NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED FROM MICROFICHE. ALTHOUGH IT IS RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE
INTERNAL TECHNICAL MEMORANDUM 3/80

C Commonwealth of Australia 1980

HEAT CAPACITY MAPPING MISSION
PROJECT HCM-051
PROGRESS REPORT TO 30 APRIL 1980

by

C.S. NILSSON, J.C. ANDREWS, M.W. LAWRENCE,

S. BALL and A.R. LATHAM
INTERNAL TECHNICAL MEMORANDUM 3/80

HEAT CAPACITY MAPPING MISSION
PROJECT HCM-051
PROGRESS REPORT TO 30 APR 1980

C.S. NILSSON, J.C. ANDREWS¹, M.W. LAWRENCE, S. BALL², and A.R. LATHAM

ABSTRACT

This report covers progress on NASA Project HCM-051 to 30 Apr 1980. Ground truth data have been gathered to compare to HCM Infra-red images and these data are analysed to delineate the Tasman Front. The status of IR photographic image and computer-compatible tape (CCT) processing is presented and an example of an enhanced image is presented.

POSTAL ADDRESS: The Superintendent, RAN Research Laboratory
P.O. Box 706, Darlinghurst N.S.W. 2010

¹ Present address: AUSTRALIAN INSTITUTE OF MARINE SCIENCE, TOWNSVILLE, QLD.
² Marine Physics Group, WSRL, DEFENCE RESEARCH CENTRE, SALISBURY, S.A.
<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AIMS OF HCM-051</td>
<td>1</td>
</tr>
<tr>
<td>2. GROUND-TRUTH DATA</td>
<td>1</td>
</tr>
<tr>
<td>3. OBSERVATIONS OF THE TASMAN FRONT</td>
<td>2</td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>2</td>
</tr>
<tr>
<td>3.2 The experiments and data analysis</td>
<td>3</td>
</tr>
<tr>
<td>3.3 Dynamic topographies, currents and transports</td>
<td>5</td>
</tr>
<tr>
<td>3.4 Water column integrities and thermocline shapes</td>
<td>7</td>
</tr>
<tr>
<td>3.5 Meanders and isolated eddies</td>
<td>9</td>
</tr>
<tr>
<td>3.6 Surface temperature</td>
<td>13</td>
</tr>
<tr>
<td>3.7 Some satellite observations</td>
<td>17</td>
</tr>
<tr>
<td>3.8 Scales of the motion and linearity</td>
<td>20</td>
</tr>
<tr>
<td>3.9 Discussion</td>
<td>23</td>
</tr>
<tr>
<td>4. STATUS OF HCM-051 IMAGE PROCESSING</td>
<td>28</td>
</tr>
<tr>
<td>4.1 Photographic image processing</td>
<td>28</td>
</tr>
<tr>
<td>4.2 Computer-compatible tape (CCT) processing</td>
<td>28</td>
</tr>
<tr>
<td>5. AN ENHANCED IR IMAGE 21 AUG 1978</td>
<td>30</td>
</tr>
<tr>
<td>6. COMPARISON OF IR IMAGE AND GROUND-TRUTH DATA</td>
<td>31</td>
</tr>
<tr>
<td>7. THE NEED FOR SYNOPTIC (IR) DATA</td>
<td>32</td>
</tr>
<tr>
<td>8. PRIORITIES OF HCM DATA PROCESSING AND JUSTIFICATION OF DATA NEEDS</td>
<td>33</td>
</tr>
<tr>
<td>9. PUBLICATIONS</td>
<td>34</td>
</tr>
<tr>
<td>10. ACKNOWLEDGEMENTS</td>
<td>34</td>
</tr>
<tr>
<td>11. APPENDIX: STATUS OF CCT PROCESSING (02 APR 80)</td>
<td>35</td>
</tr>
<tr>
<td>12. REFERENCES</td>
<td>45</td>
</tr>
</tbody>
</table>
1. **AIMS OF HCM-051**

The primary aim of this experiment is to relate the surface infra-red manifestations of the East Australian Current (EAC) and the Tasman Front (as seen by satellite) to the subsurface associated variability of temperature and salinity (as measured from ships and aircraft). Where this can be done, the sea surface temperature images obtained from HCM-051 will be used to obtain time series pictures of the EAC area in order to study the behaviour of the EAC and the Tasman Front.

