sounding enroute DW-EN, 100' agl to 5000' msl - one run Kingfisher, EN-ES, 100' - Sounding south of ES, 100' agl to 5000' (LICOR into calibrate near top)
Jul 02	13	1430-1747	3.5	Clear, hot, light winds SSW becoming westerly, double boundary layer, upper from 3600 to 4400' msl during flight, Altimeter 29.95	- *The 2-plane, 4 fight all day study at El Reno* - Sounding 5500' msl to 100' agl - 2 runs at 100' - 2 runs at 0.8 Zi, 2600 ' msl - 2 runs at 100' - 2 runs at 0.8 Zi, 2600' msl - Sounding at east end, 5500' to 100' - 2 runs at 100' - 2 runs at 0.8 Zi, 2600' msl - 2 runs at 100' - 2 runs at 0.8 Zi, 2600' - 2 runs at higher 0.8 Zi, 3200' - Sounding at east end, 5500' msl to 100' - 2 runs at 100' - 1 run at 3200', offset 0.3 n mile south for footprint study - 1 run at 3200', offset 0.6 n mile - 2 runs at 100' - Sounding at east end, 100' agl to 5500' msl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 02	14	2303-0135	2.7	Clear, hot, winds SSW at 10 knots, Altimeter 29.90/29.88, BL 7200' msl at 2316 Z BL 8200' msl at 0025 Z	- *4 th flight of day at El Reno; Evening Transition* - Sounding 7500' msl to 100' agl - 2 runs at 100' TAPE 2 - 2 runs at 0.8 Zi, 6000' msl - pop-up sounding, 6000 to 8000' msl - 4 runs at 100' - Sounding at east end, 100' to 8500' msl - 2 runs at 0.8 Zi, 6900' - 4 runs at 100'
Jul 03	15	1558-1855	3.2	Clear with a few very small StrCu at top of heavy haze layer, Hot, 32/22 on takeoff, Winds SW 15 kt, Altimeter 29.95/29.92, BL 4600' msl at 1612 Z BL 5900' msl at 1710 Z BL 5900' msl at 1800 Z BL 6000' msl at 1840 Z	- *Kingfisher and DW-DE study* - Sounding to ES, 5500' msl to 100' agl - 2 runs ES-EN line, 100' - 2 runs at 0.8 Zi, 3800'msl - 1 run at 100' northbound - Sounding EN-DW, 100' to 6000' msl - 2 runs on DW-DE tracks at 5000' msl - 2 runs at 100' - Sounding enroute DW-EN, 100' to 6500' msl - 2 runs Kingfisher line, 5000' - 1 run southbound, 100' - Sounding south of ES, 100' to 6300' msl
Jul 04	16	1822-2123	3.2	Clear after passage of cold front and thunderstorms overnight, Winds NNE 10 knots, Cooler and dry, 24/14, Altimeter 30.17/30.14: rapid boundary layer growth; 5100' msl at 1835 Z 5900' msl at 1925 Z 6300' msl at 1950 Z 6500' msl at 2015 Z	- *Kingfisher with Long-EZ, and El Reno* - Sounding to ES, 5500' msl to 100' agl - 2 runs Kingfisher, 100' - 2 runs at 0.8 Zi, 4200' msl - Sounding at ES, 6500' msl to 100' agl - 2 runs at 100' agl - Sounding at ES, 100' to 6500' msl - 2 runs at 0.8 Zi, 5300' msl - 2 runs at 100' - Sounding enroute ES-RE, 100' to 6500' msl - 4 runs at El Reno, 100'

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 05	17	1559-1909	3.4	Clear in area worked with very few small StrCu, winds SSE 9 kts, Altimeter 30.17 Boundary layer 4300' msl at 1635 Z 5600' msl at 1745 Z	- *ARM CART line and Verma Grassland* - **Intercomp with Long-EZ,** part of BN-BS at 500' - CS-CN line at 100', northbound - Sounding around tethersonde, 4500' msl to 100' agl - 4 more lines on CN-CS track, 100' - Another sounding around tethersonde, 100' to 6000' msl - 14 lines past VERMA grassland site, first 5 at various directions, last 9 on east/west line, 100'; no event on first E/W line - one run over large area of uniform grassland - Partial sounding enroute to Ponca City
Jul 05	18	2027-2105	0.8	Mostly clear, some high cloud near OKC, smoke from burning fields. Altimeter 30.18/30.09 BL top approx 6500' msl	- *Ponca City to Oklahoma City* - One event in smoke plume from burning fields - gentle pitches and yaws, no event
Jul 08	19	1555-1907	3.4	Clear for most of flight, some high cloud on some DW-DE runs, warm, Winds SSW 11-15 knots, Cumulus just starting at end of flight, Altimeter 30.05/30.05 Boundary Layer 3200' msl at 1610 Z 4600' msl at 1640 Z 5400' msl at 1750 Z 5300' msl at 1830 Z	- *Kingfisher, DW-DE and El Reno* - Sounding to ES, 6000' msl to 100' agl - 3 runs on Kingfisher line, 100' - Sounding EN-DW, 100' to 5000' msl - 6 runs at 100' agl on DW-DE line (some shade on at least first 4 lines) - Sounding DW-EN, 100' to 6000' msl - 3 runs on Kingfisher line, 100' - Sounding ES-RE, 100' to 6000' msl - 4 runs at 100' on El Reno line (Note; first two right after Long-EZ, **Intercomparison on third run**); last run just ahead of Long-EZ
Jul 09	20	1602-1845	2.9	Clear at start, cumulus building to about 30 percent, Winds SSW 12-15 knots, Altimeter 30.06/30.04 Boundary Layer 3200' msl at 1620 Z 4200' msl at 1720 Z 4100' msl at 1740 Z	- *Washita GE-GW, and FW-FE lines* - Sounding to GE, 6500' msl to 500' agl - 3 runs on GE-GW line, 500' agl - 3 runs at 300' agl - 2 runs at 500' agl - Sounding GE-FW, 500' agl to 5500' msl - 2 runs on FW-FE line, 500' - 2 runs at 300' agl - 1 run at 500' agl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 10	21	1510-1722	2.4	Clear at start, but TCu and showers developing, Wind SSW 15 knots, Altimeter 30.03 Boundary Layer 3250' msl at 1525 Z, south 3700' msl at 1545 Z, north 3700' msl at 1600 Z, south 3900' msl at 1615 Z, north 3800' msl at 1630 Z, south 4600' msl at 1645 Z, north	- *Advection/Budget Study, paperclip flight plan, on line BS-BN* - Sounding at BS (0 DME), 5500' msl to 100' - Aborted run, GPS in error - Run north, 0 to 16 n miles DME, 100' - Sounding at 16 DME from BS, 100' to 4300' msl - Run south at 0.8 Zi, 3200' msl, 16-5 DME - Sounding at 5 miles from BS, 4400' msl to 100' - Run north, 5 to 21 miles from BS, 100' - Sounding at 21 miles from BS, 100' to 4500' - Run south at 0.8 Zi, 3400' msl, 24 to 12 miles from BS (divert around shower) - Sounding at 17 miles from BS, 5000' msl to 100' agl (pattern moved north 5 miles) - Run north, 20-36 miles from BS, 100' agl - Sounding at 36 miles from BS, 100' to 5500' msl - Run south at 0.8 Zi, 4000' msl, 36 to 25 miles from BS
Jul 12	22	1502-1822	3.5	Clear, winds south at 20, Altimeter 30.07/30.07 Heavy rains in parts of project area night of July 10; only 0.1 inch at Kingfisher, Boundary layer relatively constant, and moist aloft 2900' msl at 1512 Z 3600' msl at 1524 Z 3700' msl at 1550 Z 3800' msl at 1610 Z 4500' msl at 1750 Z Log-EZ at DW-DE)	- *Kingfisher and El Reno with P-3 LASE overflights* - Sounding to ES, 5000' msl to 100' agl - Kingfisher, ES-EN 100' - Sounding 100' agl to 4500' msl, north end - 2 runs at 0.8 Zi, 3100' msl - Pop up sounding to check top of BL, 3100-4000' msl - 2 runs at 100' agl - Sounding at north end, 100' to 4500' - Run south at 0.8 Zi, 3200' msl **El Reno, with P-3 overpass** - 2 runs at 0.8 Zi, 3100', Long-EZ below at 100', P-3 above - Pop-up sounding 3100-4500' msl - 4 runs at 100' agl - Sounding 100'agl to 5000' msl - 2 runs at 0.8 Zi, 3500' msl - 4 runs at 100' agl - **Kingfisher,** 1 run at 100' agl northbound - direct return after bird-strike, ran event at 3000' msl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 13	23	1554-1851	3.1	Clear, hot, winds SSW at 20 knots, Altimeter 30.00/29.98 Boundary Layer 3600' msl at 1604 Z 3600' msl at 1625 Z 3700' msl at 1635 Z 4000' msl at 1645 Z 4200' msl at 1655 Z 4000' msl at 1715 Z 3800' msl at 1730 Z 4100' msl at 1825 Z	- *Advection/Budget flight on BS-BN track plus DW-DE; P-3 overflies line 3* - Sounding to BS, 5500 ' msl to 100' agl - Run at 100', from BS to 16 mile point - Sounding at 16 DME, 100' to 4100' - Inbound run at 0.8 Zi, 3200' msl, from 16 to 6 mile point from BS - Sounding a t6 mile point, 4200' msl to 100' - Run at 100' from 6 to 22 mile points - Sounding at 22 mile DME, 100 to 4500' msl - Inbound run at 0.8 Zi, 3500', from 22 to 12 mile point - Sounding at 12 mile point, 4600' msl to 100' - Run at 100' from 13-29 miles from BS - Sounding at 29 miles DME, 100' to 4500' msl - Inbound run at 0.8 Zi, 3400 ' msl, from 29 to 18 mile point from BS - Sounding at 18 mile point, 4700' msl to 100' - Run at 100 ' from 18 to 34 miles from BS **DW-DE Study** - Four runs on DW-DE line at 100' - Sounding enroute to Oklahoma City, 100' agl to 7500' msl
Jul 14	24	1540-1833	3.1	Front nearby, some TCu in area, Winds light, westerly in the south, northeast north of Kingfisher, hot, Altimeter 30.04/30.03 Boundary Layer 3000' msl at 1555 Z 3200' msl at 1625 Z 4000' msl at 1755 Z	- *El Reno with P-3, plus intercomparison with North Dakota Citation; LICOR inlet test* - **Intercomparison sounding with Long-EZ,** near RE from 5500' msl to 100' agl - 2 runs at 0.8 Zi at El Reno, 2700' msl **(P3 passage)** - 2 runs at 100' - Sounding at east end, 100' msl to 4000' - 2 runs at 0.8 Zi, 2900' msl **Intercomp with Citation** - 4 runs on original Kingfisher line, 2500' msl, first two with Citation overtaking Otter, last two in formation at 130 kts (wind shift) - Sounding to RE at El reno, 6500' msl to 100' agl - 2 runs at El Reno, 100' **LICOR inlet switched to separate roof intake** - 2 runs at El Reno, 100'

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
Jul 16	25	1555-1844	3.0	Clouds to the northwest dissipated during flight, Winds south at 10 knots, hot, 31/19 at takeoff, Altimeter 30.10/30.07 Boundary Layer top 2800' msl at 1605 Z 3400' msl at 1630 Z 3600' msl at 1710 Z 3500' msl at 1720 Z 3900' msl at 1750 Z 3700' msl at 1830 Z	- *Kingfisher and El Reno* - Sounding to ES, 5500' msl to 100' agl - 2 runs on Kingfisher line, 100' - Sounding at ES, 100' agl to 4000' msl - 2 runs at 0.8 Zi, 3000' msl - 2 runs at 100' - Sounding south of ES, 100' agl to 4500' msl **El Reno** - 2 runs at 0.8 Zi, 3100' msl - 4 runs at 100' - Sounding at RE, 100' agl to 4500' msl - 2 runs at 0.8 Zi, 3400' msl - 4 runs at 100' - Sounding east of RE, 100' agl to 5000' msl - Pitches and Yaws
July 16	26	2247-0147	3.2	Clear and hazy, Boundary Layer top hard to determine in flight, Altimeter 29.99/29.97	- *Evening transition at El Reno* - Sounding, 6500' to 100' agl - 2 runs at 100' - Sounding to 6500' msl - 2 runs at 4800' msl - 2 runs at 100' agl - Sounding to 6000' msl - 2 runs at 3500' msl - 2 runs at 100' agl - Sounding - 2 runs at 3000' msl - Aborted run at 100', tape error detected **Tape 2** - 2 runs at 100' agl - Sounding to 4000' msl - 2 runs at 2400' msl - 2 runs at 100' agl - Sounding to 3500' msl
July 17	27	1244-1538	3.1	Broken cloud after large storm to north, some clearing in operational area, wet to north, Winds ESE at 15-20 knots, Altimeter 30.00/29.98 BL Top 2100' msl at 1255 Z 3300' msl at 1525 Z	- *Morning transition study coordinated with Long-EZ and Citation, P-3 LASE above* - Sounding to AS, 4500' msl to 100' agl - 2 runs at 500' agl 20 miles along AS-AN - 2 runs at 100' agl - 1 run at 500' northbound - 1 run southbound at 500', event is split (investigate possible problem on Long-EZ) - 2 runs at 100' agl - 2 runs at 500' (shortened at north end due to rain) - 2 runs at 100', AS to Cimarron River - Sounding enroute, south of AS, 100' agl to 5500' msl

DATE	FLT	GMT	HRS	WEATHER	RUNS FLOWN
July 18	Tr-6		2.2		- Oklahoma City to Lebanon
	Tr-7		2.2		- Lebanon to Terre Haute
July 19	Tr-8		2.2		- Terre Haute to Akron
	Tr-9		2.2		- Akron to Syracuse
	Tr-10		1.4		- Syracuse to Ottawa

	Test	Transit	Project	Total
Flights	1	10	27	38
Hours	1.6	20.9	82.8	105.3

TABLE 4: RUNS FLOWN BY TYPE - SGP97

*** number of runs of each type**

Date	Flt	Flux Runs				Intercomp[1]		Other	Sound
1997		100-150'	500-600'	0.8 Zi	Other Alts	LE	Cit		
June 18	01	1	1	2					1
June 19	02	4	2	7	4	2			4
June 20	03	8		6	3	1			3
June 20	04				10				2
June 21	05		10						
June 22	06	6	7						1
June 24	07	8		8		2			6
June 25	08	10		8		2		2	5
June 27	09	18							5
June 29	10	9		9	1				6
June 30	11	9	7			4			4
July 01	12	6		4	4				5
July 02	13	12		12					4
July 02	14	10		4					2
July 03	15	6		6					4
July 04	16	10		4					4
July 05	17	20	1			1			3
July 05	18				1				
July 08	19	16				1			4
July 09	20		8		5				2
July 10	21	3		3					6
July 12	22	12		7	1				6
July 13	23	8		3					8
July 14	24	6		4		1	4		3
July 16	25	12		6				2	5
July 16	26	10		8					6
July 17	27	6	6						2
		210	42	101	29	14	4	4	101

1 - Intercomparison runs (with NOAA Long-EZ and UND Citation) will also appear in Flux Runs column when intercomparison done of a flux run

TABLE 5: TWIN OTTER INSTRUMENTATION STATUS - SGP 1997

All Flights

- RADUP and RADOWN not calibrated until after Flight 08: calibration NOT reliable; must be redone and corrections applied to whole dataset: After Flight 08, reversion to original calibration gives better results. Correction equation will be applied on data re-calculation in fall 1997.
- Novatel switched to 10 Hz for velocities after Flight 07
- Green 660 underreads by approx 0.6: appears June 17 calibration not correct; Must be redone
- PDNBC had 0.2 positive bias added (instead of subtracted) until Flight 20, when entire bias was removed

Date	Flight	Instrument Status
Jun 18	01	- Novatel not recorded - Radio altimeter failed - Litton IRS circuit breaker popped at approximetely 1628, about 1/3 way into Run 03; remains inaccurate remainder of flight; must use backup wind system Runs 3-5, but not the ground calculated ones since there is a start-up problem--use the airborne computed ones direct from tape - RADUP and RADOWN not recently calibrated (apply correction). - No VHF event marker, so dew point had large dropouts on radio transmissions - Spikes on PS_LICOR affect mixing ratio for L_C02
Jun 19	02	- RADUP and RADOWN not recently calibrated.(apply correction) - No VHF event marker, so dew point had large dropouts on radio transmissions - Long-EZ time 6 seconds ahead of Twin Otter - Spikes on PS_LICOR affect mixing ratio for L_C02
Jun 20	03	- RADUP and RADOWN not recently calibrated.(apply correction) - No VHF event marker, so dew point had large dropouts on radio transmissions - LICOR fluxes considerably lower than ESRI fluxes as low altitude; checked lag and it has increased to 23, and differs between C02 and H20. Also PSNBC-PSLICOR averaging 50 mb, 20 larger than 1996 - Radio-altimeter not turned on until one minute after takeoff - Greenness not turned on until after Run 1, sounding - Spikes on PS_LICOR affect mixing ratio for L_C02
Jun 20	04	- RADUP and RADOWN not recently calibrated.(apply correction) - No VHF event marker, so dew point had large dropouts on radio transmissions - Spikes on PS_LICOR affect mixing ratio for L_C02
Jun 21	05	- ESRI C02/H20 analyzer failed at 1751 Z - Tape has some kind of a problem at 1935 Z (middle of last run); Haven't been able to read past this time. - RADUP and RADOWN not recently calibrated.(apply correction) - No VHF event marker, so dew point had large dropouts on radio transmissions - Spikes on PS_LICOR affect mixing ratio for L_C02
Jun 22	06	- RADUP and RADOWN not recently calibrated.(apply correction) - No VHF event marker, so dew point had large dropouts on radio transmissions - Spikes on PS_LICOR affect mixing ratio for L_C02 - LICOR H20 calibrated and adjusted prior to this flight; reading 4 percent low prior to this flight

Jun 24 07
- First flight with Novatel velocities updated at 10 Hz
- ESRI analyzer failed at 1600 Z near end of Run 04
- LOZ3 failed at 1556 Z after Run 3
- Upward Greenness inoperative throughout flight; dead battery
- RADUP and RADOWN not recently calibrated.(apply correction).
- No VHF event marker, so dew point had large dropouts on radio transmissions
- Spikes on PS_LICOR affect mixing ratio for L_C02

Jun 25 08
- Computer quit at approximately 1446 Z during Run 08; restarted computer at 1451 Z; 2 tapes for this flight
- ESRI analyzer failed prior to takeoff
- RADUP and RADOWN not recently calibrated.(apply correction)
- No VHF event marker, so dew point had large dropouts on radio transmissions
- Spikes on PS_LICOR affect mixing ratio for L_C02
- Greenness index going far too high, a result of GRN660 down reading near zero when overcast; Although recalibrated here in Oklahoma, calibration suspect.
- No voice on VHS tape

Jun 27 09
- New Calibrations in airborne program for RADUP and RADOWN. RADUP read very high in last set of runs at El Reno, probably due to cumulus clouds, as we have seen in AES experiments: RADUP appears too high.
- New transducer installed for PS_LICOR
- ESRI analyzer not used
- LOZ3 ozone analyzer fails, liquid problem, possibly a result of soundings
- No voice on VHS tape

Jun 29 10
- Tape failure at 141850: Two tapes this flight; data lost for Runs 15-20 plus aborted Run 21
- ESRI analyzer operated on this flight; Signicant jumps to preferred levels in C02 signal, especially Run 29
- LOZ-3 quit after takeoff, but re-set and ran successfully.
- Transmit event only worked on VHF1
- Greenness Index overreads when clouds reduce GRD660 to near zero.
- LICOR may not have been warmed up at start, as first calibration shows underreading, as does first couple of soundings
- LICOR H20 fluxes appear low, especially at start: a lag study indicates that a lag of 27 should be used for H20, but onoy 22 for C02. Also the pressure difference PSDUCT-PSLICOR has risen form 60 to 65, possibly due to dirty filter.
- RADUP with new calibration seems too high

Jun 30 11
- NOTE: LOZ3 inlet changed to mushroom inlet from dynamic inlet
- ESRI analyzer appeared to work fine until about 1810 Z, when the H20 went to half and the C02 signal went low.
- Transmit event only worked on VHF1
- 22 percent difference in LICOR and ESRI H20 fluxes
- RADUP with new calibration seems too high

Jul 01 12
- ESRI analyzer repaired, ran well throughout flight
- Computer quit at 1644 GMT, changed tape and restarted; **2 tapes this flight**
- Backup wind system failed due to loss of backup heading and pitch and roll attitudes at 165518 GMT
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 02 13
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 02 14
- Computer quit at 233757 GMT: **2 tapes this flight**
- On second tape, there is no Novatel data and no third wind data
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- Green 660 read -0.6 when near dark

Jul 03 15
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- Green 660 underreads -0.6
- Novatel not turned on this flight to reduce risk of computer halt
- LICOR was not running correctly until 1605 Z

Jul 04 16
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- Green 660 underreads -0.6
- Novatel not turned on this flight to reduce risk of computer halt

Jul 05 17
- RADUP with new calibration seems too high (may be temperature)
- Transmit event removed; VHF affects dew point
- Green 660 underreads -0.6
- Novatel not turned on this flight to reduce risk of computer halt

Jul 05 18
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- Novatel WAS operated on this flight to see if the computer would halt with a T2 error; it did not.

