

MAMS - High Resolution Atmospheric/Surface Properties

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Background. The Multispectral Atmospheric Mapping Sensor (MAMS) has been used for a number of investigations over the last 8 years. It has served as the basis for retrieval technique development, for atmospheric process studies, and to retrieve geophysical parameters at the surface (land and ocean). It was used most recently to collect high resolution visible and infrared imagery for the CaPE and STORMFEST experiments during FY91 and FY92. The Wildfire spectrometer (similar to MAMS but with different infrared channels) was also used during STORMFEST. The goals of MAMS during CaPE were:

- 1) to collect MAMS data to support the overall CaPE science objectives,
- 2) refine techniques for the retrieval of atmospheric moisture and surface geophysical parameters,
- 3) map the moisture distributions associated with the sea breeze front over Florida with MAMS ancillary satellite data on a case study basis,
- 4) identify surface features which may serve as local sources of heat and moisture and influence preferential convective regions over Florida, and
- 5) process MAMS data and derived relevant geophysical parameters to support other CaPE investigators.

For STORMFEST both the MAMS and Wildfire spectrometers were used to collect unique multispectral data to study atmospheric processes. The Wildfire objectives were:

- 1) to collect high quality Wildfire data in conjunction with other in situ and remote measurements available during the STORMFEST field phase (1 February - 15 March 1992),
- 2) to develop algorithms to retrieve total ozone content and compare with those from TOMS and HIRS (IR), and
- 3) along with water vapor imagery, use the ozone data to better understand the 3-dimensional structure and dynamics of jet streaks and frontal systems in a case study investigation.

The MAMS objectives were::

- 1) collect MAMS data to support a GSFC investigation of gravity waves,
- 2) process the MAMS data to locate gravity wave features, and produce various moisture products in support of the gravity wave investigation.

Significant Accomplishments Over the Last Year: The research activities have focused on analyzing the CaPE data sets and collecting and starting preliminary analysis of the STORMFEST MAMS and Wildfire data.

CaPE: The MAMS data from the first 8 flights during CaPE are plagued by numerous data problems. Data problems were finally eliminated for the last three flights by utilizing a new scan head and digitizer which was made available by Ames research center. A vast amount on MAMS data was collected which captured some interesting features relevant to this RTOP research. A NASA Technical Memo has been produced which describes the MAMS data collected for CaPE.

The following 5 cases (days) have been selected for investigation. Much time has been spent on pre-processing the data for the case studies, including the calibration and navigation of the data sets in preparation for quantitative analysis.

Case Studies:

30 July 91: This day has been selected to study the flux of heat and moisture from the surface. This activity supports other work at MSFC under RTOP 460-23-34 (Surface Hydrologic Analysis for CaPE). MAMS flew repeatedly over the surface flux network to collect time dependent data sets. Data quality is fair on this day as some line drop-outs and calibration noise was present. Reasonable surface temperatures and land scene information will be

available in the cloud free regions.

- 6 Aug 91: This was an outstanding day for a sea breeze mapping mission. MAMS collected data for 2 hours over the Cape with repeated flight tracks over the developing sea breeze front. The MAMS data for this day has some roll correction problems which is taking extra time to fix. These data are also coincident with in situ thermodynamic measurements from the NCAR and Wyoming King-Airs, and with interferometer data from the HIS. These additional data sets will be used along with the VAS data in a case study analysis.
- 16 Aug 91: Predominantly clear skies prevailed during the MAMS flight and an extremely high quality data set was collected. It will be used for moisture mapping and surface flux investigations.
- 17 Aug 91, MAMS data for this flight includes repeated passes over the outer rain bands from tropical storm Bob (when it was off the coast of Florida). The cloud top information will be processed to support the lightning investigations. INS failed on aircraft and additional work is necessary to navigate MAMS imagery.
- 19 Aug 91, MAMS, HIS, and MTS data was collected over portions of Hurricane Bob. The data has been processed to locate the eye of the hurricane, however, a clear view of the ocean below in the eye was obscured by cirrus at that time. No further activities are planned for this data set.

STORMFEST

Both MAMS and Wildfire data were collected during the STORMFEST experiment period. A NASA Technical Memo has been produced which describes the Wildfire and MAMS data collected for STORMFEST.

Wildfire. Wildfire data was collected on 5 ER2 flights during STORMFEST IOP. Two of these flights were made in direct support of the Wildfire ozone mapping objectives. The data from these flights is of very good quality. These two days (14 and 17 February) will serve as the basis for this research investigation. Additionally, the flight on 25 February will be used to intercompare Wildfire data with that synthesized from coincident HIS data. The 14 February case will also be used to support the GSFC gravity wave investigation.

Calibration and navigation of the Wildfire data for the case studies has begun. The data is consistently of very good quality throughout both flight days. Refinement of existing split window techniques for the retrieval of column ozone content below the aircraft has begun.

Ancillary data required for the investigation has been ordered.

MAMS

Four flights were made with the MAMS during the latter part of the STORMFEST IOP. These flights were either in support of the gravity wave objectives or for other instrument investigations. The objective in processing this data further has not been determined.

Current and Future Work:

CaPE:

Processing of the data sets on the 4 remaining cases will continue. Surface geophysical parameters will be derived for the 30 July and 16 August cases. Modifications to both the split window variance ratio (SWVR) and the physical split window (PSW) techniques for the retrieval of integrated water content (IWC) will be finalized and the techniques applied to the MAMS data of 6 and 16 August. VAS data will be used and new retrievals will be made to support a more detailed mesoscale analysis. Products derived from the HIS data will be evaluated as well as the thermodynamic and wind data from the King Airs.

STORMFEST:

The refined techniques to retrieve integrated ozone content of the atmosphere below the aircraft will be applied to the case study data. The results will be verified against other ancillary data. The 0-20km ozone values will be combined with satellite estimates to derived two layers (0-20 km and 20-TOA) of ozone.

Publications:

- Jedlovec, G. J. , and R. J. Atkinson, 1992: Variability of Geophysical Parameters from Aircraft Radiance Measurements for FIFE. Accepted *J. Geophys. Res. - Atmospheres*.
- Guillory, A. R., R. J., Atkinson, and G. J. Jedlovec, 1992: Multispectral Atmospheric Mapping Sensor (MAMS) Data for the Convection and Precipitation / Electrification experiment. NASA Tech, Memo., in press.
- Jedlovec, G. J., and G. S. Carlson, 1992: Wildfire and Multispectral Atmospheric Mapping Sensor (MAMS) Data for the STORM Frontal Experiment and Systems Test. NASA Tech. Memo., in press.
- Jedlovec, G. J., and R. J. Atkinson, 1992: Calibration, navigation, and registration of MAMS data for FIFE, NASA Tech. Memo., in press.
- Carlson, G. S., and G. J. Jedlovec, 1991: Remote sensing of ozone variability using an airborne scanning infrared spectrometer. Fifth Topical Meeting on Optical Remote Sensing of the Atmosphere, 109-111.