A secondary aim is to study oceanographic fronts and eddies over the whole area covered by HCM-051, in particular to study the temporal and spatial variations of the Sub-Tropical Convergence south of Australia.

2. **GROUND TRUTH DATA**

Oceanographic surveys by ship in the Tasman Sea in support of HCM-051 were undertaken by the Australian Defence Science and Technology Organisation as follows:

<table>
<thead>
<tr>
<th>DATE</th>
<th>AREA</th>
<th>HCM DAY NOS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Jul - 4 Aug 78</td>
<td>Sydney - Sydney</td>
<td>092 - 100</td>
</tr>
<tr>
<td>4 - 11 Sept 78</td>
<td>Sydney - New Zealand</td>
<td>131 - 138</td>
</tr>
<tr>
<td>11 - 16 Feb 79</td>
<td>Sydney - Brisbane</td>
<td>291 - 296</td>
</tr>
<tr>
<td>22 Feb - 1 Mar 79</td>
<td>Eden - Sydney</td>
<td>302 - 309</td>
</tr>
<tr>
<td>25 Feb - 1 Mar 79</td>
<td>Brisbane - Sydney</td>
<td>305 - 309</td>
</tr>
<tr>
<td>8 - 13 Mar 79</td>
<td>Sydney - Eden</td>
<td>316 - 321</td>
</tr>
</tbody>
</table>

Oceanographic surveys by Royal Australian Air Force Orion aircraft in direct support of HCM-051 using air expendable bathythermographs (AXBT) probes were completed as follows:

<table>
<thead>
<tr>
<th>DATE</th>
<th>LATITUDE</th>
<th>HCM DAY NOS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 - 30 Aug 78</td>
<td>30 - 35oS</td>
<td>125 - 126</td>
</tr>
<tr>
<td>13 Dec 78</td>
<td>30 - 35oS</td>
<td>231</td>
</tr>
<tr>
<td>8 Feb 79</td>
<td>28 - 33oS</td>
<td>288</td>
</tr>
</tbody>
</table>

Much of these data are yet unpublished. However, the data pertaining to the Tasman Front have been largely analysed and written up for publication. This analysis is given in the next section.
3. OBSERVATIONS OF THE TASMAN FRONT

3.1. Introduction

The question of what happens to the East Australian Current after continental separation has been addressed by several authors beginning with Wyrtki (1962) who postulated a broad zonal flow of about 500 km width was fed by the East Australian Current and crossed the Tasman Sea at latitude 35°S. More recently Stanton (1975, 1976) and Denham and Crook (1976) have studied a narrow meandering zonal current frequently found between North Island of New Zealand and Norfolk Island. This current is structurally similar to the East Australian Current, though much weaker, and this leads both Stanton and Denham and Crook to support Warren's (1970) contention that a zonal jet is the most theoretically plausible current system across the Tasman.

The evidence for such a current has been collected mainly close to the Australian and New Zealand mainlands, with very little data taken more than 300 miles beyond the continental shelves. The central Tasman Sea has been neglected largely because of the limited endurance of the research ships involved; there have been several cruises which crossed the Tasman but no extensive grid searches were conducted in the central Tasman.

In this section we discuss the results of large scale surveys using ships and aircraft near latitudes where the zonal jet should exist. The surveys extended mid way across the Tasman Sea and in one case as far as New Zealand. Broadly speaking, the main result is that the conjunction of the warm water from the South-Coral Sea and the cold water from the Tasman Sea is seen as a very abrupt thermal front at all depths. The associated pressure gradient gives rise to very swift currents along the Tasman Front towards New Zealand. Gross meridional distortions of the
Front occur as water of South-Coral or Tasman Sea origin breaks through the Front to form respectively warm core eddies in the Tasman Sea or cold core eddies in the South-Coral Sea.

3.2. The experiments and data analysis.

A Royal Australian Air Force Orion aircraft deployed air expendable bathythermograph (AXBT) probes at the positions shown by the filled circles on Fig. 1a on 29 August 1978. A course for HMAS Diamantina was then chosen to investigate features revealed by the AXBT survey. This track (4-11 September 1978) is shown as the dashed line on Fig. 1a. Expendable bathythermograph (XBT) probes were released at intervals of about 20 km and surface water was continuously sampled with a thermostalinograph. The open circles on Fig. 1a show positions where XBT probes were released from HMAS Diamantina during 13-18 September to extend the earlier coverage.