Jul 08 19
- Novatel left off this flight
- Backup wind system unserviceable after 1625 Z as pitch, roll and heading synchro signals not correct.
- ESRI H20 has some big steps in Event 1, sounding
- Surface very hot; PRT5 limited at 51.2 for significant portions of Kingfisher line
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 09 20
- PDNBC 0.2 mb bias removed
- LOZ3 not on until about 3 minutes after takeoff
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 10 21
- Trimble GPS data inaccurate to approximately 1530: use Novatel in plots
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 12 22
- LICOR not correct until 1508; line off
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 13 23
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 14 24
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- **Special Test, last two runs:** LICOR inlet changed from the duct to a separate forward-facing inlet on top of fuselage next to duct inlet
- Even at higher altitudes, there is a significant difference between LICOR and ESRI H20 fluxes; see cospectra

Jul 16 25
- LICOR and ESRI H20 fluxes had large differences at low altitudes, but excellent agreement at higher altitude.
- The LICOR zero has shifted upwards to about +9 from its usual -7 to -8.
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point

Jul 17 26
- DAT write problem at 0050 Z; **2 tapes this flight.**
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- There are positive excursions in both C02 analyzers in conjunction with negative excursions in ozone, indicating that the aircraft flew through an exhaust or smoke plume on some of the runs (high and low altitude)

Jul 18 27
- The LICOR zero has shifted upwards to about +9 from its usual -7 to -8.
- RADUP with new calibration seems too high (maybe temperature)
- Transmit event removed; VHF affects dew point
- The LICOR zero has shifted upwards to about +9 from its usual -7 to -8.

TABLE 6: TWIN OTTER DATA SUMMARY - SGP97

The following pages present a summary of the data from all of the flux runs flown by the Twin Otter in SGP97. NOTE: *This summary is from the initial in-field analysis and will be updated when data are re-analyzed with final calibrations and the Kalman filtering algorithm is applied to the wind data.* Note also that the fluxes and rms values listed here were computed from **linearly detrended** data.

The legend below lists the column headings, units, and a brief description of the parameter.

Data on each table are grouped by the site flown, after which are presented two summary lines of data giving: (1) the averages for all the runs flown at that site, and (2) the Bowen Ratio and the standard deviation of the run-to-run variations in the flux estimates.

Column Heading	Type	Units	Description
ST GMT		hr min sec	Greenwich Mean Time at start of run
SEC		sec	length of run in time
DIST		km	length of run in distance
PALT	run-mean	m	pressure altitude above mean sea level
RALT	"	m	radio-altimeter height above terrain
TEMP	"	deg C	air temperature
DEWPT	"	deg C	dew point temperature
PRT5	"	deg C	radiometric surface temperature
GRN	"	-	greenness index (ratio 730/660 nm)
NETRD	"	Wm^{-2}	net radiation
LICOR	"	ppm	$C0_2$ concentration
HDGL	"	deg true	aircraft heading
WIND	"	deg true	wind direction
	"	ms^{-1}	wind speed
UGEL	rms	ms^{-1}	wind component from north
VGEL	"	ms^{-1}	wind component from east
WEP	"	ms^{-1}	vertical wind component
POT	"	deg C	potential temperature
RC02	"	$mgkg^{-1}$	$C0_2$ mixing ratio
RH20	"	$gmkg^{-1}$	H_20 mixing ratio
WT	flux	Wm^{-2}	sensible heat flux
WQ	"	Wm^{-2}	latent heat flux
WC	"	$mgm^{-2}s^{-1}$	$C0_2$ flux
UW	"	Nm^{-2}	momentum flux along mean wind direction
WOZ	"	$\mu gm^{-2}s^{-2}$	ozone flux

1 NRC C-FPOK, FILE OARCPOK97_NEW(12 JUNE 97), FLIGHT DATE 18-JUN-97 PRINT DATE 18-JUN-97 SGP FLIGHT 01, LITTON WINDS

NOSEBOOM TEMPERATURE DATA USED
MEAN WIND DIRECTION AND SPEED FROM LITTON

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO LINE																								
LITTON WINDS																								
16	17 57	341	18.51	573.	0.	27.15	10.97	31.4	1.86	661.	402.6	264	226 6.3	0.82	0.85	0.82	0.15	3.3	0.62	70.	448.	-0.11	-0.18	-0.49
BACKUP WINDS																								
16	17 57	341	18.51	573.	0.	27.13	10.97	31.4	1.86	661.	402.6	264	227 6.5	1.38	0.80	0.82	0.15	3.3	0.62	45.	463.	0.75	-0.07	-0.38
16	26 43	242	15.57	497.	0.	28.13	17.24	31.1	1.80	678.	403.5	094	225 5.2	4.01	1.43	0.85	0.21	3.5	0.54	86.	176.	-0.66	0.35	-0.59
16	51 05	244	0.95	1018.	0.	23.63	12.60	31.6	1.48	706.	400.5	264	286 51.9	0.96	0.65	0.89	0.38	4.4	2.07	-103.	1528.	1.08	-0.04	-1.11
16	58 08	228	1.65	948.	0.	24.15	13.96	31.7	1.57	718.	402.3	096	168 22.4	1.07	0.82	1.04	0.26	3.7	1.50	-19.	922.	0.10	-0.07	-0.59

1 NRC C-FPOK, FILE OARCPOK97_NEW(18 JUNE 97), FLIGHT DATE 19-JUN-97 PRINT DATE 19-JUN-97 SGP FLIGHT 02, LITTON WINDS

DETRENDED			RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO LINE																								
INTERCOMP WITH LONG EZ, 500 '																								
	15 33 47	224	14.42	585.	153.	28.11	20.62	30.6	1.71	561.	385.4	099	221	8.3	1.05	1.08	0.90	0.13	1.0	0.25	22.	243.	0.04	-0.40	-0.23
4 RUNS AT 0.8 ZI																								
	15 42 52	309	15.38	900.	485.	25.71	19.33	30.3	1.63	579.	382.7	263	224	10.7	1.05	1.35	0.79	0.31	2.1	0.59	-45.	218.	0.29	-0.39	-0.12
	15 50 06	226	15.09	892.	477.	25.82	19.37	30.7	1.60	593.	382.6	100	228	10.0	1.10	1.29	0.74	0.30	1.8	0.61	22.	-27.	-0.09	-0.07	0.01
	15 56 17	292	15.29	903.	490.	26.15	18.95	31.1	1.65	608.	381.3	265	222	10.7	1.12	1.76	0.75	0.45	2.1	0.91	-108.	536.	0.51	-0.39	-0.45
	16 03 05	204	14.21	896.	481.	26.32	17.80	31.6	1.58	623.	381.0	100	222	10.5	1.06	1.23	0.83	0.33	1.6	0.75	-63.	464.	0.40	-0.43	-0.27
4 RUNS			14.99	898.	483.	26.00	18.86	30.9	1.62	601.	381.9		224	10.5	1.08	1.41	0.78	0.35	1.9	0.72	-49.	298.	0.28	-0.32	-0.21
4 RUNS AT 100 FT																								
	16 14 09	257	14.76	486.	42.	30.56	21.09	32.4	1.83	652.	380.2	265	201	8.8	1.39	1.24	0.78	0.25	1.2	0.37	95.	269.	-0.34	-0.39	-0.38
	16 21 37	219	14.46	484.	41.	30.74	21.19	32.7	1.80	667.	379.8	099	208	8.4	1.22	1.22	0.81	0.25	1.1	0.45	83.	365.	-0.32	-0.48	-0.52
	16 27 37	279	14.93	480.	35.	31.05	21.19	32.8	1.81	678.	379.3	267	207	8.3	1.22	1.23	0.79	0.25	1.3	0.41	102.	207.	-0.38	-0.41	-0.45
	16 34 24	222	14.12	479.	36.	31.19	20.29	32.7	1.82	691.	378.6	100	212	8.5	1.28	1.28	0.77	0.25	1.1	0.41	90.	319.	-0.36	-0.42	-0.54
4 RUNS			14.57	482.	39.	30.89	20.94	32.7	1.82	672.	379.5		207	8.5	1.28	1.24	0.79	0.25	1.2	0.41	93.	290.	-0.35	-0.42	-0.47
																BOWEN RATIO=		0.32			7.	59.	0.02	0.03	0.06
RUNS AT 0.8 ZI																								
	16 47 14	289	15.14	1082.	672.	26.47	15.12	32.8	1.57	696.	376.8	264	220	12.0	0.86	1.35	0.82	0.59	1.7	1.81	-73.	511.	0.15	-0.20	-0.37
	16 55 60	222	15.00	1063.	654.	26.39	16.38	32.7	1.55	712.	377.6	102	223	11.2	0.80	1.24	0.72	0.46	1.5	1.50	31.	46.	-0.03	-0.04	-0.03
2 RUNS			15.07	1073.	663.	26.43	15.75	32.8	1.56	704.	377.2		221	11.6	0.83	1.30	0.77	0.52	1.6	1.65	-21.	279.	0.06	-0.12	-0.20
																BOWEN RATIO=		-0.08			52.	233.	0.09	0.08	0.17
RUNS AT 0.5 ZI																								
	17 02 57	274	14.89	796.	374.	28.33	19.34	33.7	1.68	716.	378.3	265	206	9.0	1.03	1.06	0.95	0.13	0.9	0.50	-6.	436.	0.10	-0.37	-0.33
	17 09 53	237	14.94	810.	390.	28.28	19.03	33.5	1.63	727.	378.2	101	208	9.0	0.97	1.19	1.05	0.13	0.9	0.55	21.	540.	-0.09	-0.32	-0.67
	17 16 04	285	15.11	830.	410.	28.22	18.84	34.0	1.65	729.	378.0	265	202	8.9	1.19	1.00	0.88	0.12	0.8	0.54	-6.	403.	0.08	-0.29	-0.19
	17 22 54	241	14.69	815.	394.	28.43	19.53	34.2	1.64	737.	377.6	100	204	9.1	0.99	1.06	1.10	0.14	0.8	0.63	-9.	887.	0.16	-0.50	-0.17
4 RUNS			14.91	813.	392.	28.32	19.19	33.9	1.65	727.	378.0		205	9.0	1.05	1.08	1.00	0.13	0.8	0.56	0.	567.	0.06	-0.37	-0.34
																BOWEN RATIO=		0.00			12.	192.	0.09	0.08	0.20
0.8 ZI																								
	17 29 10	275	15.07	1083.	674.	26.15	17.60	33.7	1.58	738.	377.1	263	205	10.3	1.03	1.15	0.91	0.39	1.3	1.60	-88.	1232.	0.27	-0.48	-0.32
INTERCOMP WITH LONG-EZ																								
	17 47 32	235	14.23	598.	160.	30.88	20.48	35.6	1.68	758.	378.4	101	196	9.0	1.06	1.42	1.10	0.19	1.1	0.51	102.	464.	-0.38	-0.43	-0.70

1 NRC C-FPOK, FILE OARCPOK97_NEW(18 JUNE 97), FLIGHT DATE 20-JUN-97 PRINT DATE 20-JUN-97 SGP FLIGHT 03, LITTON WINDS

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
100 FT RUNS, EL RENO																								
15	27 41	224	14.79	478.	40.	29.10	21.48	31.0	1.87	543.	385.7	101	216 10.5	1.56	1.46	0.95	0.19	1.1	0.25	85.	224.	-0.32	-0.77	-0.39
15	33 29	278	14.60	477.	37.	29.21	19.68	31.1	1.91	560.	385.2	263	212 10.3	1.56	1.44	0.91	0.22	1.1	0.24	104.	201.	-0.36	-0.66	-0.29
15	40 05	227	14.70	477.	39.	29.43	22.64	31.7	1.86	570.	384.6	101	214 9.8	1.55	1.48	0.91	0.21	1.0	0.22	81.	206.	-0.32	-0.72	-0.32
15	45 55	272	14.65	474.	35.	29.67	22.68	31.6	1.88	587.	383.9	263	206 9.8	1.62	1.41	0.87	0.26	1.2	0.27	101.	215.	-0.34	-0.63	-0.40
15	52 36	236	14.66	478.	39.	29.74	22.50	32.2	1.85	597.	383.7	101	210 10.1	1.60	1.44	0.91	0.20	1.1	0.23	81.	217.	-0.34	-0.65	-0.33
15	58 37	275	14.62	476.	38.	29.95	22.54	32.6	1.88	610.	383.4	264	205 10.3	1.45	1.34	0.84	0.25	1.1	0.28	103.	245.	-0.35	-0.55	-0.38
16	05 31	231	14.59	478.	40.	30.13	22.50	32.9	1.85	624.	382.9	101	207 10.2	1.52	1.48	0.87	0.22	1.2	0.29	94.	251.	-0.37	-0.68	-0.37
16	11 22	275	14.76	476.	36.	30.38	22.23	33.1	1.87	638.	382.4	264	203 10.6	1.60	1.34	0.87	0.23	1.2	0.36	86.	218.	-0.34	-0.48	-0.38
8 RUNS			14.67	477.	38.	29.70	22.03	32.0	1.87	591.	384.0		209 10.2	1.56	1.42	0.89	0.22	1.1	0.27	92.	222.	-0.34	-0.64	-0.36
															BOWEN RATIO=		0.41			9.	16.	0.02	0.09	0.04
1300 FT RUNS																								
16	18 21	227	14.64	840.	427.	26.98	20.18	32.9	1.63	644.	382.5	103	210 12.2	1.24	1.15	0.71	0.41	1.0	1.03	20.	278.	-0.09	-0.23	-0.33
16	27 15	282	15.00	855.	441.	27.39	19.37	32.8	1.63	666.	382.4	262	209 13.5	0.82	1.33	0.71	0.70	1.2	1.67	-55.	302.	-0.05	-0.15	-0.82
16	35 03	232	14.73	843.	430.	27.27	20.43	33.5	1.64	675.	382.2	103	207 12.0	0.97	1.40	0.82	0.37	0.8	1.20	-41.	438.	0.01	-0.07	-0.74
3 RUNS			14.79	846.	433.	27.21	19.99	33.1	1.63	662.	382.4		209 12.6	1.01	1.29	0.75	0.49	1.0	1.30	-25.	339.	-0.04	-0.15	-0.63
															BOWEN RATIO=		-0.07			33.	70.	0.04	0.07	0.21
0.8 ZI ATTEMPTS																								
16	50 16	288	14.65	1074.	670.	27.90	12.99	33.8	1.55	713.	379.9	261	217 13.9	0.88	1.24	0.71	0.88	1.3	1.94	7.	-171.	-0.09	0.08	-0.22
16	57 41	233	14.93	961.	554.	26.89	18.94	34.1	1.58	711.	381.4	102	211 11.6	0.84	1.19	0.75	0.57	0.9	1.61	-11.	189.	-0.07	0.08	-0.59
17	04 01	279	14.78	982.	575.	26.76	19.10	34.3	1.60	717.	381.2	262	208 11.5	1.02	1.45	0.83	0.74	0.9	2.07	-72.	535.	0.03	-0.21	-0.39
17	10 42	240	14.93	975.	568.	26.50	20.40	34.2	1.57	725.	381.2	101	209 11.2	1.01	0.94	0.70	0.30	0.7	1.03	3.	249.	-0.03	-0.06	-0.12
17	16 46	277	15.03	986.	581.	26.26	20.90	34.3	1.58	727.	381.1	261	201 11.4	0.97	1.19	0.95	0.30	0.6	1.04	-56.	626.	-0.05	-0.12	-1.15
17	23 46	227	14.37	981.	576.	26.30	21.05	34.4	1.56	736.	381.2	103	203 11.2	0.93	1.09	1.08	0.20	0.7	0.80	28.	717.	-0.14	-0.22	-0.69
5 RUNS			14.81	977.	571.	26.54	20.08	34.3	1.58	723.	381.2		206 11.4	0.95	1.17	0.86	0.42	0.8	1.31	-22.	463.	-0.05	-0.11	-0.59
															BOWEN RATIO=		-0.05			37.	208.	0.06	0.11	0.34

1 NRC C-FPOK, FILE OARCPOK97_NEW(18 JUNE 97), FLIGHT DATE 20-JUN-97 PRINT DATE 20-JUN-97 SGP FLIGHT 04, LITTON WINDS

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
AS-AN																								
19	33 25	542	38.52	585.	249.	30.93	22.80	42.2	1.35	677.	379.3	014	188 13.1	1.67	1.35	1.51	0.20	0.5	0.34	182.	520.	-0.13	-0.99	-0.54
19	42 34	515	35.12	576.	245.	31.91	22.28	43.9	1.25	672.	379.1	014	187 13.8	1.47	1.52	1.27	0.24	0.5	0.34	184.	164.	-0.15	-0.48	-0.30
19	51 16	503	34.62	576.	238.	33.24	20.69	42.1	1.17	677.	378.9	014	190 13.5	1.38	1.63	1.33	0.21	0.5	0.41	177.	281.	0.00	-0.67	-0.42
AN-AS																								
20	03 12	729	33.75	593.	256.	32.91	21.18	41.5	1.14	665.	378.5	192	184 14.6	1.55	1.65	1.64	0.27	0.5	0.40	289.	199.	-0.03	-0.67	-0.56
20	15 27	782	36.42	582.	250.	31.94	22.29	42.3	1.25	640.	377.8	191	183 16.1	1.53	1.65	1.44	0.21	0.5	0.48	149.	622.	-0.11	-1.00	-0.64
20	28 36	771	36.10	586.	248.	31.55	20.84	41.1	1.31	628.	376.6	192	189 15.5	1.35	1.44	1.26	0.18	0.5	0.45	142.	252.	-0.08	-0.58	-0.28
STUDY WITH LONG-EZ, BOTTOM 30 N MILES OF AS-AN TRACK - NORTHBOUND SINGLE EVENT, SOUTHBOUND SPLIT DUE TO LENGTH IN TIME																								
20	44 34	814	57.39	526.	186.	32.55	20.49	41.0	1.35	590.	376.3	014	194 14.6	1.43	1.43	1.24	0.19	0.5	0.49	139.	411.	-0.13	-0.55	-0.32
21	00 26	681	31.41	520.	184.	32.84	20.31	41.3	1.43	571.	376.0	192	192 13.5	1.42	1.53	1.21	0.19	0.5	0.42	130.	464.	-0.21	-0.82	-0.44
21	11 57	639	28.37	525.	178.	32.47	20.47	39.4	1.28	561.	374.6	193	191 13.6	1.38	1.62	1.22	0.20	0.5	0.32	156.	285.	-0.07	-0.52	-0.36
21	24 13	801	57.75	515.	176.	32.88	20.35	39.8	1.37	510.	374.8	012	192 15.1	1.51	1.50	1.27	0.19	0.6	0.32	147.	147.	-0.12	-0.82	-0.48
21	40 02	708	30.52	510.	175.	33.15	20.15	39.8	1.41	496.	374.8	193	193 16.2	1.52	1.48	1.19	0.15	0.6	0.30	97.	214.	-0.15	-0.56	-0.41
21	51 56	599	27.03	523.	179.	32.61	20.96	38.1	1.33	477.	372.9	192	191 15.5	1.48	1.45	1.27	0.20	0.7	0.33	142.	192.	-0.10	-0.78	-0.43

1 NRC C-FPOK, FILE OARCPOK97_NEW(21 JUNE 97), FLIGHT DATE 21-JUN-97 PRINT DATE 21-JUN-97 SGP FLIGHT 05, LITTON WINDS

DETRENDED			RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
BS-BS IN 2 HALVES																								
	17 17 36	812	56.53	496.	168.	27.83	21.19	38.8	1.44	631.	373.7	015	185	9.3	1.19	1.24	1.08	0.19	0.8	0.18	126.	220.	-0.30	-0.35	-0.61
	17 31 14	775	52.55	502.	169.	28.26	21.51	39.3	1.24	657.	372.5	015	176	8.9	1.21	1.44	1.34	0.21	0.6	0.17	172.	223.	-0.24	-0.34	-0.30
CART LINE, DOWN AND BACK																								
	18 12 48	597	29.17	486.	174.	28.88	21.38	39.5	1.25	627.	371.2	178	171	9.9	1.10	1.28	1.19	0.19	0.6	0.18	158.	222.	-0.23	-0.24	-0.26
	18 24 05	432	29.07	481.	168.	28.99	21.48	39.7	1.26	640.	371.2	359	180	9.8	1.19	1.35	1.16	0.18	0.5	0.20	121.	256.	-0.15	-0.11	-0.09
TOP HALF OF BN-BS																								
	18 33 25	587	28.69	489.	167.	29.16	21.45	39.5	1.19	646.	371.0	188	174	8.7	1.27	1.42	1.36	0.25	0.5	0.15	221.	217.	-0.21	-0.30	-0.28
	18 43 18	518	26.13	507.	165.	29.25	21.17	42.0	1.24	688.	370.8	189	179	8.8	1.47	1.36	1.49	0.27	0.9	0.23	282.	427.	-0.51	-0.65	-0.43
DW-DE, DE-DW																								
	18 57 09	550	30.65	495.	157.	29.52	20.60	41.7	1.41	670.	369.6	100	179	9.3	1.52	1.49	1.28	0.24	0.7	0.30	192.	389.	-0.34	-0.61	-0.19
	19 07 44	549	32.14	500.	163.	29.59	20.64	41.4	1.40	580.	369.5	259	173	10.1	1.48	1.54	1.30	0.23	0.8	0.20	176.	285.	-0.38	-0.44	-0.50
PART OF BN-BS																								
	19 22 14	584	27.73	490.	162.	29.85	20.72	41.5	1.36	661.	369.3	190	173	11.2	1.32	1.33	1.26	0.21	0.7	0.23	178.	244.	-0.36	-0.55	-0.37

1 NRC C-FPOK, FILE OARCPOK97_NEW(22 JUNE 97), FLIGHT DATE 22-JUN-97 PRINT DATE 22-JUN-97 SGP FLIGHT 06, LITTON WINDS

DETRENDED RUN AVERAGES													RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
GN-GS (500'), GS-GN (150')																							
15 18	08 607	30.73	566.	179.	21.64	19.38	26.1	1.95	203.	365.7	187	152	8.0	0.89	0.79	0.70	0.12	1.1	0.12	19.	97.	-0.29	-0.20	-0.41
15 29	55 534	32.64	458.	64.	22.78	19.76	26.1	2.00	168.	364.4	016	156	6.6	0.92	0.83	0.62	0.11	1.2	0.12	23.	90.	-0.35	-0.28	-0.39
GE-GW																							
15 49	04 498	27.95	568.	160.	22.10	19.50	26.5	1.93	186.	365.7	231	139	6.0	0.90	0.71	0.68	0.15	1.3	0.13	27.	93.	-0.33	-0.13	-0.40
FW-FE, FS-FN 500'																							
16 08	41 468	27.83	550.	147.	23.34	19.16	28.2	1.94	201.	363.6	070	168	7.1	0.92	0.92	0.79	0.15	1.2	0.15	38.	141.	-0.39	-0.26	-0.34
16 25	16 478	30.63	555.	141.	23.41	19.07	27.3	1.91	177.	363.5	002	167	9.1	0.88	1.02	0.72	0.11	1.1	0.19	22.	147.	-0.35	-0.27	-0.31
ES-EN (500'), EN-ES (100')																							
16 46	07 437	28.93	509.	170.	25.19	19.07	34.2	1.28	411.	363.2	002	156	9.0	1.05	1.12	1.18	0.20	0.6	0.19	110.	244.	-0.30	-0.56	-0.47
16 55	31 524	27.63	381.	34.	26.70	19.64	35.1	1.31	474.	363.2	175	149	7.9	1.33	1.45	0.80	0.33	1.0	0.23	141.	183.	-0.28	-0.26	-0.43
EW-EE, EE-EW (500')																							
17 07	23 488	26.03	482.	143.	25.01	18.84	35.8	1.31	530.	363.2	096	151	8.1	1.10	1.25	1.12	0.17	0.7	0.15	108.	152.	-0.23	-0.42	-0.63
17 17	03 434	25.70	496.	157.	25.31	18.91	38.3	1.25	639.	362.6	262	152	8.6	1.29	1.20	1.14	0.20	0.7	0.21	134.	210.	-0.30	-0.28	-0.51
EL RENO TRACK, 100'																							
17 33	46 249	14.41	471.	37.	25.48	18.92	28.4	1.72	355.	360.7	264	173	9.7	1.37	1.30	0.74	0.20	1.1	0.33	63.	164.	-0.30	-0.43	-0.24
17 39	39 254	14.45	467.	34.	25.49	18.99	28.4	1.73	386.	360.7	102	177	8.7	1.39	1.32	0.74	0.24	1.4	0.27	79.	194.	-0.46	-0.51	-0.35
17 45	54 245	14.28	467.	33.	25.56	19.10	29.2	1.72	418.	360.4	264	171	9.5	1.47	1.48	0.73	0.23	1.5	0.24	85.	157.	-0.41	-0.44	-0.27
17 51	51 259	14.61	463.	30.	25.55	19.34	28.9	1.75	377.	360.3	102	173	8.5	1.48	1.49	0.76	0.27	1.6	0.28	90.	198.	-0.48	-0.49	-0.46
4 RUNS		14.44	467.	34.	25.52	19.09	28.7	1.73	384.	360.5		173	9.1	1.43	1.40	0.74	0.24	1.4	0.28	79.	178.	-0.41	-0.47	-0.33
															BOWEN RATIO=			0.44		10.	18.	0.07	0.03	0.09

1 NRC C-FPOK, FILE OARCPOK97_NEW(22 JUNE 97), FLIGHT DATE 24-JUN-97 PRINT DATE 24-JUN-97 SGP FLIGHT 07, LITTON WINDS

DETRENDED RUN AVERAGES													RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO																								
0.8 ZI (LAST RUN WITH LONG EZ INTERCOMP)																								
15	48	60	288	14.75	1085.	675.	20.71	15.04	28.6	1.62	610.	361.5	255	204	16.9	1.32	1.48	1.05	0.30	0.5	0.73	-48.	311.	0.07	-0.30	-0.30
16	15	24	238	14.75	1093.	685.	21.08	9.12	29.4	1.62	649.	361.3	108	199	16.6	1.92	1.49	1.06	0.32	0.7	1.08	-133.	1246.	0.05	-0.90	0.00
16	21	09	290	15.39	1089.	680.	21.27	17.02	29.4	1.64	635.	361.6	256	198	17.3	1.69	1.39	1.01	0.34	0.6	0.95	-69.	603.	0.11	-0.49	0.00
16	49	39	239	14.93	1229.	823.	20.59	15.72	30.0	1.56	693.	361.3	111	202	18.4	1.44	1.49	1.23	0.36	0.5	1.09	-145.	1652.	0.01	-0.99	0.09
16	56	03	341	16.11	1224.	818.	20.78	15.81	30.1	1.60	708.	361.4	255	203	18.3	1.60	1.38	0.95	0.41	0.5	1.05	-105.	615.	0.02	-0.32	0.03
17	29	36	245	14.90	1251.	844.	20.67	15.94	31.0	1.57	736.	360.9	108	200	15.7	1.25	1.18	1.03	0.24	0.5	0.72	-31.	429.	-0.08	-0.21	0.06
17	35	19	297	15.64	1255.	850.	20.71	16.12	31.2	1.61	737.	361.0	256	200	16.6	1.37	1.27	0.90	0.26	0.7	0.87	-59.	589.	-0.11	-0.36	0.00
18	08	35	236	14.39	1248.	842.	21.14	1.04	31.9	1.58	760.	359.5	107	197	16.7	1.73	1.86	1.28	0.21	0.7	0.69	-111.	1117.	-0.06	-1.37	0.02
8 RUNS				15.11	1184.	777.	20.87	13.23	30.2	1.60	691.	361.1		200	17.0	1.54	1.44	1.06	0.31	0.6	0.90	-88.	820.	0.00	-0.62	-0.01
																	BOWEN RATIO=		-0.11			39.	435.	0.07	0.39	0.11
100 FT RUNS (Last run with long-ez INTERCOMP																										
15	56	19	241	14.82	478.	42.	26.80	20.14	29.6	1.85	639.	360.8	104	196	11.8	1.75	1.73	1.03	0.21	1.1	0.34	98.	228.	-0.36	-0.81	-0.03
16	02	22	268	14.64	475.	39.	27.04	19.69	29.9	1.87	664.	360.6	260	194	12.2	1.79	1.56	1.01	0.25	1.2	0.35	130.	317.	-0.48	-0.87	0.00
16	30	03	240	14.68	483.	47.	27.35	19.60	30.1	1.83	636.	361.0	105	191	14.4	1.94	1.58	0.99	0.24	1.0	0.33	107.	304.	-0.31	-0.92	0.07
16	35	56	266	14.77	479.	43.	27.58	12.79	30.4	1.86	690.	360.7	260	191	14.5	1.98	1.92	1.05	0.27	1.1	0.44	122.	355.	-0.35	-0.94	0.00
17	08	21	247	14.87	475.	38.	28.28	19.00	31.6	1.88	736.	360.1	107	196	13.3	2.01	1.91	1.06	0.24	1.1	0.37	112.	275.	-0.33	-0.89	-0.04
17	14	06	269	14.47	479.	41.	28.38	18.88	31.8	1.80	740.	359.7	259	194	13.3	1.97	1.86	1.05	0.26	1.2	0.38	127.	306.	-0.43	-0.83	-0.18
17	46	60	241	14.74	480.	41.	28.71	19.05	32.5	1.87	767.	359.3	105	193	14.1	2.16	2.01	1.06	0.26	1.0	0.32	118.	270.	-0.37	-0.94	0.00
17	59	40	262	14.75	481.	41.	28.84	19.34	32.9	1.84	768.	358.8	260	188	15.1	1.88	1.95	1.01	0.28	1.1	0.36	126.	285.	-0.35	-0.81	0.00
8 RUNS				14.72	479.	42.	27.87	18.56	31.1	1.85	705.	360.1		193	13.6	1.94	1.81	1.03	0.25	1.1	0.36	118.	293.	-0.37	-0.88	-0.02
																	BOWEN RATIO=		0.40			10.	35.	0.05	0.05	0.07

1 NRC C-FPOK, FILE OARCPOK97_NEW(24 JUNE 97), FLIGHT DATE 25-JUN-97 PRINT DATE 25-JUN-97 SGP FLIGHT 08, TAPE 1

DETRENDED				RUN AVERAGES										RMS							CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O		WT	WQ	WC	UW	WOZ
EL RENO																									
0.8 ZI																									
14	06 03	274	14.59	784.	392.	22.33	19.79	24.9	2.62	92.	360.9	267	222	8.9	0.60	0.92	0.44	0.27	4.2	0.45	-51.	167.	0.55	-0.08	-0.39
14	30 06	236	14.92	785.	396.	22.47	19.79	24.8	2.82	91.	359.2	099	217	7.9	0.46	0.76	0.37	0.28	2.5	0.33	-14.	47.	0.22	-0.03	-0.12
14	35 53	275	15.02	788.	400.	22.16	20.15	25.3	2.44	114.	363.6	266	213	7.7	0.61	0.74	0.40	0.13	2.3	0.25	-12.	52.	0.23	-0.03	-0.18
15	02 32	232	14.83	784.	394.	22.88	19.20	26.7	1.87	308.	358.4	101	219	9.4	0.85	1.01	0.52	0.28	2.7	0.47	-2.	105.	0.22	-0.12	-0.15
15	43 53	229	14.98	983.	600.	22.27	17.18	30.5	1.66	598.	356.9	098	237	8.1	0.73	1.00	0.74	0.44	1.9	1.19	18.	282.	0.41	-0.25	0.07
15	49 04	297	15.07	1013.	631.	21.95	17.26	30.9	1.69	628.	357.1	267	236	8.9	0.80	1.04	0.58	0.51	2.6	1.31	-92.	665.	0.44	-0.24	-0.11
16	09 08	222	14.40	1000.	619.	22.07	9.17	31.2	1.65	573.	356.3	097	223	6.9	0.79	0.96	0.83	0.32	1.7	1.08	0.	371.	0.08	0.01	-0.17
100 FT																									
14	13 05	237	14.69	445.	37.	24.93	22.07	24.9	3.75	88.	369.4	096	218	3.9	0.62	0.64	0.38	0.09	1.9	0.18	5.	43.	0.01	-0.10	-0.15
14	18 43	263	14.51	441.	33.	25.12	22.20	25.1	1.16	108.	368.6	269	221	4.5	0.66	0.63	0.37	0.08	1.3	0.17	6.	49.	-0.02	-0.09	-0.11
14	42 37	141	8.76	451.	37.	24.83	22.03	25.4	2.16	146.	368.1	095	218	4.6	0.79	0.75	0.50	0.09	0.9	0.15	21.	66.	-0.06	-0.18	-0.25
14	55 20	278	14.63	444.	35.	25.42	21.95	26.4	2.26	267.	364.8	267	212	7.2	0.94	0.77	0.50	0.12	1.6	0.21	24.	94.	-0.15	-0.17	-0.30
15	27 16	232	14.66	444.	37.	26.26	21.66	30.2	1.99	543.	361.2	097	232	5.7	0.97	1.04	0.73	0.31	1.9	0.27	99.	222.	-0.41	-0.32	-0.27
15	32 59	270	14.38	443.	35.	26.38	21.69	30.6	2.00	599.	360.6	269	234	6.2	1.03	0.99	0.66	0.27	1.8	0.28	101.	216.	-0.40	-0.22	-0.23
15	56 20	233	14.63	443.	35.	27.12	21.32	32.6	1.93	646.	357.8	097	222	5.6	1.29	1.24	0.77	0.29	1.7	0.42	138.	314.	-0.45	-0.29	-0.33
16	01 53	274	14.74	440.	32.	27.34	21.13	32.8	1.98	677.	357.3	269	219	6.5	1.33	1.25	0.75	0.29	2.2	0.49	151.	383.	-0.64	-0.34	-0.34
16	14 51	278	14.86	440.	34.	27.28	12.14	32.6	1.97	612.	356.8	269	217	6.9	1.07	1.28	0.69	0.26	1.5	0.48	103.	372.	-0.43	-0.26	-0.27
16	21 22	218	14.33	442.	37.	27.27	19.71	32.2	2.07	497.	356.4	096	215	5.2	0.99	1.05	0.69	0.25	1.4	0.34	95.	193.	-0.38	-0.21	-0.27
5	RUNS		14.59	442.	35.	27.08	19.20	32.2	1.99	606.	357.8		221	6.0	1.14	1.16	0.71	0.27	1.7	0.40	118.	296.	-0.46	-0.26	-0.29
																BOWEN RATIO=		0.40			22.	78.	0.09	0.05	0.04

1 NRC C-FPOK, FILE OARCPOK97_NEW(25 JUNE 97), FLIGHT DATE 27-JUN-97 PRINT DATE 27-JUN-97 SGP FLIGHT 09,

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO																								
15	59 56	267	14.45	439.	31.	28.56	21.22	31.1	2.26	698.	357.6	269 223	6.8	1.18	1.10	0.65	0.22	1.9	0.38	72.	291.	-0.46	-0.24	0.00
16	05 52	233	14.71	440.	33.	28.66	21.28	31.4	2.22	721.	358.0	098 219	6.1	1.11	1.08	0.66	0.23	1.7	0.38	90.	307.	-0.44	-0.24	0.00
16	11 07	273	14.47	439.	31.	28.84	21.36	31.1	2.17	650.	358.9	269 222	6.7	1.10	1.04	0.66	0.19	1.8	0.38	73.	275.	-0.43	-0.22	0.00
16	17 26	235	14.61	441.	34.	28.92	21.31	30.9	2.16	628.	359.0	099 214	6.2	1.02	1.00	0.68	0.18	1.6	0.37	75.	259.	-0.40	-0.28	0.00
16	22 57	273	14.60	438.	30.	29.11	21.23	31.8	2.13	721.	358.6	268 217	6.8	1.18	1.09	0.62	0.20	1.7	0.38	68.	265.	-0.42	-0.27	0.00
16	29 11	238	14.54	440.	34.	29.20	21.21	32.5	2.06	776.	358.3	099 207	6.0	1.11	1.10	0.72	0.23	1.9	0.38	101.	366.	-0.53	-0.37	0.00
6	RUNS		14.56	440.	32.	28.88	21.27	31.5	2.17	699.	358.4	217	6.4	1.12	1.07	0.67	0.21	1.8	0.38	80.	294.	-0.45	-0.27	0.00
															BOWEN RATIO=			0.27		12.	36.	0.04	0.05	0.00
KINGFISHER, ES-EN																								
16	46 20	420	27.04	355.	35.	30.68	19.65	35.0	1.47	770.	356.8	356 222	6.2	1.30	1.27	0.68	0.25	1.2	0.57	61.	418.	-0.18	-0.28	0.00
16	54 50	526	27.00	354.	32.	30.80	19.74	35.8	1.44	779.	356.5	184 212	6.5	1.39	1.22	0.73	0.33	1.4	0.65	95.	485.	-0.34	-0.24	0.00
17	04 52	431	27.22	356.	34.	30.90	19.71	35.9	1.42	794.	356.0	356 218	6.1	1.28	1.17	0.71	0.33	1.4	0.53	106.	319.	-0.24	-0.23	0.00
17	23 58	521	26.97	355.	31.	31.24	19.59	37.3	1.42	791.	356.2	183 211	7.2	1.39	1.19	0.71	0.33	1.2	0.58	106.	431.	-0.28	-0.22	0.00
17	33 59	431	27.15	357.	34.	31.25	19.50	37.4	1.40	841.	355.6	357 216	6.7	1.35	1.19	0.72	0.21	1.2	0.39	75.	273.	-0.18	-0.28	0.00
17	42 17	533	27.19	354.	30.	31.42	19.70	37.3	1.38	820.	355.4	183 207	7.2	1.61	1.43	0.68	0.28	1.2	0.46	106.	366.	-0.24	-0.33	0.00
6	RUNS		27.10	355.	33.	31.05	19.65	36.5	1.42	799.	356.1	214	6.6	1.39	1.25	0.70	0.29	1.3	0.53	92.	382.	-0.24	-0.26	0.00
															BOWEN RATIO=			0.24		18.	71.	0.06	0.04	0.00
EL RENO																								
18	01 44	270	14.71	442.	33.	30.16	20.80	33.5	2.39	772.	356.3	268 212	6.7	1.12	1.42	0.66	0.31	1.7	0.42	90.	296.	-0.46	-0.29	0.00
18	07 50	239	14.52	442.	33.	30.38	20.62	34.7	2.09	800.	355.6	098 207	5.4	1.23	1.36	0.70	0.29	1.9	0.50	106.	374.	-0.59	-0.23	0.00
18	13 19	269	14.66	443.	33.	30.39	20.67	34.4	2.09	842.	355.1	268 211	6.3	1.63	1.46	0.71	0.26	2.2	0.63	109.	465.	-0.71	-0.37	0.00
18	19 27	245	14.74	445.	35.	30.41	20.44	33.9	2.09	796.	355.2	099 207	5.7	1.30	1.27	0.69	0.24	1.8	0.50	89.	378.	-0.55	-0.27	0.00
18	25 08	268	14.67	442.	31.	30.53	20.52	34.8	2.09	917.	355.0	268 215	6.0	1.28	1.31	0.73	0.26	1.8	0.37	99.	351.	-0.54	-0.25	0.00
18	31 17	237	14.43	446.	34.	30.48	20.23	35.6	2.13	842.	355.2	098 207	5.2	1.35	1.44	0.76	0.26	1.7	0.45	109.	405.	-0.64	-0.25	0.00
6	RUNS		14.62	443.	33.	30.39	20.55	34.5	2.15	828.	355.4	210	5.9	1.32	1.38	0.71	0.27	1.9	0.48	100.	378.	-0.58	-0.28	0.00
															BOWEN RATIO=			0.27		8.	51.	0.08	0.05	0.00

1 NRC C-FPOK, FILE OARCPOK97_NEW(29 JUNE 97), FLIGHT DATE 29-JUN-97 PRINT DATE 29-JUN-97 SGP FLIGHT 10. TAPE 1

DETRENDED				RUN AVERAGES										RMS							CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O		WT	WQ	WC	UW	WOZ
EL RENO																									
0.8 ZI																									
13	10	60	282	14.78	704.	284.	22.51	21.85	23.2	2.09	119.	362.2	258	195	15.3	0.45	0.89	0.41	0.32	2.9	0.11	-23.	18.	0.17	-0.03	-0.04
13	33	00	252	14.80	689.	269.	22.14	22.16	23.7	2.02	257.	370.4	106	193	12.0	0.83	0.91	0.54	0.19	2.6	0.10	-27.	34.	0.42	-0.19	-0.28
13	38	16	274	14.69	709.	292.	22.09	22.17	24.0	2.04	273.	370.4	260	191	12.3	0.90	1.02	0.62	0.19	2.8	0.11	-16.	26.	0.36	-0.13	-0.16
13	56	22	245	14.47	705.	290.	22.28	22.29	24.9	1.96	325.	372.1	103	194	11.1	0.95	0.99	0.66	0.15	2.1	0.11	-36.	63.	0.52	-0.23	-0.24
14	08	29	284	14.86	764.	350.	22.50	21.99	25.2	2.07	314.	369.2	261	200	12.4	0.85	1.23	0.63	0.35	3.3	0.19	-43.	52.	0.28	-0.15	-0.10
15	00	14	242	14.64	752.	335.	23.60	22.56	27.6	1.87	528.	364.7	102	202	10.3	0.95	1.03	0.66	0.15	1.1	0.22	-22.	96.	0.23	-0.20	-0.18
15	13	49	278	14.55	755.	339.	23.90	22.66	28.4	1.91	573.	363.8	262	201	9.8	1.02	1.14	0.81	0.17	1.1	0.25	-27.	167.	0.21	-0.24	-0.03
15	36	26	241	14.69	845.	435.	23.49	22.34	28.7	1.81	634.	362.4	101	211	9.5	1.14	1.23	0.75	0.12	0.7	0.24	-9.	133.	0.10	-0.33	-0.17
15	42	43	289	15.10	840.	430.	23.65	7.75	29.0	1.87	652.	362.2	263	204	9.1	1.12	1.01	0.77	0.10	0.6	0.24	4.	152.	0.01	-0.25	-0.13
16	00	40	240	14.71	774.	361.	24.67	22.83	29.7	1.82	698.	361.0	101	209	8.8	0.91	0.94	0.93	0.11	0.6	0.27	24.	190.	-0.05	-0.17	-0.27
100 '																									
13	17	15	251	14.56	468.	35.	23.57	23.24	23.6	2.86	211.	374.2	101	182	7.5	1.18	0.88	0.64	0.10	1.5	0.09	18.	42.	0.05	-0.32	-0.25
13	23	07	252	14.59	468.	35.	23.72	23.29	23.8	2.89	235.	374.2	266	177	8.0	1.15	0.86	0.63	0.12	1.6	0.08	21.	39.	0.04	-0.29	-0.23
13	44	31	256	14.62	465.	35.	24.27	23.35	24.6	2.47	295.	374.4	101	181	7.7	1.24	0.86	0.69	0.12	1.2	0.12	35.	73.	-0.12	-0.38	-0.29
13	50	14	261	14.56	466.	35.	24.39	23.35	24.8	2.49	319.	374.3	265	178	8.5	1.19	1.01	0.67	0.12	1.0	0.13	36.	68.	-0.16	-0.38	-0.34
14	14	47	242	13.82	468.	38.	24.93	23.45	25.8	2.80	326.	373.5	101	188	7.7	1.09	0.95	0.66	0.15	1.2	0.13	39.	79.	-0.10	-0.35	-0.21
15	19	39	252	14.73	469.	37.	26.96	23.73	28.8	2.14	598.	363.3	101	196	7.9	1.15	1.16	0.76	0.17	1.5	0.22	70.	175.	-0.40	-0.41	-0.30
15	25	06	270	14.56	466.	33.	27.17	23.83	29.1	2.17	614.	362.6	265	193	8.0	1.27	1.10	0.74	0.21	1.6	0.22	83.	189.	-0.46	-0.40	-0.35
15	48	56	247	14.66	466.	34.	27.72	23.80	30.0	2.13	675.	361.1	101	203	7.9	1.34	1.32	0.76	0.20	1.5	0.28	88.	229.	-0.51	-0.44	-0.32
15	54	17	269	14.69	465.	33.	27.84	23.88	30.3	2.11	690.	360.6	265	198	8.0	1.30	1.34	0.75	0.21	1.5	0.29	86.	203.	-0.48	-0.36	-0.31
4 RUNS				14.66	467.	34.	27.42	23.81	29.6	2.14	644.	361.9		197	7.9	1.27	1.23	0.75	0.20	1.5	0.25	82.	199.	-0.46	-0.40	-0.32
																	BOWEN RATIO=		0.41			7.	20.	0.04	0.03	0.02