No ships were used during the second experiment (13 December 1979) when a RAAF Orion deployed AXBT probes at the positions shown by the filled circles on Fig. 1b.

Fig. 1c represents the third experiment. The dashed line shows the track of HMAS Kimbla (11-19 February 1979) where a geomagnetic electrokinetograph (GEK) was used to obtain ocean current vectors at intervals of about 30 km, interleaved with similarly spaced XBT’s and in conjunction with continuous surface thermograph data. This track was chosen to investigate features revealed by AXBT’s deployed at the positions marked by filled circles on Fig. 1c from a RAAF Orion on 8 February 1979.

The fourth and final experiment was a ship survey (HMAS Diamantina, 22 February-1 March 1979; and 8-12 March 1979) along the tracks shown in
Fig. 1d. A continuous surface thermosalinograph recording was made and XBT probes were released approximately every 20 km. Ocean current vector measurements (GEK) were interleaved with XBT measurements.

The standard display for AXBT traces was not used since the resolution is poor; instead a frequency to voltage converter was used with a battery driven strip chart voltmeter in order to expand the temperature scale to $2.0^\circ C \text{ cm}^{-1}$. Dynamic height anomaly (0 re 1300 dbar) was calculated for each bathythermal profile by first calculating the anomaly over the sampled pressure interval from the temperature profile and temperature-salinity curves; secondly a correction for the remaining pressure interval to 1300 dbar was obtained from regression relations between deep temperatures and dynamic height. This method was adopted by one of us (C.S.N) from a suggestion by Godfrey to modify Andrews (1976) treatment of West Australian Current XBT profiles. The AXBTs measured to 350 m while some XBTs measured to 450 m and others to 750 m. As an example, if $D(z_1/z_2)$ is the dynamic height anomaly over the pressure interval from $z_1$ to $z_2$ and $T(z)$ is the temperature at depth $z$, the relation we used for standard 450 m XBTs was

$$D(0/1300) = D(0/450) + 3.71T(450) + 53.15 \text{ (dyn.cm.$^\circ$C).} \ (1)$$

Contour diagrams of $D(0/1300)$ for the four experiments are shown in Figs. la to ld. Dashed lines are drawn where we consider that even though there are insufficient data, isobars are required to produce a consistent or complete picture. The 190 dyn cm contours in Figs. 1 are heavily drawn to represent the position of the centre of the Tasman Front. This isobar frequently, though not always, coincides with the position of the fastest flowing surface water in the central and western Tasman and South-Coral Seas.
The XBT traces were digitised at integer Celsius values, at flexure points, and at 0, 150, 250 and 450 metres. Some examples of reconstituted XBT profiles are shown in Figs. 2a, b and c but the main displays of vertical structure are vertical isotherm sections to 450m depth as functions of progressive distances along ships' tracks. These were computer generated from the digitised XBT data. Thus Fig. 3a is the section along track BCD of Fig. 1a, Fig. 3b is along EF of Fig. 1a and Fig. 3c is along GHIJKL of Fig. 1c. Surface temperatures obtained from the thermograph traces are plotted above the isotherm sections to allow the eye to correlate surface fronts with deeper baroclinic thermal fronts. A complete surface isotherm map obtained from all the thermograph data taken during experiment 4 on HMAS Diamantina is shown in Fig. 4.

3.3. Dynamic topographies, currents and transports.

Figures 1 show that the Tasman Front is a zonal band separating a high pressure region in the north from a low pressure region in the south. The band is created by a collection of cyclonic deformations protruding northward and anticyclonic deformations protruding southward so that the Front takes on more the nature of a planetary wave with a zonal wavevector. In fact Figs. 1b and 1c each contain a full-wavelength with southward currents near the coast and out to sea, connected by a northward return flow. Figure 1d contains one and one half wavelengths along 34\degree S latitude while Fig. 1a shows two full wavelengths out to 163\degree E longitude and at least four wavelengths between Australia and North Island. The square on Fig. 1a shows the region where Stanton (1976) found a wavelike meandering zonal jet. It had essentially the same shape and dimensions as the meanders we have drawn between 165\degree E.
and North Island. There can be little doubt that the Tasman Front, as its name implies, extends from Australia to New Zealand between the South-Coral Sea and the Tasman Sea. Consideration of thermal structure in the next section shows that the Front is in fact an interface between the cold water of the Tasman Sea and the hot water of the South-Coral Sea.