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 30-JUN-97 PRINT DATE 30-JUN-97 SGP FLIGHT 11. WITH L-E

DETRENDED			RUN AVERAGES									RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER LINE, ES-EN			WITH LONG-EZ																				
100'																							
16 28 30	400	26.79	380.	32.	27.52	23.17	36.6	1.42	733.	369.2	001	174	8.6	1.44	1.38	0.86	0.30	1.1	0.25	143.	225.	-0.31	-0.46	-0.48
16 36 26	565	27.19	378.	30.	27.87	23.37	36.7	1.39	736.	368.4	179	174	9.7	1.48	1.56	0.85	0.34	1.3	0.23	165.	193.	-0.27	-0.41	-0.40
17 18 23	566	26.78	381.	32.	29.37	23.73	39.3	1.38	793.	364.9	181	185	11.1	1.58	1.44	0.89	0.35	0.8	0.23	167.	228.	-0.18	-0.55	-0.23
17 29 05	403	27.08	383.	33.	29.68	23.80	39.5	1.38	814.	364.3	358	192	9.9	1.44	1.50	0.88	0.35	0.8	0.20	171.	192.	-0.22	-0.50	-0.35
17 37 56	547	27.33	380.	30.	30.04	23.77	40.2	1.40	817.	364.1	181	190	9.9	1.61	1.70	0.94	0.37	1.0	0.24	195.	275.	-0.32	-0.55	-0.47
17 48 18	393	26.61	382.	32.	30.26	23.80	40.5	1.39	831.	364.2	358	194	9.3	1.65	1.73	0.87	0.33	1.1	0.26	143.	245.	-0.31	-0.62	-0.36
6 RUNS		26.96	381.	32.	29.12	23.61	38.8	1.39	787.	365.9		185	9.7	1.53	1.55	0.88	0.34	1.0	0.23	164.	226.	-0.27	-0.52	-0.38
															BOWEN RATIO=			0.72		18.	29.	0.05	0.07	0.08
600 '																								
16 50 41	395	27.27	523.	183.	26.50	23.09	37.2	1.31	761.	367.4	000	181	10.3	1.39	1.23	1.26	0.18	0.7	0.21	118.	300.	0.01	-0.76	-0.15
16 59 06	590	27.09	512.	173.	27.02	23.04	37.4	1.34	770.	366.4	180	180	11.8	1.19	1.14	1.30	0.22	0.7	0.20	194.	296.	-0.38	-0.73	-0.11
17 10 12	394	27.34	505.	165.	27.51	23.33	38.3	1.31	792.	365.5	359	184	11.2	1.06	1.17	1.17	0.23	0.6	0.15	154.	149.	-0.10	-0.35	-0.46
3 RUNS		27.23	513.	174.	27.01	23.15	37.6	1.32	774.	366.4		182	11.1	1.21	1.18	1.24	0.21	0.7	0.19	155.	248.	-0.16	-0.61	-0.24
															BOWEN RATIO=			0.63		31.	70.	0.16	0.19	0.16
DW-DE LINE																								
600 ' AGL																								
18 12 40	509	29.98	506.	168.	29.04	23.39	34.8	1.56	895.	364.7	099	191	9.3	0.91	1.11	0.94	0.17	1.2	0.36	70.	395.	-0.36	-0.30	-0.27
18 22 35	592	32.26	526.	186.	29.06	23.40	34.8	1.57	892.	364.0	260	193	10.3	1.01	1.04	0.96	0.19	1.1	0.33	82.	365.	-0.35	-0.38	-0.88
18 34 42	524	30.43	514.	177.	29.42	23.45	34.9	1.59	898.	363.3	099	189	10.3	1.01	1.14	0.96	0.18	0.9	0.40	62.	400.	-0.27	-0.35	-0.42
3 RUNS		30.89	515.	177.	29.17	23.41	34.8	1.57	895.	364.0		191	10.0	0.98	1.10	0.95	0.18	1.1	0.36	71.	387.	-0.33	-0.34	-0.52
															BOWEN RATIO=			0.18		8.	15.	0.04	0.03	0.26
100 ' AGL																								
18 45 10	530	29.58	386.	36.	31.15	24.02	35.3	1.78	891.	362.6	261	194	9.8	1.43	1.54	0.80	0.27	1.4	0.52	98.	404.	-0.35	-0.46	-0.46
18 55 55	509	30.41	385.	35.	31.36	24.30	35.5	1.79	896.	361.7	098	192	8.4	1.44	1.59	0.82	0.27	1.2	0.57	69.	480.	-0.31	-0.51	0.35
19 06 17	537	29.50	389.	37.	31.55	24.09	35.5	1.80	882.	362.3	261	194	8.5	1.45	1.37	0.85	0.28	1.2	0.56	96.	381.	-0.25	-0.46	-0.32
3 RUNS		29.83	387.	36.	31.35	24.14	35.4	1.79	890.	362.2		193	8.9	1.44	1.50	0.82	0.27	1.3	0.55	88.	422.	-0.30	-0.48	-0.14
															BOWEN RATIO=			0.21		13.	42.	0.04	0.02	0.35
EN-ES, INTERCOMP WITH LE (SOME ALTITUDE EXCURSIONS AT START)																								
19 25 12	539	26.38	510.	165.	30.95	22.67	42.0	1.27	815.	362.5	182	184	10.6	1.23	1.35	1.27	0.20	0.7	0.40	153.	321.	-0.18	-0.16	-0.23

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 01-JUL-97 PRINT DATE 01-JUL-97 SGP FLIGHT 12.

DETRENDED			RUN AVERAGES									RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER RUNS																							
16 17 42	418	26.85	382.	31.	31.34	21.28	39.9	1.43	731.	357.4	355	221 8.0	1.24	1.35	0.82	0.27	1.2	0.25	104.	188.	-0.25	-0.41	-0.34
19 09 59	549	27.35	390.	31.	34.48	20.40	44.6	1.37	846.	354.7	184	204 10.6	1.67	1.68	0.90	0.39	0.9	0.36	148.	296.	-0.21	-0.50	-0.38
2 RUNS		27.10	386.	31.	32.91	20.84	42.3	1.40	789.	356.1		211 9.2	1.46	1.51	0.86	0.33	1.1	0.31	126.	242.	-0.23	-0.46	-0.36
														BOWEN RATIO=			0.52		22.	54.	0.02	0.04	0.02
DW-DE LINE																							
100 FT																							
16 37 56	372	22.56	379.	33.	31.97	21.11	34.4	1.62	803.	357.7	097	200 7.7	1.42	1.30	0.77	0.23	1.0	0.39	77.	336.	-0.25	-0.35	-0.26
16 50 59	540	30.55	383.	33.	32.05	20.97	34.9	1.90	826.	356.6	262	196 8.5	1.36	1.40	0.79	0.26	1.4	0.48	78.	368.	-0.37	-0.44	-0.35
18 41 14	490	29.88	389.	33.	34.32	20.62	38.0	1.73	908.	355.1	099	195 9.9	1.55	1.43	0.87	0.24	1.0	0.50	73.	368.	-0.24	-0.53	-0.37
18 50 31	535	29.40	392.	35.	34.31	20.53	37.8	1.75	896.	354.6	260	200 11.1	1.61	1.51	0.89	0.24	1.0	0.45	83.	412.	-0.32	-0.61	-0.35
4 RUNS		28.10	386.	34.	33.16	20.81	36.3	1.75	858.	356.0		198 9.3	1.49	1.41	0.83	0.24	1.1	0.46	78.	371.	-0.30	-0.48	-0.33
														BOWEN RATIO=			0.21		4.	27.	0.05	0.10	0.04
0.5 ZI																							
17 03 36	467	29.15	784.	460.	27.90	19.10	34.6	1.49	832.	356.4	100	200 10.0	0.96	1.12	0.92	0.17	0.9	0.44	35.	340.	-0.23	-0.19	-0.11
17 13 49	561	30.41	788.	466.	28.18	19.18	35.3	1.50	850.	356.8	261	207 11.5	1.23	1.25	0.99	0.19	1.0	0.52	-33.	519.	-0.28	-0.13	-0.54
18 19 21	490	30.64	852.	532.	29.07	18.91	37.2	1.41	903.	356.9	100	200 10.8	1.28	1.29	1.02	0.15	0.6	0.46	-28.	479.	-0.19	-0.29	-0.19
18 29 19	590	31.04	853.	531.	29.16	18.82	37.6	1.41	891.	356.5	259	202 12.6	1.07	1.16	0.92	0.13	0.6	0.49	-11.	475.	-0.18	-0.09	-0.48
4 RUNS		30.31	819.	497.	28.58	19.00	36.2	1.45	869.	356.6		202 11.2	1.13	1.21	0.96	0.16	0.8	0.48	-9.	453.	-0.22	-0.18	-0.33
														BOWEN RATIO=			-0.02		27.	68.	0.04	0.08	0.18
0.8 ZI																							
17 31 60	449	31.54	1117.	809.	26.35	16.01	35.2	1.39	887.	358.1	098	228 13.5	0.96	1.43	0.81	0.43	0.7	1.12	-104.	721.	-0.09	-0.27	-0.62
17 41 41	622	30.54	1122.	813.	26.54	15.90	35.8	1.40	889.	358.3	261	229 14.1	1.07	1.89	0.83	0.52	0.8	1.33	-89.	439.	-0.04	-0.24	-0.38
17 54 21	511	34.77	1118.	807.	26.59	16.47	35.8	1.38	901.	357.7	100	223 12.3	1.10	1.47	0.85	0.39	0.7	1.09	-25.	321.	-0.08	-0.17	-0.10
18 06 45	630	31.80	1115.	805.	26.79	16.55	36.5	1.37	897.	357.8	261	221 12.7	0.97	1.42	0.70	0.34	0.6	0.90	-37.	241.	-0.07	-0.09	-0.22
4 RUNS		32.16	1118.	809.	26.57	16.23	35.8	1.38	894.	358.0		225 13.1	1.03	1.55	0.80	0.42	0.7	1.11	-64.	431.	-0.07	-0.19	-0.33
														BOWEN RATIO=			-0.15		33.	182.	0.02	0.07	0.19

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 02-JUL-97 PRINT DATE 02-JUL-97 SGP FLIGHT 13.

DETRENDED RUN AVERAGES													RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO																							
100 FT																							
14 51	22 270	14.47	465.	32.	28.00	21.54	30.2	2.29	532.	363.8	271	241	5.5	0.91	0.81	0.56	0.19	1.4	0.24	55.	131.	-0.28	-0.08	-0.19
14 57	13 232	14.65	467.	34.	28.12	21.50	30.4	2.24	546.	363.3	097	241	4.9	1.23	0.97	0.60	0.19	1.4	0.27	64.	169.	-0.30	-0.13	-0.22
15 14	36 276	14.74	466.	32.	28.57	21.40	31.6	2.25	598.	362.4	272	247	4.5	1.02	0.90	0.60	0.20	1.6	0.33	64.	214.	-0.43	-0.09	-0.25
15 20	26 233	14.57	466.	32.	28.73	21.30	31.8	2.19	612.	361.9	096	242	3.9	1.16	1.21	0.59	0.20	1.7	0.41	63.	246.	-0.39	-0.21	-0.23
15 50	13 267	14.65	467.	33.	29.41	20.90	33.7	2.18	685.	360.9	271	224	4.1	0.86	0.98	0.67	0.25	1.6	0.35	92.	279.	-0.46	-0.15	-0.24
15 55	57 243	14.66	466.	32.	29.51	20.67	34.1	2.15	696.	360.3	096	225	3.1	1.04	0.84	0.66	0.23	1.7	0.34	76.	251.	-0.46	-0.14	-0.35
16 12	35 262	14.41	464.	31.	29.88	21.43	35.0	2.14	731.	359.8	272	248	3.3	0.94	0.98	0.63	0.24	1.7	0.36	101.	247.	-0.45	-0.11	-0.24
16 18	16 243	14.80	464.	32.	29.94	21.47	35.0	2.11	745.	359.4	095	255	2.3	0.99	0.90	0.66	0.22	1.8	0.40	94.	337.	-0.58	-0.11	-0.34
16 57	25 263	14.72	464.	32.	30.95	21.41	36.9	2.10	815.	359.0	271	221	3.1	0.94	1.02	0.66	0.25	1.7	0.44	95.	316.	-0.42	-0.08	-0.31
17 02	56 247	14.50	465.	33.	31.00	21.41	37.0	2.10	824.	358.6	095	222	1.8	0.97	0.98	0.67	0.21	1.6	0.37	84.	301.	-0.45	-0.10	-0.28
17 21	25 262	14.68	464.	32.	31.39	21.43	37.8	2.09	841.	358.4	273	281	1.7	1.09	1.10	0.72	0.23	1.9	0.43	83.	343.	-0.52	0.00	-0.33
17 26	58 246	14.58	465.	34.	31.46	21.31	38.1	2.07	851.	358.4	093	320	1.8	1.07	1.15	0.68	0.19	2.0	0.46	68.	392.	-0.63	-0.15	-0.35
12 RUNS		14.62	465.	32.	29.75	21.31	34.3	2.16	706.	360.5		242	3.1	1.02	0.99	0.64	0.22	1.7	0.37	78.	269.	-0.45	-0.11	-0.28
															BOWEN RATIO=		0.29			15.	72.	0.10	0.05	0.05
0.8 ZI																								
15 03	19 275	15.11	797.	386.	25.30	19.32	30.5	1.96	563.	363.4	272	257	6.8	0.90	1.14	0.68	0.46	0.9	0.74	-11.	145.	-0.03	-0.08	0.02
15 09	23 234	14.92	792.	379.	25.40	19.75	30.7	1.88	576.	363.2	095	263	5.2	0.89	1.20	0.78	0.32	0.7	0.64	-45.	332.	0.09	-0.26	0.08
15 26	08 273	14.81	798.	385.	26.22	19.11	31.6	1.94	630.	362.1	272	260	5.7	1.38	1.18	0.66	0.77	1.2	1.07	88.	-238.	-0.19	0.05	0.00
15 32	06 228	14.63	800.	386.	26.22	19.05	31.9	1.85	641.	362.1	094	259	4.2	1.17	1.21	0.68	0.62	1.0	0.96	117.	-189.	-0.19	0.09	0.06
16 01	51 254	14.38	808.	399.	26.04	19.14	33.8	1.87	703.	360.7	272	255	3.3	0.89	0.72	0.71	0.12	0.9	0.34	0.	202.	-0.22	0.03	-0.18
16 07	33 235	14.69	810.	401.	26.11	19.71	34.2	1.82	713.	360.6	094	260	2.7	0.95	0.73	0.84	0.12	0.7	0.32	2.	207.	-0.16	0.13	-0.19
16 24	13 268	14.98	810.	403.	26.46	20.43	34.9	1.88	748.	359.7	271	253	3.5	0.82	0.78	0.96	0.14	0.9	0.41	12.	516.	-0.47	0.00	-0.51
16 30	06 247	15.11	812.	402.	26.55	20.02	35.1	1.79	759.	360.0	094	255	2.6	0.90	0.83	0.93	0.10	0.9	0.35	36.	369.	-0.32	-0.08	-0.45
8 RUNS		14.83	803.	393.	26.04	19.57	32.8	1.87	667.	361.5		258	4.2	0.99	0.97	0.78	0.33	0.9	0.60	25.	168.	-0.19	-0.01	-0.15
															BOWEN RATIO=		0.15			50.	246.	0.16	0.12	0.22
16 35	60 265	14.71	986.	587.	25.36	19.12	34.9	1.78	774.	360.4	272	268	3.7	1.19	1.01	0.65	0.37	0.8	0.84	-34.	215.	-0.08	-0.12	-0.14
16 42	04 243	14.84	988.	586.	25.55	18.84	35.6	1.73	785.	360.7	092	275	2.9	1.01	0.79	0.64	0.33	0.9	0.78	-41.	211.	-0.07	-0.10	-0.37
17 09	32 280	15.75	992.	592.	25.58	19.71	36.7	1.73	818.	359.3	272	268	2.5	1.06	0.98	0.84	0.10	0.9	0.48	-8.	357.	-0.26	0.05	-0.38
17 15	50 241	14.80	993.	588.	25.65	19.56	36.9	1.74	825.	359.5	093	285	1.9	1.10	0.78	1.03	0.11	0.9	0.49	-7.	610.	-0.43	-0.08	-0.60
4 RUNS		15.03	990.	588.	25.53	19.31	36.0	1.75	801.	360.0		273	2.7	1.09	0.89	0.79	0.23	0.9	0.65	-23.	348.	-0.21	-0.06	-0.37
															BOWEN RATIO=		-0.06			15.	162.	0.15	0.07	0.16

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 02-JUL-97 PRINT DATE 03-JUL-97 SGP FLIGHT 14. TAPE 1

DETRENDED RUN AVERAGES													RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO, EVENING TRANSITION																								
100 FT																								
23	26 22	250	14.56	469.	33.	34.57	19.17	32.3	2.71	319.	353.6	269 179	4.2	0.89	0.89	0.47	0.17	1.2	0.50	7.	207.	-0.14	-0.08	-0.27
23	31 53	254	14.66	468.	32.	34.53	19.26	32.2	3.19	318.	353.2	097 163	4.1	0.95	0.82	0.45	0.19	1.1	0.42	8.	168.	-0.10	-0.11	-0.27
00	03 49	245	14.60	472.	36.	34.54	19.70	30.5	-0.02	213.	355.7	268 169	4.8	0.70	0.72	0.36	0.17	0.6	0.35	10.	59.	0.03	-0.06	-0.20
00	09 16	262	14.64	468.	32.	34.31	20.41	30.2	3.55	211.	355.1	098 160	5.0	0.81	0.63	0.39	0.23	0.7	0.39	-6.	68.	0.02	-0.11	-0.21
00	14 52	251	14.60	470.	34.	34.19	20.63	29.8	3.19	114.	355.1	267 171	5.7	0.77	0.64	0.37	0.18	0.5	0.35	-6.	100.	0.03	-0.11	-0.23
00	20 22	262	14.64	468.	32.	34.09	20.87	29.5	4.76	180.	354.9	098 164	5.3	0.76	0.66	0.35	0.18	0.6	0.31	-9.	89.	0.04	-0.09	-0.22
00	55 48	245	14.56	471.	34.	33.63	21.64	28.1	12.13	31.	356.9	268 176	5.3	0.74	0.51	0.29	0.17	0.9	0.18	-3.	12.	0.05	-0.06	0.00
01	01 12	258	14.75	469.	33.	33.31	21.99	27.9	10.47	66.	356.6	099 167	5.0	0.72	0.49	0.29	0.20	1.0	0.31	-10.	37.	0.06	-0.06	-0.07
01	06 41	248	14.44	470.	34.	33.15	22.11	27.4	-7.12	11.	356.7	267 173	5.3	0.70	0.49	0.31	0.18	1.1	0.23	-10.	24.	0.09	-0.07	-0.09
01	12 05	256	14.76	469.	32.	32.83	22.29	27.2	3.65	35.	357.2	099 168	5.1	0.73	0.52	0.33	0.17	1.2	0.17	-10.	30.	0.10	-0.08	-0.09
6000' MSL																								
23	44 42	273	15.83	1832.	0.	20.99	14.24	30.2	1.65	215.	355.9	267 219	6.5	0.47	0.40	0.35	0.16	0.5	0.51	-6.	-39.	0.00	-0.04	-0.22
23	51 53	247	15.60	1846.	0.	20.81	14.56	30.3	1.66	222.	355.9	099 212	6.0	0.38	0.57	0.35	0.09	0.6	0.37	-4.	70.	-0.03	-0.06	0.01
6900' MSL																								
00	40 35	334	18.43	2118.	0.	18.55	12.17	28.1	1.68	-48.	357.5	268 236	7.2	0.33	0.23	0.18	0.13	0.4	0.49	7.	-51.	0.00	0.00	0.17
00	48 06	234	15.89	2120.	0.	18.77	11.43	28.0	1.60	27.	357.5	097 233	6.1	0.34	0.21	0.17	0.07	0.4	0.27	5.	-50.	-0.01	0.00	0.05

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 03-JUL-97 PRINT DATE 03-JUL-97 SGP FLIGHT 15. NO NOVATEL

DETRENDED					RUN AVERAGES								RMS							CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER LINE																								
100'																								
	16 19 55	425	26.63	381.	32.	31.39	21.99	41.7	1.40	730.	355.2	354 237	7.7	1.48	1.51	0.80	0.30	1.1	0.27	154.	245.	-0.26	-0.38	-0.45
	16 28 29	498	27.02	381.	32.	31.54	22.01	42.5	1.39	727.	354.8	184 237	6.3	1.53	1.41	0.79	0.33	1.0	0.28	153.	247.	-0.26	-0.33	-0.41
	17 02 55	425	26.98	383.	32.	32.15	21.68	44.5	1.38	792.	354.6	355 220	6.4	1.48	1.48	0.80	0.33	0.9	0.36	144.	217.	-0.20	-0.29	-0.33
	18 31 23	522	26.95	388.	30.	33.99	20.29	47.1	1.34	856.	353.6	183 202	7.3	1.77	1.63	0.87	0.40	0.9	0.62	202.	307.	-0.16	-0.38	-0.32
	4 RUNS		26.90	383.	32.	32.27	21.49	44.0	1.38	776.	354.5	224	6.7	1.57	1.51	0.82	0.34	1.0	0.38	163.	254.	-0.22	-0.34	-0.38
															BOWEN RATIO=			0.64		23.	33.	0.04	0.04	0.05
0.8 ZI																								
	16 41 15	438	28.13	1172.	864.	23.42	19.38	39.5	1.24	768.	354.7	354 229	7.3	1.09	1.26	1.10	0.14	0.7	0.63	-13.	822.	0.21	-0.50	0.76
	16 50 28	549	29.89	1175.	867.	23.62	19.45	40.7	1.25	777.	355.0	185 223	6.8	1.00	1.34	1.16	0.14	0.7	0.74	-7.	915.	0.07	-0.27	0.63
	18 11 11	528	27.75	1545.	0.	21.99	14.55	42.4	1.18	873.	355.2	185 216	8.9	1.66	1.39	1.04	0.74	1.4	2.79	-104.	1307.	-0.28	-0.06	0.01
	18 21 36	406	27.70	1548.	0.	21.79	15.82	43.0	1.19	872.	355.2	354 215	9.6	1.29	1.35	1.06	0.40	1.2	1.98	-29.	867.	-0.17	0.17	-0.17
DW-DE LINE																								
0.8 ZI																								
	17 20 46	468	30.88	1542.	0.	21.08	15.54	37.3	1.30	856.	355.3	097 225	9.7	1.12	1.27	0.94	0.66	1.0	2.49	26.	-73.	-0.12	-0.27	-0.16
	17 30 33	574	31.04	1546.	0.	21.31	15.51	37.8	1.32	869.	355.8	263 224	9.5	1.32	1.36	0.90	0.58	0.9	2.42	-43.	495.	-0.13	-0.16	-0.27
100 FT																								
	17 42 46	488	30.36	384.	32.	33.19	20.91	42.0	1.81	865.	354.7	096 220	7.1	1.50	1.56	0.82	0.29	1.1	0.48	126.	341.	-0.29	-0.40	-0.21
	17 52 11	540	29.71	387.	34.	33.20	20.78	41.7	1.85	857.	354.0	264 210	6.9	1.69	1.67	0.78	0.29	1.2	0.51	115.	357.	-0.33	-0.43	-0.25
	2 RUNS		30.03	386.	33.	33.19	20.85	41.9	1.83	861.	354.4	215	7.0	1.60	1.62	0.80	0.29	1.2	0.50	121.	349.	-0.31	-0.42	-0.23
															BOWEN RATIO=			0.35		6.	8.	0.02	0.01	0.02

1 NRC C-FPOK, FILE 0ARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 04-JUL-97 PRINT DATE 04-JUL-97 SGP FLIGHT 16. NO NOVATEL

DETRENDED				RUN AVERAGES										RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER, 100 FT																								
18 39 55	503	26.95	375.	30.	24.15	11.70	35.0	1.44	877.	350.1	002	029	4.7	1.41	1.58	0.81	0.33	1.0	0.30	181.	383.	-0.28	-0.33	-0.54
18 49 41	434	26.74	380.	33.	24.21	11.38	35.0	1.42	874.	349.9	177	027	5.5	1.51	1.54	0.79	0.28	0.8	0.26	142.	305.	-0.20	-0.29	-0.38
19 29 58	491	26.97	381.	33.	24.88	11.12	37.6	1.40	836.	349.6	001	022	4.2	1.42	1.65	0.80	0.34	0.8	0.27	171.	267.	-0.13	-0.10	-0.43
19 39 28	438	26.75	381.	33.	24.96	11.04	37.1	1.43	836.	349.0	178	031	5.1	1.58	1.39	0.81	0.31	0.8	0.28	165.	303.	-0.18	-0.17	-0.40
20 14 38	487	26.72	381.	31.	25.49	10.97	37.8	1.48	776.	349.7	002	030	3.8	1.56	1.56	0.81	0.34	0.8	0.24	167.	253.	-0.16	-0.08	-0.44
20 23 60	441	26.79	382.	32.	25.49	10.48	37.8	1.45	770.	349.2	178	022	4.2	1.82	1.23	0.80	0.30	0.8	0.23	155.	236.	-0.16	-0.29	-0.42
6 RUNS		26.82	380.	32.	24.86	11.12	36.7	1.44	828.	349.6		027	4.6	1.55	1.49	0.80	0.32	0.8	0.26	164.	291.	-0.19	-0.21	-0.44
															BOWEN RATIO=		0.56			12.	48.	0.05	0.10	0.05
0.8 ZI																								
19 01 31	541	28.65	1274.	0.	15.07	9.55	34.5	1.29	839.	349.6	002	024	5.7	1.21	1.20	1.37	0.12	0.5	0.23	62.	287.	-0.18	-0.23	-0.17
19 12 12	456	29.11	1275.	0.	15.37	9.23	35.2	1.32	838.	350.1	177	028	6.2	1.21	1.19	1.45	0.12	0.6	0.23	72.	333.	-0.12	-0.13	-0.29
19 55 15	480	26.47	1630.	0.	12.28	8.10	35.9	1.30	768.	349.8	001	024	4.9	1.14	0.96	0.97	0.14	0.9	0.31	4.	99.	0.02	0.24	-0.02
20 04 40	439	28.31	1631.	0.	12.41	8.16	35.8	1.31	772.	350.2	177	025	5.8	1.22	0.91	0.88	0.13	0.8	0.28	0.	115.	-0.12	-0.24	-0.07
EL RENO																								
20 42 20	246	14.50	470.	31.	24.15	13.07	30.1	2.20	776.	347.9	275	045	3.0	1.30	1.46	0.70	0.21	1.6	0.31	92.	300.	-0.42	-0.13	-0.27
20 47 51	261	14.89	471.	32.	24.24	13.02	30.0	2.24	771.	347.9	091	028	2.9	1.43	1.43	0.70	0.21	2.0	0.38	95.	410.	-0.75	-0.18	-0.47
20 53 17	248	14.44	471.	30.	24.36	13.28	29.8	2.23	757.	347.3	275	043	2.9	1.47	1.46	0.72	0.24	2.0	0.40	101.	396.	-0.66	-0.22	-0.60
20 58 50	261	14.78	473.	33.	24.35	12.91	29.8	2.29	749.	347.7	091	029	3.4	1.49	1.31	0.67	0.22	1.6	0.37	92.	290.	-0.43	-0.04	-0.32
4 RUNS		14.65	471.	32.	24.27	13.07	29.9	2.24	763.	347.7		036	3.0	1.42	1.42	0.70	0.22	1.8	0.37	95.	349.	-0.56	-0.14	-0.42
															BOWEN RATIO=		0.27			4.	54.	0.14	0.07	0.13

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 05-JUL-97 PRINT DATE 07-JUL-97 SGP FLIGHT 17. RADIATION ADJUSTE

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH20	WT	WQ	WC	UW	WOZ
NOTE: **** RADIATIONNCORRECTED TO JULY 5 CALIBRATION																								
INTERCOMP WITH LONG-EZ, ON BS-BN RUN																								
16	12	06	550	33.51	495.	164.	21.69	13.86	33.8	1.74	510.	347.7	016	160	4.2	1.04	1.08	1.14	0.18	2.1	0.33	113.	241.	-0.33	-0.08	-0.56
CART LINE, CS-CN																								
16	36	40	477	29.52	360.	38.	23.65	13.91	34.4	1.60	561.	349.3	000	162	4.5	1.27	1.45	0.82	0.30	1.4	0.27	175.	175.	-0.45	-0.15	-0.48
17	03	46	550	29.47	357.	34.	24.30	13.76	36.0	1.62	585.	349.7	178	152	4.5	1.33	1.42	0.81	0.30	1.2	0.36	161.	249.	-0.31	-0.22	-0.43
17	14	16	475	29.65	358.	34.	24.52	13.59	37.0	1.57	600.	349.6	000	166	4.7	1.35	1.44	0.84	0.33	1.3	0.32	179.	194.	-0.26	-0.05	-0.37
17	23	42	546	29.95	357.	33.	24.65	3.64	37.7	1.59	596.	349.8	178	160	3.1	1.26	1.62	0.76	0.31	1.2	0.38	152.	181.	-0.17	-0.05	-0.32
17	34	23	488	29.49	361.	36.	24.84	7.67	37.7	1.55	613.	349.9	000	174	3.0	1.39	1.57	0.83	0.34	1.4	0.38	188.	240.	-0.32	-0.26	-0.38
5 RUNS				29.62	359.	35.	24.39	10.51	36.6	1.59	591.	349.7		162	3.9	1.32	1.50	0.81	0.32	1.3	0.34	171.	208.	-0.30	-0.15	-0.40
																	BOWEN RATIO=			0.82		13.	31.	0.09	0.09	0.05
LINES AT VERMA GRASSLANDS																								
VARIOUS HEADINGS																								
18	18	53	58	3.38	409.	33.	23.00	15.39	34.1	2.85	635.	343.3	179	141	3.8	1.17	0.97	0.68	0.20	1.9	0.28	96.	305.	-0.76	-0.05	-0.23
18	22	51	70	4.08	403.	31.	23.13	15.17	32.3	3.03	641.	343.4	206	141	4.4	0.94	1.08	0.73	0.18	1.5	0.25	96.	266.	-0.66	-0.06	-0.49
18	25	04	65	3.92	407.	33.	23.16	15.19	32.6	3.04	643.	343.4	033	156	4.7	0.79	0.94	0.66	0.20	1.5	0.28	105.	304.	-0.71	-0.08	-0.26
18	27	19	66	3.88	402.	32.	23.09	15.22	32.6	3.04	641.	343.5	224	145	4.4	0.65	0.98	0.66	0.15	1.2	0.21	66.	221.	-0.50	0.02	-0.20
18	29	25	68	4.00	405.	35.	23.20	15.26	33.1	3.05	646.	343.2	057	164	4.2	1.09	1.07	0.61	0.16	1.4	0.24	77.	254.	-0.57	-0.12	-0.27
18	35	44	46	3.05	413.	33.	23.15	15.31	32.1	3.17	640.	342.8	303	163	5.7	0.88	1.34	0.77	0.22	1.8	0.32	133.	432.	-0.95	-0.31	-0.74
6 RUNS				3.72	407.	33.	23.12	15.26	32.8	3.03	641.	343.3		152	4.5	0.92	1.06	0.69	0.19	1.6	0.26	96.	297.	-0.69	-0.10	-0.37
																	BOWEN RATIO=			0.32		21.	67.	0.14	0.10	0.19
EAST/WEST LINE AT VERMA SITE																								
18	39	53	55	3.40	408.	29.	23.27	15.18	33.3	2.96	640.	343.1	266	163	4.3	0.78	1.34	0.67	0.20	1.6	0.28	96.	317.	-0.63	-0.18	-0.43
18	41	56	59	3.37	408.	29.	23.33	15.25	33.2	2.98	649.	342.8	094	182	3.8	0.68	1.36	0.67	0.22	1.4	0.26	116.	320.	-0.68	-0.14	-0.56
18	44	05	57	3.32	409.	30.	23.27	15.20	33.5	2.98	631.	342.9	266	172	3.9	0.76	1.28	0.73	0.20	1.6	0.33	123.	374.	-0.81	-0.21	-0.23
18	46	11	58	3.40	409.	30.	23.38	15.13	33.6	2.99	642.	342.9	091	189	2.8	0.60	1.12	0.72	0.20	1.5	0.26	112.	353.	-0.78	-0.17	-0.25
18	48	35	54	3.21	410.	31.	23.40	15.19	33.6	2.99	636.	342.5	266	169	3.7	1.06	0.85	0.68	0.23	1.8	0.37	115.	417.	-0.85	-0.08	-0.55
18	50	37	57	3.36	406.	27.	23.49	15.20	33.7	3.01	641.	342.6	092	196	4.1	0.85	0.88	0.68	0.23	1.7	0.33	111.	361.	-0.76	-0.18	-0.34
18	52	50	56	3.23	409.	30.	23.35	15.00	33.5	3.00	636.	343.1	266	185	3.4	0.67	0.98	0.65	0.19	1.3	0.26	93.	311.	-0.60	-0.03	-0.37
7 RUNS				3.33	408.	29.	23.36	15.16	33.5	2.99	639.	342.8		179	3.6	0.77	1.12	0.69	0.21	1.6	0.30	109.	350.	-0.73	-0.14	-0.39
																	BOWEN RATIO=			0.31		10.	35.	0.09	0.06	0.12
LOW RUN OVER GRASSLAND WEST OF VERMA SITE																								
18	54	43	142	8.55	417.	37.	23.62	14.99	35.3	2.74	620.	344.7	232	204	1.8	1.03	1.34	0.75	0.22	1.2	0.30	124.	260.	-0.58	-0.08	-0.43

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 05-JUL-97 PRINT DATE 05-JUL-97 SGP FLIGHT 18 SMOKE L

NOSEBOOM TEMPERATURE DATA USED
MEAN WIND DIRECTION AND SPEED FROM LITTON

DETRENDED					RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
20	35 54	121	7.26	1897.	0.	15.47	0.33	30.2	1.44	778.	358.1	197	076	2.8	0.42	0.51	0.66	0.3712.7	0.46	47.	-137.	-0.64	-0.08	-0.43
20	47 14	79	5.84	2024.	0.	14.82	1.09	32.8	1.74	741.	350.9	191	101	5.1	0.13	0.20	0.13	0.09	0.5 0.16	-5.	15.	0.02	-0.01	0.01

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 08-JUL-97 PRINT DATE 08-JUL-97 SGP FLIGHT 19. RADIATION ADJUSTE

DETRENDED					RUN AVERAGES								RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER LINE, FIRST SET																								
16	12 25	427	26.88	381.	33.	31.40	19.11	41.0	1.36	495.	357.8	353 239	8.2	1.34	1.29	0.78	0.29	1.1	0.21	139.	176.	-0.21	-0.31	-0.39
16	21 05	495	26.65	380.	32.	31.62	18.91	41.7	1.33	494.	357.4	184 230	7.7	1.38	1.41	0.78	0.31	1.0	0.22	134.	186.	-0.23	-0.35	-0.28
16	30 25	438	27.45	380.	32.	31.73	18.69	42.5	1.36	512.	357.3	354 230	7.2	1.49	1.22	0.75	0.30	1.1	0.22	130.	159.	-0.19	-0.29	-0.34
3	RUNS		26.99	380.	32.	31.58	18.90	41.7	1.35	500.	357.5	233	7.7	1.40	1.31	0.77	0.30	1.1	0.22	134.	174.	-0.21	-0.32	-0.34
															BOWEN RATIO=			0.77		4.	11.	0.02	0.02	0.04
DW-DE, PARTLY SHADED																								
16	48 19	486	29.89	377.	33.	32.30	16.21	41.1	1.75	472.	356.5	093 214	5.7	1.51	1.50	0.77	0.38	1.4	0.34	144.	245.	-0.39	-0.29	-0.42
17	00 16	526	29.87	375.	33.	32.43	18.18	40.4	1.79	391.	356.5	265 209	5.6	1.37	1.43	0.72	0.27	1.3	0.34	108.	190.	-0.33	-0.27	-0.40
17	10 19	492	29.81	374.	30.	32.58	18.19	41.1	1.74	451.	356.3	094 208	5.4	1.34	1.27	0.71	0.24	1.3	0.36	77.	253.	-0.31	-0.26	-0.36
3	RUNS		29.86	375.	32.	32.44	17.53	40.9	1.76	438.	356.4	210	5.6	1.41	1.40	0.73	0.30	1.3	0.35	110.	229.	-0.34	-0.27	-0.39
															BOWEN RATIO=			0.48		27.	28.	0.03	0.01	0.02
DW-DE, SUNNIER																								
17	19 41	538	29.77	376.	31.	32.82	18.37	43.7	1.67	583.	356.5	264 206	6.4	1.28	1.27	0.78	0.31	1.2	0.32	138.	270.	-0.38	-0.29	-0.34
17	29 49	489	30.00	377.	31.	33.01	18.27	43.5	1.69	566.	356.6	095 209	6.8	1.46	1.39	0.82	0.31	1.0	0.35	133.	274.	-0.31	-0.33	-0.28
17	39 03	529	29.42	378.	31.	33.18	18.19	43.9	1.72	580.	356.5	263 208	7.5	1.38	1.38	0.82	0.33	1.1	0.34	150.	297.	-0.34	-0.29	-0.29
3	RUNS		29.73	377.	31.	33.00	18.28	43.7	1.69	576.	356.5	208	6.9	1.37	1.35	0.81	0.32	1.1	0.34	140.	280.	-0.34	-0.30	-0.30
															BOWEN RATIO=			0.50		7.	12.	0.03	0.02	0.03
KINGFISHER, 2ND SET																								
17	58 16	501	26.47	382.	31.	33.00	18.79	47.0	1.29	573.	357.2	183 213	7.0	1.66	1.55	0.88	0.39	1.1	0.24	208.	206.	-0.19	-0.33	-0.47
18	07 46	419	27.04	381.	31.	33.07	18.97	47.4	1.28	577.	356.8	356 215	7.0	1.64	1.46	0.84	0.36	0.9	0.23	193.	194.	-0.18	-0.23	-0.41
18	16 11	506	26.61	381.	30.	33.21	19.04	47.3	1.29	579.	356.3	183 211	6.5	1.59	1.54	0.90	0.41	0.9	0.30	221.	228.	-0.09	-0.26	-0.40
3	RUNS		26.71	381.	31.	33.09	18.93	47.2	1.29	576.	356.8	213	6.8	1.63	1.52	0.87	0.39	1.0	0.26	207.	209.	-0.15	-0.27	-0.43
															BOWEN RATIO=			0.99		11.	14.	0.04	0.04	0.03
EL RENO WITH LONG EZ																								
18	33 42	272	14.72	467.	31.	32.12	18.94	38.6	2.02	638.	355.1	267 215	7.6	1.25	1.47	0.75	0.25	1.8	0.54	110.	351.	-0.49	-0.30	-0.24
18	39 15	231	14.53	472.	35.	32.15	18.56	38.9	2.04	642.	354.9	099 217	7.0	1.47	1.40	0.82	0.25	1.7	0.38	119.	400.	-0.66	-0.48	-0.33
18	44 55	265	14.89	472.	34.	32.22	18.86	38.6	2.07	639.	354.8	265 215	7.8	1.30	1.52	0.80	0.25	1.8	0.52	119.	452.	-0.67	-0.45	-0.47
18	50 16	235	14.70	470.	32.	32.30	19.16	39.2	2.04	639.	354.4	099 221	7.5	1.30	1.46	0.77	0.25	1.8	0.46	112.	408.	-0.56	-0.38	-0.37
4	RUNS		14.71	470.	33.	32.20	18.88	38.8	2.04	640.	354.8	217	7.5	1.33	1.46	0.79	0.25	1.8	0.48	115.	403.	-0.60	-0.40	-0.35
															BOWEN RATIO=			0.29		4.	36.	0.07	0.07	0.08