Geostrophic and GEK currents are quite swift even as far east as Lord Howe Island (159°E). For example the northward branch across 33 and 34°S at 159°E in Fig. 1d had GEK currents up to 1m s⁻¹; near H and J in Fig. 1c the GEK currents were respectively 1.5 and 0.75 m s⁻¹ in the directions of the cyclonic isobars. These values are typical of the extreme currents encountered at the Tasman Front. Geostrophic currents calculated from the isobar spacings in Figs. 1 lie in the same range from about 0.5 to 1.5 m s⁻¹.

The following approximate volume transports are based on Andrews (1979) universal velocity profile for the area. This profile allows actual geostrophic velocity profiles to be extrapolated to great depths. He found that actual current profiles attain a vertical asymptote at about 2700 m depth but we will adhere to the historical convention of calculating baroclinic transports over the uppermost 1300 dbar. Accordingly the volume transport, V, is related to the change in dynamic height ΔD(0 re 1300) between two stations by

\[ V = 28 \times 10^6 \frac{\Delta D}{\sin(\text{latitude})} \text{ m}^3 \text{s}^{-1},\text{dyn m.} \tag{2} \]

At latitudes near Sydney this is about 50 \times 10^6 m^3 s⁻¹ for each metre change in dynamic height.

Applying this analysis to Figs. 1a, b and c we find the southward transport between Coffs Harbour and Sydney has a representative figure
of $35 \times 10^6 \text{m}^3 \text{s}^{-1}$. This stream then turns eastward and, from Figs. 1a, b and d, we find that the volume flow in the Tasman Front after leaving the continental shelf is about the same. At first glance one might be tempted to say that the Front carries about $35 \times 10^6 \text{m}^3 \text{s}^{-1}$ into the central Tasman Sea. In fact, volume transports of beyond $30 \times 10^6 \text{m}^3 \text{s}^{-1}$ are associated with eddies adjacent to the Front which recirculate a large fraction of the water and do not allow it to progress continuously eastward. The net eastward transport is estimated from the averaged pressure drop across the band occupied by the Front and its associated eddies. Very roughly, this is about $30 \text{cm}$ so the net zonal transport is about $15 \times 10^6 \text{m}^3 \text{s}^{-1}$; Stanton (1976) found the transport in the Front within the square on Fig. 1a ranged from $10 \times 10^6$ to $14 \times 10^6 \text{m}^3 \text{s}^{-1}$.

3.4. Water column integrity and thermocline shapes.

In this section we discuss the difference between the shape of the thermocline in the South-Coral and Tasman Seas generally and in particular we investigate whether the thermocline is modified near the Front.

Figure 2a shows five XBT profiles from the South-Coral Sea, well north of the Front, and five from the Tasman Sea, well south of the Front. The (warm) South-Coral Sea profiles come from leg KL of Fig. 1c near $156^\circ E$ while the (cold) Tasman Sea profiles come from Fig. 1d along $36^\circ S$ between $155$ and $156^\circ E$. We see that the essential difference between the two is that the thermocline is colder at all depths in the Tasman Sea with the maximum difference of about $6^\circ C$ occurring over about 150 to 300m depth. A slightly more subtle difference enables us to identify the origin of a water column: below the mixed layer, South-Coral Sea profiles are very nearly linear while Tasman Sea profiles have a
shallower, rounded, somewhat exponential thermocline down to about 200m where the profile then becomes linear.