1 NRC C-FPOK, FILE 0ARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 09-JUL-97 PRINT DATE 09-JUL-97 SGP FLIGHT 20. WASHITA ETC

DETRENDED			RUN AVERAGES										RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
WASHITA, GE-GW,																								
500'																								
	16 22 57 514	27.30	569.	167.	26.95	9.14	37.0	2.04	508.	363.4	233	196	7.5	0.94	1.03	1.05	0.20	1.7	0.22	132.	272.	-0.49	-0.26	-0.54
	16 33 45 411	27.24	573.	172.	27.11	20.51	37.6	1.96	528.	363.0	062	202	6.9	1.12	1.05	1.13	0.16	1.1	0.20	119.	288.	-0.24	-0.39	-0.14
	16 42 33 477	25.36	568.	167.	27.31	12.34	38.0	2.00	530.	362.9	233	200	6.7	0.99	1.06	1.03	0.18	1.1	0.20	117.	214.	-0.42	-0.38	-0.92
	17 18 46 479	25.63	567.	164.	28.08	20.42	39.8	2.01	552.	361.9	234	192	6.1	1.26	1.38	1.15	0.17	0.9	0.31	129.	371.	-0.31	-0.18	-0.28
	17 28 14 420	26.03	565.	162.	28.28	19.40	40.1	1.98	589.	361.6	063	193	6.1	1.11	1.24	1.11	0.18	1.2	0.27	125.	338.	-0.45	-0.41	-0.24
5 RUNS		26.31	568.	166.	27.55	16.36	38.5	2.00	541.	362.6		197	6.6	1.08	1.15	1.09	0.18	1.2	0.24	124.	297.	-0.38	-0.32	-0.42
															BOWEN RATIO=			0.42		6.	54.	0.09	0.09	0.28
300 '																								
	16 52 11 411	25.49	511.	104.	28.13	18.12	38.8	2.01	547.	362.7	062	196	5.8	1.16	1.47	0.98	0.19	1.1	0.25	126.	283.	-0.38	-0.46	-0.07
	17 00 40 499	26.26	505.	100.	28.40	20.64	39.1	2.21	553.	362.2	233	195	6.2	1.31	1.36	0.99	0.23	1.1	0.29	151.	328.	-0.55	-0.23	-0.63
	17 10 17 420	26.13	508.	101.	28.58	18.34	39.3	2.05	567.	361.9	062	193	5.9	1.14	1.24	1.05	0.25	1.2	0.28	192.	318.	-0.57	-0.30	-0.49
3 RUNS		25.96	508.	102.	28.37	19.03	39.1	2.09	556.	362.3		195	6.0	1.20	1.36	1.01	0.22	1.1	0.27	156.	310.	-0.50	-0.33	-0.40
															BOWEN RATIO=			0.50		27.	19.	0.09	0.10	0.24
FW-FE LINE																								
500'																								
	17 45 13 481	29.76	566.	165.	28.83	9.21	39.7	2.60	539.	359.7	066	206	5.0	1.00	1.00	1.06	0.13	1.1	0.32	87.	353.	-0.57	-0.15	-0.18
	17 54 37 555	30.14	565.	164.	28.98	20.47	39.0	2.37	519.	358.9	240	193	4.8	1.04	1.11	1.13	0.15	1.2	0.33	108.	352.	-0.42	-0.18	-0.24
	18 25 30 497	29.96	559.	155.	29.46	19.84	40.0	2.32	611.	358.3	068	177	5.0	0.98	1.22	1.05	0.17	1.5	0.33	115.	420.	-0.61	-0.23	0.14
3 RUNS		29.95	563.	161.	29.09	16.51	39.6	2.43	556.	359.0		192	4.8	1.01	1.11	1.08	0.15	1.3	0.33	103.	375.	-0.53	-0.19	-0.09
															BOWEN RATIO=			0.28		12.	32.	0.08	0.03	0.17
300 '																								
	18 05 34 521	30.26	502.	95.	29.83	20.28	38.5	3.84	494.	358.3	067	182	4.6	1.08	1.12	0.89	0.20	1.4	0.34	112.	391.	-0.56	-0.19	-0.29
	18 15 26 532	30.04	507.	100.	29.83	20.28	37.7	0.48	428.	358.4	239	177	4.7	1.03	1.22	0.80	0.17	1.1	0.35	71.	267.	-0.31	-0.17	-0.31
2 RUNS		30.15	505.	98.	29.83	20.28	38.1	2.16	461.	358.4		179	4.6	1.06	1.17	0.85	0.19	1.3	0.34	92.	329.	-0.44	-0.18	-0.30
															BOWEN RATIO=			0.28		21.	62.	0.13	0.01	0.01

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 10-JUL-97 PRINT DATE 10-JUL-97 SGP FLIGHT 21. ADVECTION/BUDGET

DETRENDED			RUN AVERAGES									RMS						CORRECTED FLUXES				
ST GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
PAPERCLIP PATTERN ON BS-BN LINE																							
100 FT RUNS, NORTHBOUND																							
15 35 19	426	28.58	372.	35.	29.97	20.98	36.7	1.86	441.	360.5	011	209	7.7	1.69	1.57	0.92	0.30	1.1	0.27	156.	248.	-0.17	-0.68	-0.46
16 04 11	433	28.12	367.	32.	30.60	20.77	39.4	1.84	501.	359.1	010	203	7.1	1.51	1.59	0.84	0.32	1.7	0.30	147.	269.	-0.42	-0.47	-0.34
16 34 28	445	29.09	368.	34.	31.28	20.50	42.1	1.48	513.	359.1	012	194	7.3	1.43	1.45	0.79	0.30	0.9	0.31	139.	186.	-0.16	-0.34	-0.31
3 RUNS		28.60	369.	34.	30.62	20.75	39.4	1.73	485.	359.6		202	7.3	1.54	1.54	0.85	0.31	1.2	0.29	147.	234.	-0.25	-0.50	-0.37
															BOWEN RATIO=			0.63		7.	35.	0.12	0.14	0.06
0.8 ZI , SOUTHBOUND																								
15 51 11	420	21.92	988.	692.	23.95	18.60	35.4	1.42	401.	359.3	195	206	8.3	0.95	1.09	1.06	0.18	2.1	0.55	23.	248.	0.44	0.01	-0.17
16 18 36	439	22.32	1056.	753.	23.75	17.18	38.5	1.37	421.	357.6	194	197	8.4	0.92	1.09	0.87	0.20	2.7	1.01	-18.	581.	0.41	-0.04	0.11
16 49 26	433	22.41	1239.	0.	22.51	18.37	39.3	1.17	435.	358.2	194	203	7.6	1.09	0.97	1.24	0.12	1.9	0.54	-22.	183.	0.30	0.01	0.71
3 RUNS		22.22	1094.	482.	23.40	18.05	37.7	1.32	419.	358.4		202	8.1	0.99	1.05	1.06	0.17	2.2	0.70	-6.	337.	0.38	-0.01	0.22
															BOWEN RATIO=			-0.02		20.	174.	0.06	0.02	0.37

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 12-JUL-97 PRINT DATE 12-JUL-97 SGP FLIGHT 22. WITH P-3 AND LONG

DETRENDED				RUN AVERAGES									RMS					CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER, 100'																								
15	18 02	390	26.63	386.	31.	29.09	20.85	35.5	1.38	408.	360.9	356 205	10.3	1.60	1.35	0.93	0.31	0.8	0.13	174.	155.	-0.11	-0.62	-0.50
15	51 46	536	26.41	388.	30.	29.63	12.79	38.0	1.34	455.	359.6	183 195	10.4	1.53	1.49	0.88	0.38	0.7	0.13	172.	116.	-0.08	-0.47	-0.32
16	01 56	390	26.91	391.	34.	29.60	21.02	38.5	1.32	481.	359.8	356 199	10.6	1.47	1.38	0.92	0.35	0.8	0.13	185.	143.	-0.15	-0.46	-0.49
17	53 11	395	26.44	398.	33.	31.39	16.53	45.1	1.33	584.	357.2	356 209	9.6	1.62	1.48	0.95	0.38	0.8	0.20	215.	185.	-0.13	-0.57	-0.53
4 RUNS			26.60	391.	32.	29.93	17.80	39.3	1.34	482.	359.4	202	10.2	1.56	1.43	0.92	0.35	0.8	0.15	187.	150.	-0.12	-0.53	-0.46
															BOWEN RATIO=		1.25			17.	25.	0.03	0.07	0.08
0.8 ZI																								
15	30 56	572	27.29	947.	620.	23.86	19.19	34.9	1.19	406.	359.4	187 216	13.0	0.90	1.57	1.02	0.59	2.0	0.36	-143.	225.	0.48	-0.35	0.31
15	41 55	396	27.83	948.	621.	23.64	19.56	35.4	1.19	435.	359.4	353 210	12.5	1.02	1.53	1.02	0.30	1.1	0.23	-83.	203.	0.35	-0.36	0.12
16	14 49	559	28.53	966.	640.	24.03	19.53	37.2	1.20	481.	358.9	186 215	12.0	1.01	1.31	0.81	0.32	1.1	0.22	-35.	97.	0.15	-0.22	0.15
3 RUNS			27.88	954.	627.	23.84	19.43	35.8	1.19	441.	359.2	214	12.5	0.98	1.47	0.95	0.40	1.4	0.27	-87.	175.	0.33	-0.31	0.19
															BOWEN RATIO=		-0.50			44.	56.	0.14	0.06	0.08
EL RENO, 100'																								
16	46 10	261	14.49	477.	33.	29.04	21.59	34.2	2.13	566.	358.5	264 198	9.6	1.37	1.18	0.83	0.26	1.4	0.24	138.	256.	-0.46	-0.46	-0.44
16	51 48	235	14.33	478.	34.	29.09	21.66	34.2	2.17	577.	358.4	102 200	9.1	1.48	1.44	0.86	0.24	1.4	0.26	120.	242.	-0.46	-0.49	-0.40
16	57 04	262	14.56	477.	33.	29.16	21.54	34.5	2.18	581.	358.3	264 196	9.5	1.54	1.39	0.81	0.25	1.5	0.25	104.	215.	-0.46	-0.47	-0.27
17	02 38	244	14.61	481.	36.	29.19	21.65	34.7	2.18	588.	358.0	102 194	9.3	1.41	1.49	0.93	0.26	1.6	0.29	147.	342.	-0.62	-0.59	-0.42
17	26 17	272	15.10	477.	31.	29.56	21.71	35.7	2.16	609.	357.4	264 193	9.4	1.41	1.55	0.88	0.26	1.5	0.30	127.	281.	-0.52	-0.50	-0.47
17	32 14	244	14.58	478.	31.	29.71	21.68	36.0	2.19	617.	357.2	101 195	8.9	1.47	1.38	0.82	0.30	1.5	0.30	138.	311.	-0.55	-0.55	-0.37
17	37 48	275	15.01	477.	31.	29.73	21.57	36.2	2.15	614.	357.2	263 197	9.2	1.30	1.52	0.81	0.27	1.7	0.31	121.	274.	-0.55	-0.45	-0.33
17	43 28	243	14.77	481.	33.	29.78	21.61	36.5	2.15	621.	357.0	101 200	8.8	1.49	1.55	0.87	0.28	1.4	0.30	150.	319.	-0.54	-0.50	-0.39
8 RUNS			14.68	478.	33.	29.41	21.63	35.3	2.16	597.	357.8	197	9.2	1.43	1.44	0.85	0.27	1.5	0.28	131.	280.	-0.52	-0.50	-0.39
															BOWEN RATIO=		0.47			14.	40.	0.05	0.04	0.06
0.8 ZI																								
16	31 52	283	15.26	935.	520.	24.08	19.98	32.7	1.77	533.	359.0	263 213	10.9	0.96	1.28	0.91	0.18	0.7	0.25	-37.	213.	0.08	-0.32	0.44
16	38 11	232	15.03	936.	520.	24.17	19.82	33.0	1.73	543.	359.1	103 216	10.8	1.00	1.14	0.82	0.16	0.6	0.23	3.	87.	0.01	-0.12	0.07
17	13 56	305	16.39	1075.	662.	23.55	19.36	33.8	1.74	588.	358.4	263 207	10.8	0.94	1.38	1.08	0.65	1.1	0.98	-111.	516.	-0.12	-0.25	-0.20
17	20 46	245	15.41	1074.	659.	23.41	19.80	34.0	1.65	596.	358.3	101 207	10.5	1.15	1.18	0.95	0.30	0.7	0.57	-7.	127.	-0.03	0.00	0.25
4 RUNS			15.52	1005.	590.	23.80	19.74	33.4	1.72	565.	358.7	211	10.7	1.01	1.25	0.94	0.32	0.8	0.51	-38.	236.	-0.02	-0.17	0.14
															BOWEN RATIO=		-0.16			45.	168.	0.07	0.12	0.24
INBOUND 3000' MSL																								
18	09 08	451	28.83	933.	602.	25.42	19.29	39.8	1.27	610.	357.3	161 200	9.3	1.06	1.29	1.18	0.16	0.8	0.30	56.	392.	-0.20	-0.44	0.09

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 13-JUL-97 PRINT DATE 13-JUL-97 SGP FLIGHT 23. ADVECTION/ BUDGET

DETRENDED					RUN AVERAGES								RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
PAPERCLIP ADVECTION STUDY ON BS-BN																								
100 ' RUNS																								
	16 11 30	440	29.57	373.	35.	31.02	20.24	40.0	1.78	500.	356.5	010	206	8.1	1.50	1.44	0.90	0.31	1.0	0.20	127.	183.	-0.30	-0.49	-0.30
	16 37 41	448	29.72	371.	35.	31.72	20.08	40.6	1.84	540.	357.4	012	200	8.3	1.59	1.53	0.87	0.27	1.1	0.23	113.	182.	-0.27	-0.48	-0.23
	17 06 34	433	28.87	375.	35.	32.44	20.02	41.7	1.70	573.	358.2	011	202	8.7	1.33	1.45	0.81	0.30	1.1	0.23	139.	192.	-0.18	-0.34	-0.23
	17 33 56	416	27.27	371.	33.	33.21	20.14	43.3	1.50	592.	358.5	012	198	7.3	1.65	1.63	0.89	0.32	0.9	0.25	181.	320.	-0.30	-0.64	-0.65
	4 RUNS		28.86	373.	35.	32.10	20.12	41.4	1.71	551.	357.7		202	8.1	1.52	1.51	0.87	0.30	1.0	0.23	140.	219.	-0.26	-0.49	-0.35
																BOWEN RATIO=		0.64			25.	58.	0.05	0.11	0.17
0.8 ZI																									
	16 25 25	369	18.93	975.	681.	25.20	17.98	37.5	1.49	502.	357.1	198	224	8.9	1.13	1.48	0.97	0.44	1.0	0.61	-78.	274.	0.19	-0.23	0.09
	16 52 04	424	20.88	1057.	752.	25.33	17.24	39.2	1.38	532.	357.5	198	217	9.3	1.26	1.54	0.80	0.64	1.0	1.08	-99.	417.	0.14	0.00	-0.01
	17 20 22	429	21.92	1046.	751.	26.00	17.30	40.4	1.22	561.	358.0	197	217	8.8	1.19	1.32	0.99	0.54	0.9	1.17	-82.	731.	0.24	-0.08	0.12
	3 RUNS		20.58	1026.	728.	25.51	17.51	39.0	1.36	532.	357.5		219	9.0	1.19	1.45	0.92	0.54	1.0	0.95	-86.	474.	0.19	-0.10	0.07
																BOWEN RATIO=		-0.18			9.	191.	0.04	0.10	0.06
DW-DE LINE																									
	17 46 55	499	29.53	383.	29.	33.31	20.19	43.5	1.69	595.	357.7	098	188	7.4	1.56	1.62	0.89	0.31	1.5	0.29	148.	292.	-0.29	-0.47	-0.36
	17 56 32	520	29.94	383.	29.	33.46	20.25	44.0	1.70	593.	357.1	261	183	8.4	1.49	1.57	0.88	0.36	1.4	0.33	161.	264.	-0.29	-0.44	-0.61
	18 06 23	513	29.70	385.	30.	33.55	20.22	43.8	1.72	603.	356.7	098	184	8.7	1.60	1.56	0.91	0.32	1.3	0.30	155.	244.	-0.24	-0.52	-0.35
	18 16 01	511	28.87	386.	30.	33.58	20.15	44.4	1.73	594.	356.4	261	187	9.6	1.51	1.66	0.86	0.32	1.3	0.32	142.	263.	-0.23	-0.45	-0.30
	4 RUNS		29.51	384.	30.	33.48	20.20	43.9	1.71	596.	357.0		185	8.5	1.54	1.60	0.89	0.33	1.4	0.31	152.	266.	-0.26	-0.47	-0.41
																BOWEN RATIO=		0.57			7.	17.	0.03	0.03	0.12

1 NRC C-FPOK, FILE OARCPOK97_NEW(30 JUNE 97), FLIGHT DATE 14-JUL-97 PRINT DATE 14-JUL-97 SGP FLIGHT 24. EL RENO, CITATION

DETRENDED			RUN AVERAGES										RMS							CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO																								
0.8 ZI																								
16	01 40	270	15.28	816.	410.	26.94	13.03	35.1	1.87	440.	358.5	274	294	4.8	0.74	0.74	0.93	0.15	0.8	0.30	21.	227.	-0.12	-0.12	-0.10
16	08 14	234	14.96	818.	410.	27.02	18.34	35.9	1.79	472.	359.5	092	299	4.9	0.72	0.74	0.88	0.14	0.9	0.36	-1.	238.	0.02	-0.07	-0.13
16	30 10	269	15.40	883.	480.	26.87	18.10	36.1	1.85	478.	359.7	275	311	3.9	0.86	0.71	0.57	0.26	2.5	0.61	-3.	-8.	-0.08	0.05	0.03
16	36 04	237	15.40	878.	472.	26.96	18.24	36.5	1.78	438.	359.8	091	315	4.0	0.76	0.73	0.59	0.21	1.8	0.52	22.	-31.	0.00	0.03	-0.04
4	RUNS		15.26	849.	443.	26.95	16.93	35.9	1.82	457.	359.4		304	4.4	0.77	0.73	0.74	0.19	1.5	0.45	10.	107.	-0.05	-0.03	-0.06
																BOWEN RATIO=			0.09		12.	126.	0.06	0.07	0.06
100 FT (LAST TWO RUNS USE ALTERNATE LICOR INLET AND LAG OF 28, NOT 23)																								
16	14 30	269	14.65	463.	31.	30.94	19.85	36.6	2.37	438.	359.5	274	290	4.0	0.94	0.85	0.62	0.23	3.0	0.27	83.	174.	-0.20	-0.06	-0.24
16	20 07	232	14.53	465.	33.	31.02	18.65	36.9	2.40	429.	359.8	092	300	3.8	0.78	0.86	0.67	0.31	3.4	0.32	101.	283.	-0.44	-0.11	-0.44
17	58 57	265	14.73	468.	34.	33.20	21.26	42.4	1.99	615.	358.7	275	329	3.1	1.21	1.04	0.79	0.33	2.0	0.40	147.	320.	-0.53	-0.09	-0.48
18	04 22	239	14.58	468.	34.	33.25	21.26	41.6	2.16	588.	359.1	090	340	4.2	1.22	1.04	0.77	0.28	1.9	0.44	124.	382.	-0.42	-0.19	-0.41
18	12 01	271	14.85	463.	29.	33.22	21.15	41.7	2.09	617.	359.3	276	344	3.6	1.25	1.11	0.72	0.28	2.3	0.48	109.	347.	-0.58	-0.04	-0.47
18	17 34	245	14.59	467.	32.	33.19	21.44	41.7	2.08	616.	360.4	089	346	4.2	1.29	1.16	0.72	0.33	2.1	0.43	142.	353.	-0.45	-0.11	-0.51
6	RUNS		14.66	466.	32.	32.47	20.60	40.1	2.18	551.	359.5		325	3.5	1.12	1.01	0.72	0.29	2.5	0.39	118.	310.	-0.44	-0.10	-0.42
																BOWEN RATIO=			0.38		23.	68.	0.12	0.05	0.09
KINGFISHER LINE, INTERCOMP WITH NORTH DAKOTA CITATION																								
17	01 46	483	30.06	769.	450.	28.30	19.22	46.4	1.20	493.	371.9	180	323	1.7	1.15	1.11	1.18	0.18	4.2	0.27	91.	306.	1.06	0.07	0.05
17	11 22	539	32.22	767.	448.	28.45	17.58	45.8	1.30	516.	371.3	358	328	2.1	1.19	1.15	1.14	0.20	4.5	0.33	59.	230.	0.55	-0.02	-0.14
17	22 37	389	27.57	759.	443.	28.72	20.11	46.4	1.24	509.	372.0	174	351	3.0	1.00	1.24	1.15	0.16	4.3	0.37	53.	305.	0.76	0.10	-0.01
17	31 34	491	31.11	760.	441.	28.99	18.96	47.4	1.25	510.	370.3	359	353	3.1	1.07	1.09	1.36	0.24	3.8	0.37	99.	523.	1.64	-0.08	0.82
4	RUNS		30.24	764.	446.	28.61	18.97	46.5	1.25	507.	371.4		342	2.4	1.10	1.15	1.21	0.20	4.2	0.34	76.	341.	1.00	0.02	0.18
																BOWEN RATIO=			0.22		20.	110.	0.41	0.07	0.38

1 NRC C-FPOK, FILE OARCPOK97_NEW(16 JULY 97), FLIGHT DATE 16-JUL-97 PRINT DATE 16-JUL-97 SGP FLIGHT 25. KF & EL RENO,

DETRENDED				RUN AVERAGES									RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
KINGFISHER																								
100 '																								
16	10 27	426	26.55	381.	30.	31.29	19.76	43.4	1.29	455.	378.2	358 214	4.6	1.09	1.19	0.71	0.33	1.2	0.22	125.	156.	-0.02	-0.19	-0.35
16	18 55	490	26.86	383.	32.	31.59	18.54	44.0	1.30	451.	378.2	182 206	4.1	1.20	1.12	0.75	0.32	1.2	0.19	125.	153.	-0.10	-0.15	-0.43
16	51 18	429	26.87	385.	33.	32.44	19.48	46.0	1.22	524.	376.4	358 190	4.6	1.20	1.41	0.83	0.36	1.1	0.29	168.	229.	-0.03	-0.16	-0.40
16	59 55	498	26.70	384.	31.	32.77	19.63	47.1	1.19	535.	376.0	181 191	4.6	1.25	1.43	0.85	0.41	1.3	0.35	192.	243.	-0.06	-0.19	-0.38
4	RUNS		26.75	383.	32.	32.02	19.35	45.1	1.25	491.	377.2	200	4.4	1.19	1.29	0.79	0.36	1.2	0.26	153.	195.	-0.05	-0.17	-0.39
															BOWEN RATIO=			0.78		29.	41.	0.03	0.02	0.03
0.8 ZI																								
16	32 37	432	27.39	918.	600.	26.23	17.91	41.8	1.15	442.	377.7	356 219	5.5	1.05	1.21	0.89	0.17	1.8	0.51	-27.	326.	0.45	-0.18	0.77
16	41 19	519	28.49	916.	599.	26.49	17.76	43.7	1.15	452.	377.9	183 209	5.2	1.04	1.25	1.11	0.22	1.5	0.53	3.	565.	0.44	-0.23	0.88
2	RUNS		27.94	917.	600.	26.36	17.84	42.8	1.15	447.	377.8	214	5.3	1.04	1.23	1.00	0.20	1.6	0.52	-12.	446.	0.44	-0.21	0.82
															BOWEN RATIO=			-0.03		15.	120.	0.01	0.02	0.06
EL RENO																								
100'																								
17	28 50	255	14.51	471.	32.	31.59	20.40	38.8	1.44	586.	377.0	268 207	4.6	1.12	1.26	0.65	0.25	2.2	0.55	80.	356.	-0.50	-0.18	-0.62
17	34 26	247	15.04	472.	33.	31.62	20.36	38.5	2.11	607.	377.0	097 210	4.2	1.09	1.37	0.75	0.27	2.0	0.47	102.	248.	-0.47	-0.14	-0.67
17	39 49	264	14.57	472.	32.	31.71	20.39	39.1	2.02	597.	376.9	268 203	4.8	0.98	1.32	0.70	0.23	2.0	0.50	93.	323.	-0.43	-0.14	-0.49
17	45 14	251	14.87	472.	31.	31.82	20.21	38.6	2.08	605.	376.4	097 204	4.8	1.07	1.45	0.69	0.27	1.9	0.64	105.	412.	-0.52	-0.13	-0.67
18	07 24	260	14.93	474.	30.	32.12	20.56	40.4	1.99	609.	375.9	268 182	5.4	1.07	1.26	0.74	0.24	2.1	0.39	104.	352.	-0.42	-0.16	-0.52
18	12 43	253	14.64	475.	31.	32.30	20.62	40.1	2.08	622.	374.9	097 179	4.9	1.20	1.25	0.68	0.29	2.1	0.51	90.	314.	-0.50	-0.12	-0.56
18	18 19	262	14.81	474.	30.	32.38	20.46	40.4	1.99	612.	374.7	267 179	5.8	1.22	1.27	0.73	0.27	2.5	0.55	114.	417.	-0.63	-0.13	-0.68
18	23 54	249	14.54	478.	34.	32.34	20.46	40.5	2.03	620.	374.5	097 181	4.8	1.21	1.44	0.76	0.21	2.3	0.50	88.	378.	-0.52	-0.21	-0.59
8	RUNS		14.74	474.	32.	31.99	20.43	39.6	1.97	607.	375.9	192	4.8	1.12	1.33	0.71	0.25	2.1	0.51	97.	350.	-0.50	-0.15	-0.60
															BOWEN RATIO=			0.28		10.	52.	0.06	0.03	0.07
0.8 ZI																								
17	16 19	292	15.67	935.	528.	26.28	18.70	35.4	1.72	506.	378.2	268 220	5.4	0.91	0.98	0.89	0.14	1.0	0.54	6.	502.	-0.04	-0.08	0.53
17	22 44	250	15.77	943.	533.	26.34	17.92	36.8	1.63	553.	378.2	097 217	4.9	0.96	1.11	0.96	0.17	0.8	0.51	9.	572.	0.20	-0.37	1.07
17	55 19	284	15.64	1052.	647.	25.71	18.54	37.7	1.62	590.	378.2	267 206	5.7	1.04	1.20	0.95	0.14	0.9	0.74	-24.	729.	0.06	-0.15	0.85
18	01 42	251	15.15	1050.	641.	25.84	18.60	38.4	1.58	595.	378.1	097 200	5.7	0.98	1.07	1.07	0.13	1.0	0.64	22.	617.	0.17	-0.32	0.78
4	RUNS		15.56	995.	587.	26.04	18.44	37.1	1.64	561.	378.2	210	5.4	0.97	1.09	0.97	0.15	0.9	0.61	3.	605.	0.10	-0.23	0.81
															BOWEN RATIO=			0.01		17.	82.	0.09	0.12	0.19

1 NRC C-FPOK, FILE OARCPOK97_NEW(16 JULY 97), FLIGHT DATE 16-JUL-97 PRINT DATE 22-JUL-97 SGP FLIGHT 26, TAPE 1 ,

DETRENDED					RUN AVERAGES									RMS							CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
EL RENO, EVENING TRANSITION																								
100 FT RUNS																								
23	04	43	256	15.07	476.	42.	34.01	17.23	32.4	2.62	236.	372.8	263	182	8.8	1.23	1.08	0.59	0.18	1.7	0.42	14.	152.	-0.09	-0.24	-0.48
23	12	05	255	14.80	469.	33.	34.03	17.33	32.9	2.55	260.	372.2	100	182	8.0	1.24	1.10	0.60	0.24	3.0	0.59	3.	297.	-0.19	-0.33	-0.77
23	43	09	256	14.79	472.	32.	34.05	18.20	31.9	2.59	157.	373.3	264	172	8.5	1.26	1.05	0.57	0.19	2.3	0.38	15.	147.	0.06	-0.26	-0.67
23	48	38	264	14.71	472.	32.	33.98	18.18	31.4	3.23	119.	373.2	100	171	8.1	1.26	0.93	0.58	0.21	1.9	0.38	1.	146.	-0.11	-0.27	-0.32
00	17	34	240	13.90	474.	31.	33.68	18.28	29.8	2.57	17.	373.8	265	173	7.6	1.20	0.80	0.48	0.24	0.8	0.40	-7.	88.	0.04	-0.19	-0.36
00	22	52	261	14.53	472.	30.	33.55	18.41	29.3	5.82	59.	373.9	100	172	7.2	1.15	0.73	0.48	0.25	0.9	0.44	-15.	92.	0.04	-0.20	-0.35
00	56	29	255	15.11	476.	33.	32.71	19.31	27.7	3.00	-36.	374.8	265	166	7.8	0.95	0.64	0.46	0.23	0.8	0.23	-10.	26.	0.04	-0.12	-0.12
01	01	50	265	14.65	473.	31.	32.50	19.32	27.3	3.00	-11.	375.2	100	163	7.2	0.89	0.61	0.43	0.24	1.2	0.20	-18.	44.	0.09	-0.14	-0.20
01	24	17	258	14.98	471.	30.	31.77	19.57	25.9	-0.11	-56.	377.7	265	160	7.4	0.82	0.57	0.38	0.19	1.5	0.18	-11.	21.	0.06	-0.10	-0.06
01	29	43	270	14.85	471.	31.	31.55	19.55	25.6	-0.04	-57.	378.3	099	158	6.6	0.82	0.52	0.37	0.23	1.7	0.21	-19.	27.	0.12	-0.10	-0.16
HIGHER RUNS																								
4800 ' MSL																								
23	30	35	264	15.33	1464.	0.	24.35	13.57	32.6	1.63	154.	378.1	263	188	10.3	0.51	0.46	0.47	0.14	0.9	0.65	-23.	232.	-0.13	-0.01	-0.01
23	37	12	243	14.84	1458.	0.	24.49	13.53	31.6	1.72	104.	378.7	102	188	10.0	0.60	0.47	0.41	0.18	0.9	0.83	-29.	379.	-0.14	-0.12	0.40
3500' MSL																								
00	05	16	251	14.68	1073.	673.	27.91	15.83	30.8	2.10	-20.	375.7	262	175	9.8	0.55	0.47	0.43	0.09	0.8	0.46	-14.	205.	-0.10	-0.05	-0.13
00	11	43	249	14.13	1065.	667.	27.96	15.76	30.2	2.26	6.	376.1	103	175	9.8	0.44	0.50	0.45	0.07	0.6	0.35	-11.	156.	-0.06	-0.10	-0.08
3000 ' MSL																								
00	39	23	247	14.82	910.	499.	29.30	16.76	29.0	7.25	-77.	375.2	262	172	11.1	0.31	0.35	0.23	0.07	0.4	0.29	-2.	19.	0.00	0.01	0.11
00	45	46	265	15.05	896.	486.	29.43	16.40	28.5	4.76	2.	375.4	104	173	11.1	0.29	0.30	0.22	0.04	0.5	0.17	-1.	8.	0.00	0.00	-0.04
2400 ' MSL																								
01	10	28	255	15.27	737.	314.	30.57	17.72	26.9	-0.35	-61.	374.1	259	165	12.9	0.30	0.26	0.28	0.06	0.4	0.17	-9.	30.	-0.03	0.00	0.14
01	17	37	307	16.69	746.	326.	30.43	17.56	26.8	-0.12	-67.	374.2	109	165	12.7	0.32	0.24	0.15	0.05	0.4	0.16	1.	-5.	0.00	0.00	-0.01

1 NRC C-FPOK, FILE OARCPOK97_NEW(16 JULY 97), FLIGHT DATE 17-JUL-97 PRINT DATE 23-JUL-97 SGP FLIGHT 27, MORNING TRANS

DETRENDED RUN AVERAGES													RMS						CORRECTED FLUXES				
ST	GMT	SEC	DIST	PALT	RALT	TEMP	DEWPT	PRT5	GRN	NETRD	LICOR	HDGL	WIND	UGEL	VGEL	WEP	POT	RCO2	RH2O	WT	WQ	WC	UW	WOZ
20 MILES ON AS-AN TRACK,																								
500'																								
12	59	13	650	36.82	503.	160.	24.72	20.00	24.1	0.50	-25.	388.0	022	125	8.6	1.11	0.70	0.46	0.43	4.3	0.59	0.	-6.	0.02	-0.01	-0.05
13	11	44	689	36.99	504.	162.	24.45	20.01	24.6	8.44	-8.	390.7	184	117	9.1	1.24	0.72	0.45	0.36	4.8	0.56	-17.	-36.	-0.12	-0.05	-0.02
13	49	32	642	37.14	496.	155.	24.40	20.12	26.2	2.58	63.	390.6	023	107	10.1	1.17	0.94	0.59	0.35	3.6	0.34	-21.	10.	-0.01	-0.12	-0.23
RUN DIVIDED IN TWO																								
14	02	16	141	7.70	517.	167.	24.38	19.63	24.7	2.64	51.	384.4	180	116	13.7	0.69	0.50	0.46	0.27	2.3	0.32	7.	10.	0.06	0.03	0.05
14	06	26	482	27.66	512.	171.	24.68	11.05	28.7	1.44	152.	394.0	183	110	9.3	1.05	0.82	0.60	0.32	3.9	0.39	-17.	-15.	-0.12	-0.12	-0.27
14	41	54	603	35.74	499.	156.	25.35	19.57	31.4	1.55	262.	390.8	021	114	8.5	1.42	1.14	0.71	0.31	3.5	0.31	28.	-38.	-0.40	-0.18	-0.23
14	53	09	665	36.04	504.	160.	25.68	14.15	32.4	1.75	242.	391.0	184	115	9.5	1.28	0.97	0.80	0.23	4.3	0.28	6.	82.	0.04	-0.14	-0.71
100 ' (LAST TWO RUNS CUT SHORT AT CIMARRON RIVER)																								
13	24	22	665	36.72	385.	37.	25.04	20.34	24.9	0.76	19.	390.4	020	096	7.5	1.51	1.17	0.59	0.20	5.0	0.50	3.	2.	-0.07	-0.26	-0.24
13	36	36	654	37.26	384.	36.	25.17	20.31	25.6	3.26	55.	389.8	185	096	8.5	1.15	1.34	0.59	0.23	4.6	0.44	21.	27.	0.05	-0.22	-0.23
14	15	50	630	36.87	387.	36.	25.88	20.66	28.2	2.86	150.	388.9	020	108	7.0	1.29	1.50	0.68	0.29	3.2	0.35	43.	15.	-0.21	-0.35	-0.19
14	27	49	662	37.27	385.	34.	26.17	20.77	29.7	2.22	197.	388.8	185	110	7.2	1.26	1.40	0.68	0.32	2.9	0.31	62.	3.	-0.26	-0.30	-0.33
15	06	51	436	25.93	392.	36.	27.74	21.59	33.6	1.55	203.	392.6	021	119	8.6	1.20	1.11	0.74	0.31	4.7	0.30	94.	41.	-0.26	-0.30	-0.32
15	15	47	464	25.46	390.	35.	27.97	21.65	34.5	1.30	259.	391.4	185	123	8.4	1.09	1.17	0.76	0.33	5.1	0.31	113.	115.	0.16	-0.28	-0.57

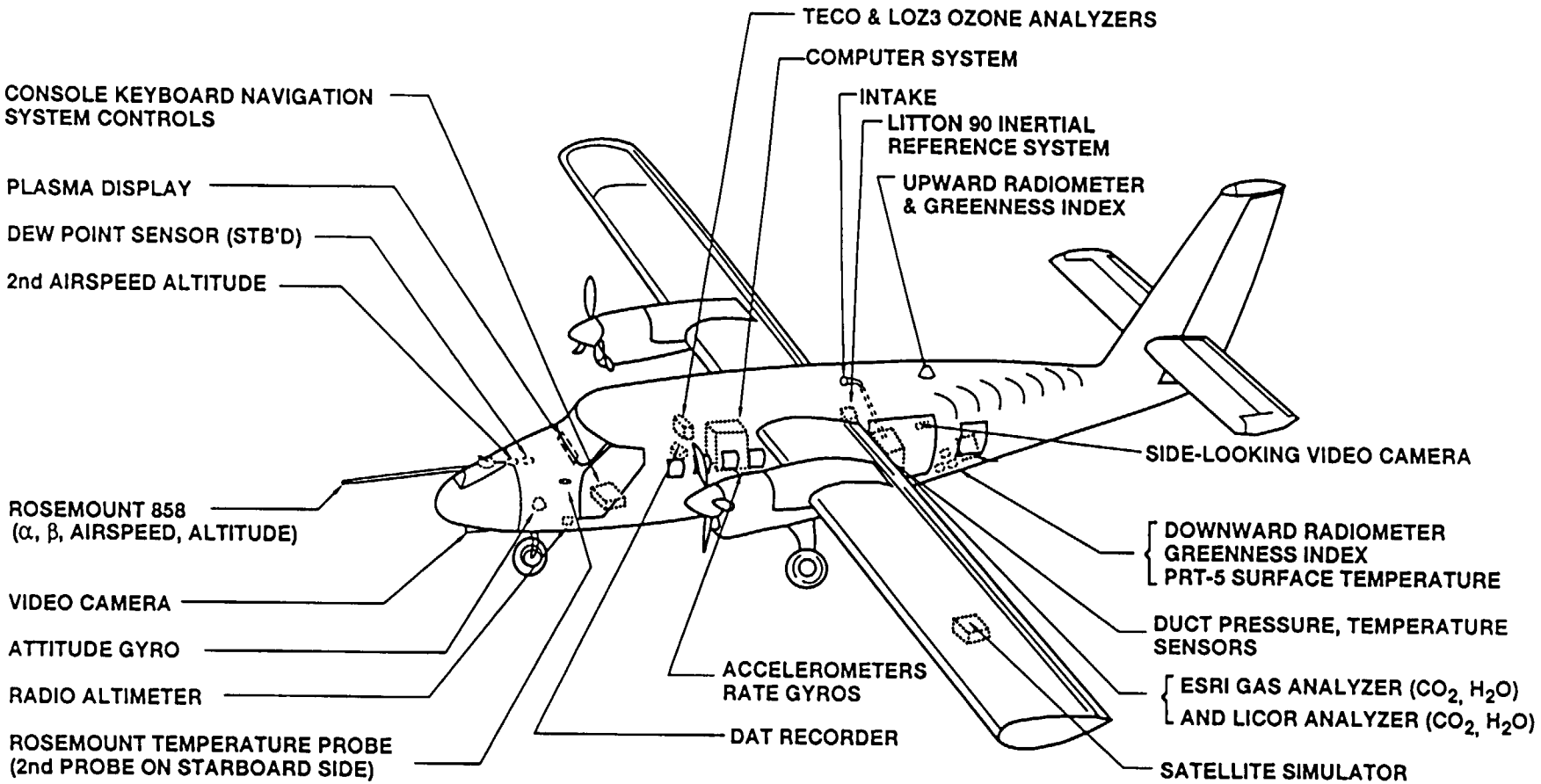
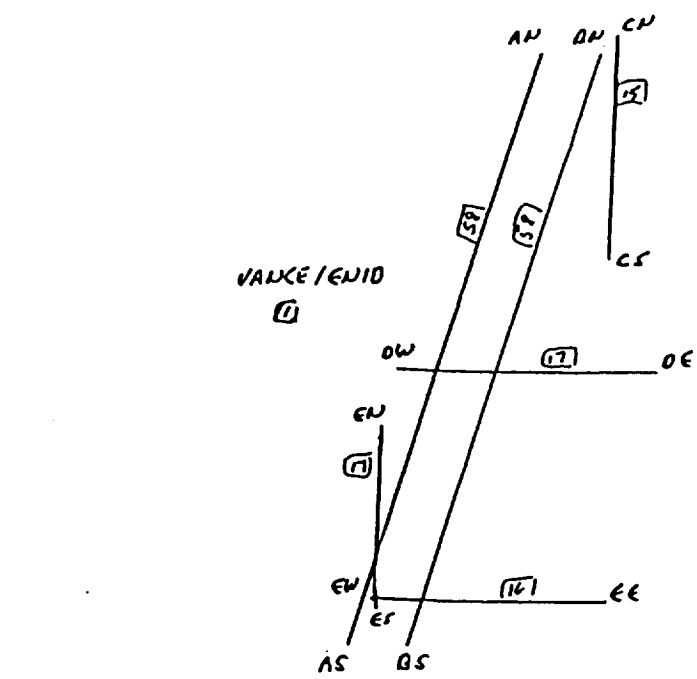
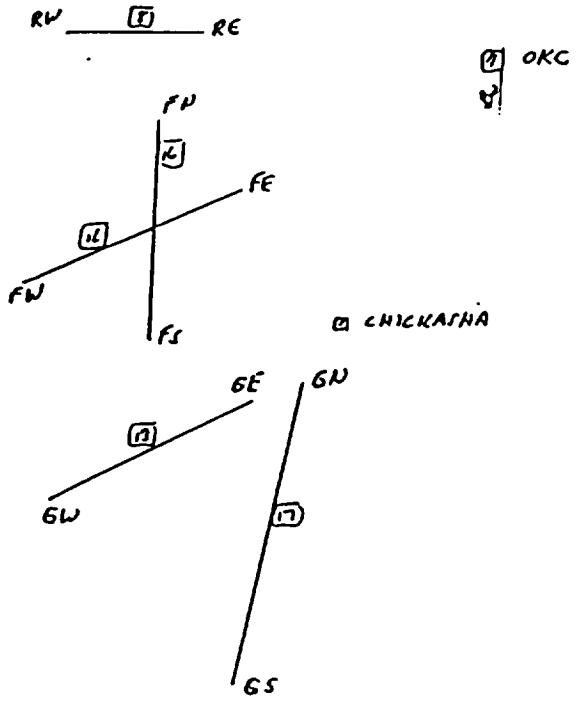


FIGURE 1: NRC TWIN OTTER ATMOSPHERIC RESEARCH AIRCRAFT AS INSTRUMENTED FOR SGP97



Towers		RAMP
CART	36 36.1 97 28.9	35 23.9 97 36.1
NOAA	34 57.6 97 58.4	OKC Intersection 35 23.8 97 36.3
VERMA Wheat	36 46.3 97 09.1	
VERMA Grass	36 57.5 96 41.2	
RENOA	35 33.3 98 01.0	
RENOB	35 34.1 98 03.7	
RENOC	35 33.8 98 08.7	



SGP97 waypoints - Final

Waypoint/ Position			length nm/km
AS 35 42.5 97 53.0	to	AN 36 39.5 97 36.7	58.5 nm 108.4 km
BS 35 42.5 97 46.0	to	BN 36 39.5 97 29.7	58.5 nm 108.4
CS 36 25.0 97 29.0	to	CN 36 40.3 97 29.0	15.3 nm 28.4 km
DW 36 12.6 97 47.0	to	DE 36 12.6 97 26.5	16.5 nm 30.7 km
EW 35 46.0 97 52.3	to	EE 35 46.0 97 33.0	15.7 nm 39.0 km
ES 35 45.0 97 51.7	to	EN 35 59.5 97 51.7	17.0 nm 31.5 km
FS 35 07.8 98 05.0	to	FN 35 24.0 98 05.0	16.2 nm 30.0 km
FW 35 09.0 98 17.0	to	FE 35 16.0 98 0.0	15.6 nm 28.8 km
GW 34 50.0 98 15.7	to	GE 34 57.2 98 02.0	13.4 nm 24.7 km
GS 34 42.0 98 03.0	to	GN 34 58.6 (noaa) 97 57.7	17.1 nm 31.8 km
RW 35 33.6 98 10.1	to	RE 35 33.2 98 00.4	7.9 nm 14.7 km

FIGURE 2: FLUX AIRCRAFT TRACKS - SGP97

TWIN OTTER DATA
SGP , RADUP CORR'D,
FLIGHT 19, EL RENO, KINGFISHER AND DE-DW TRACKS

FRL / IAR / NRC
DKA500:[JIM.SGP]RAWPLT$SP19.R01;1
Date: 08-JUL-97
Start time: 155500 End time: 190648

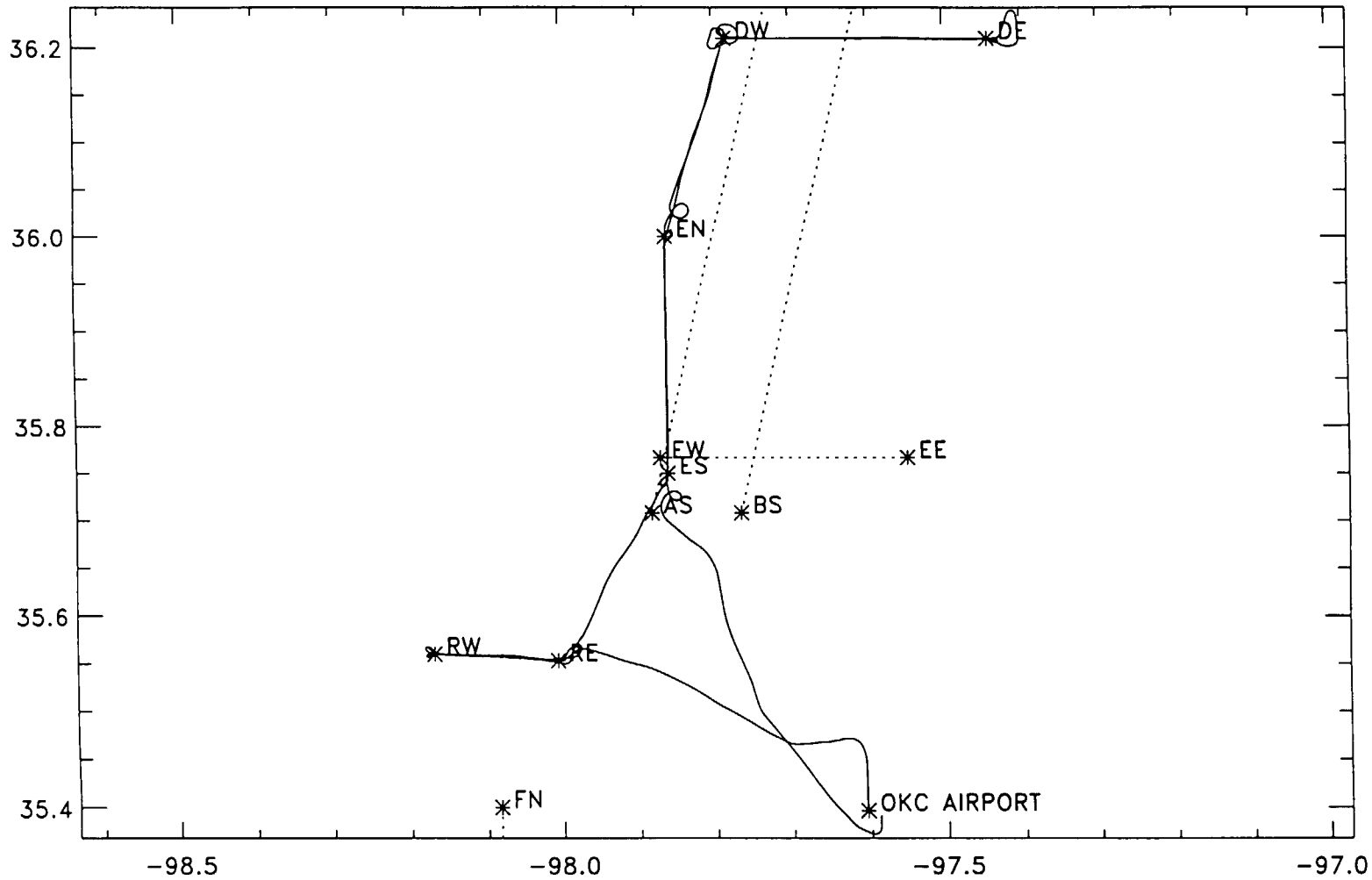


FIGURE 3: FLIGHT TRACK PLOT FOR FLIGHT 19

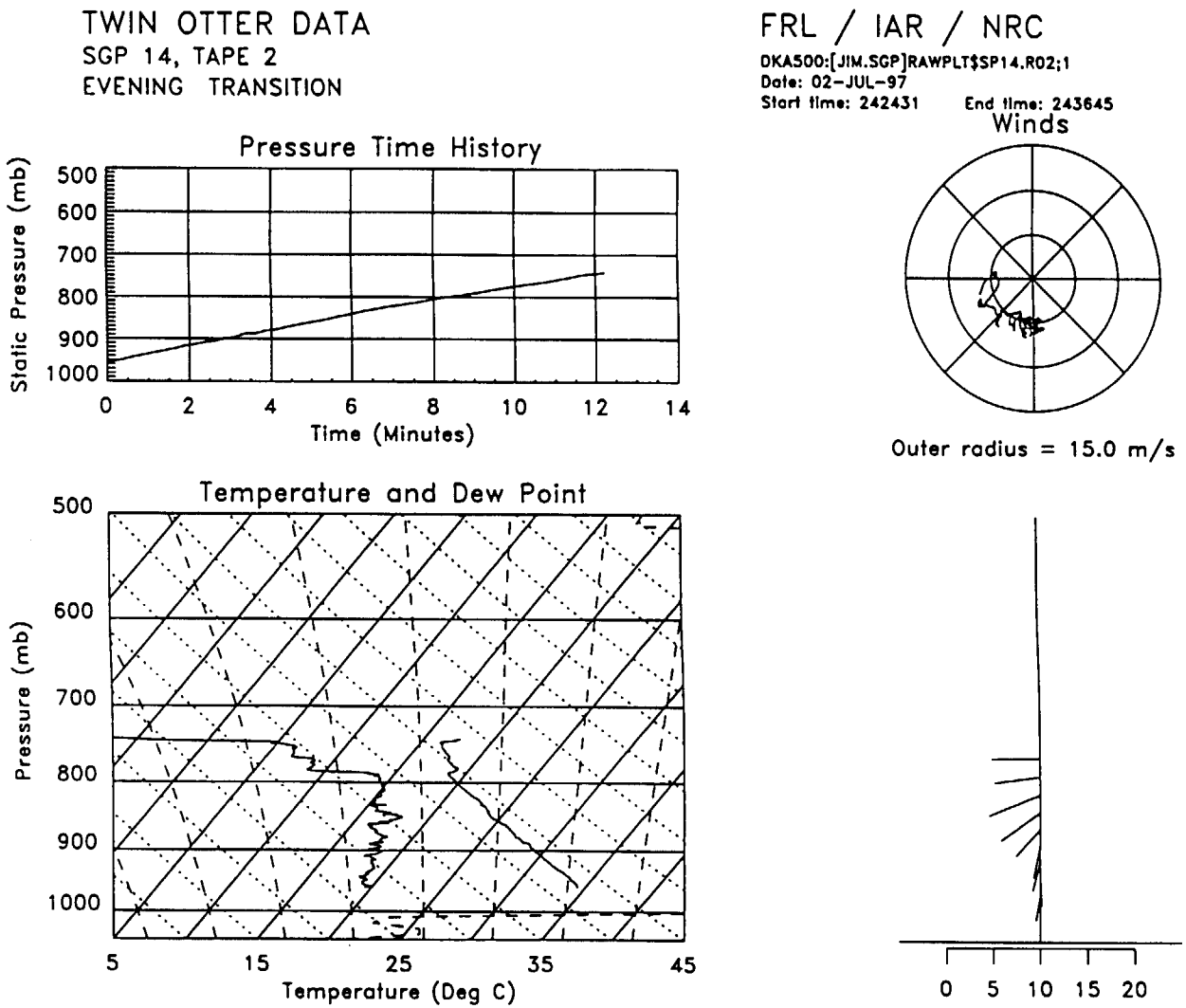
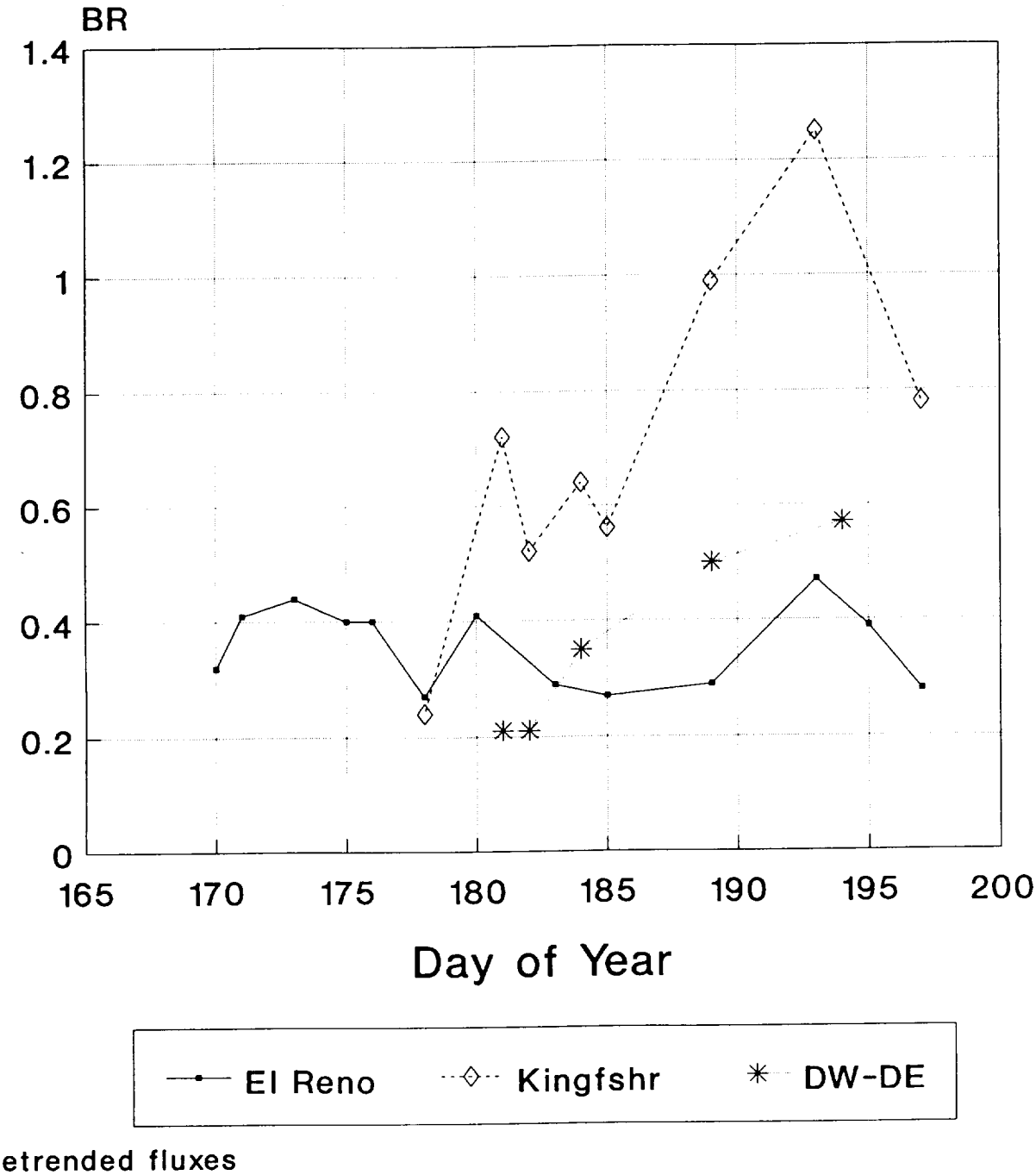


FIGURE 4: SOUNDING DATA FROM SGP FLIGHT 14

Figure 5
Bowen Ratio vs Day of Year
35-m Twin Otter Data - SGP97



detrended fluxes

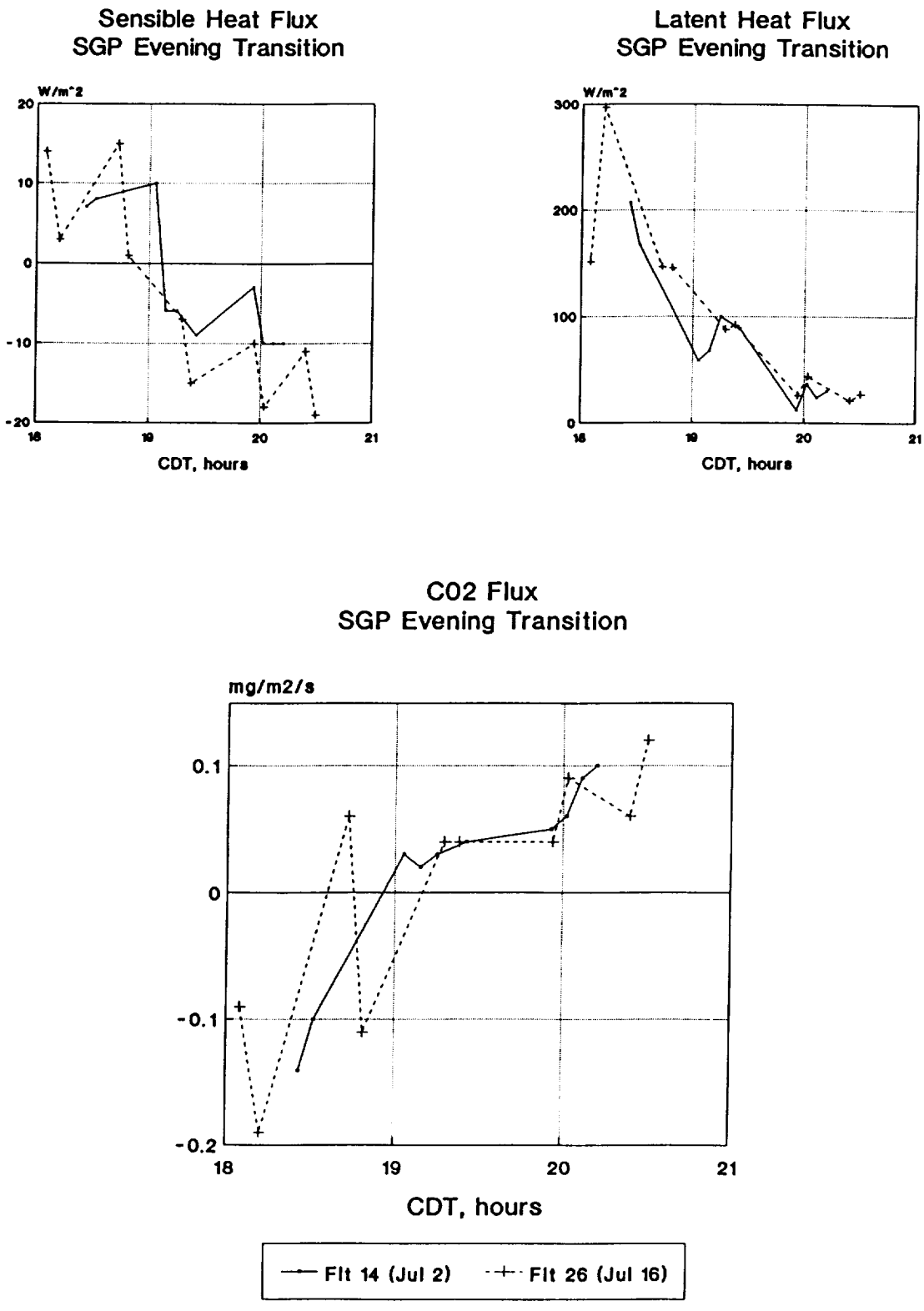


FIGURE 6: FLUXES MEASURED AT APPROXIMATELY 35 M DURING EVENING TRANSITION FLIGHTS

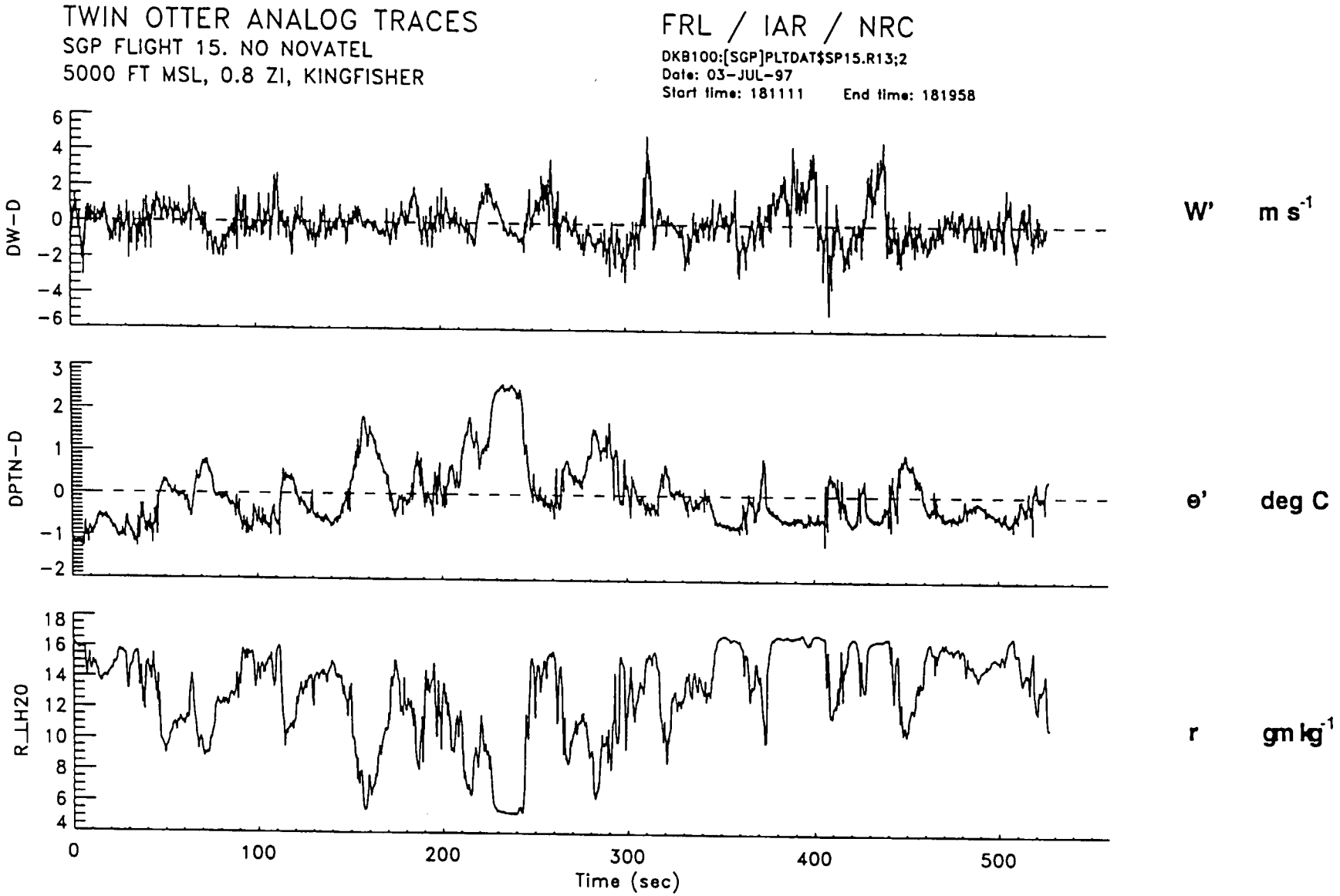


FIGURE 7: EXAMPLE OF ENTRAINMENT AT TOP OF MIXED LAYER