The two sets of profiles in Fig. 2a were taken from the same longitude but were about 1000km apart in the north-south direction. Figure 2b contains five warm profiles from near the centre of the anticyclone at 34°S, 158.5°E in Fig. 1d and five cold profiles from near the centre of the cyclonic meander at 34°S, 160°E also in Fig.1d. Thus Fig. 2b contains two classes of profiles only 140km apart (with the nearest from the two classes only 80km apart) and separated by the Tasman Front with the warm water on the South-Coral Sea side and the cool water on the Tasman Sea side. The warm profiles have the linear thermocline characteristic of the South-Coral Sea while the cool profiles have the shallower rounded thermocline nearer the surface becoming linear beyond 200m depth. Comparison of Figs. 2a and 2b show that the water columns identifiable with either the Tasman or the South-Coral Seas maintain their integrity even in the intense meandering regions near the Tasman Front. There is no significant difference between Figs. 2a and 2b and our experience not only with the data from these experiments but from the many surveys conducted in the west of central Tasman and South-Coral Seas convinces us that the shape and mean temperature of the thermal profile is a valuable indicator of water type and origin in the upper levels in these areas. In fact the Tasman Front is simply a sharp boundary between two bodies of water with different vertical thermal profiles. Currents are driven by the pressure change across the Front and the required feed water comes from the East Australian Current. Hamon (1968a) noticed that a difference in dynamic height implied not only a change in vertically averaged temperature but
also a change in thermocline shape although the presence of the Tasman Front was not known at the time.

An obvious question now is "What are the shapes of thermal profiles in warm eddies south of the Front and in cold eddies north of the Front?". We show in section 5 that the low pressure cell in Fig. 1c centred at 32°S, 157.5°E is an isolated cyclonic eddy to the north of the Front; it is obvious from the isobar pattern in Fig. 1d that the anticyclone centred at 36°S, 152°E is isolated and is south of the Front. Figure 2c shows five warm thermal profiles from the centre of the anticyclone and five cool profiles from the centre of the cyclone. Mixed layer temperatures on Fig. 2c are juxtaposed with those on Figs. 2a and b, an event which could have many causes. The important point is that the warm eddy has the linear thermocline typical of South-Coral Sea water and the cool eddy has the shallow, rounded thermocline typical of the Tasman Sea. There has been some cooling of the thermocline in the warm eddy and some warming of the thermocline in the cool eddy, of about 1°C over the interval 100-450m. This is presumably due to lateral, small scale eddy diffusion of heat into the cold eddy embedded in the warm South-Coral Sea and out of the warm eddy embedded in the cold Tasman Sea. We conclude that when eddies detach from meanders of the Front, the thermoclines in the centres of the eddies largely maintain their integrity.

3.5. Meanders and isolated eddies.

It is obvious from Figs. 1 that the position of the Tasman Front varies markedly in space and time by executing mesoscale, lateral meanders. These give the Front an appearance similar to the Gulf Stream after it turns eastward to form an interface separating "slope water"
from Sargasso Sea water; it is also quite like the Kuroshio-Oyashio front.

We now address the question of which of the meanders in Figs. 1 can properly be called closed eddies and which of the closed eddies can properly be regarded as detached from the main frontal system. The criterion we adopt for calling an eddy closed is that surrounding some central pressure anomaly there should be a closed orbit for a circulating water particle. According to this criterion a localised intensification within an elongated meander would be a closed eddy. We regard a closed eddy as detached if its water type is separated from the Sea of its origin (either South-Coral in the case of warm core eddies or Tasman in the case of cold core eddies) by the Tasman Front. Obviously a detached eddy originates in a meander which intensifies into a closed eddy; the final process is the reformation of the Tasman Front behind the break-away entity.

The only data we have for experiment 2 are AXBT profiles and these are summarised in the dynamic topography on Fig. 1b. There is a warm southward meander near the coast and a cool northward meander east of this. As signified by the dashed lines, the sparsity of data at the top of the northward meander prevents any further interpretation of that eddy structure.

Figure 1a provides some good examples of intensifying cyclonic and anticyclonic meanders. Fig. 3a shows the temperature section along the track BCD of Fig. 1a. We have anticyclones located at 32°S, 155°E and at 30.5°S, 160°E on Fig. 1a. The thermal structure of Fig. 3a shows that the first eddy contains anomalously warm surface water (20-21°C) and depressed isotherms in the thermocline between the distance marks of 150
and 500km from B. The fronts are very abrupt at the surface, being only about 30km wide, but are up to 120km wide within the thermocline. The warm surface water (and indeed the whole thermocline) originates in the South-Coral Sea. The second closed anticyclone (near 160°E) is seen as depressed isotherms between the distance marks of 800 and 1030km on Fig. 3a and exhibits a typical anomalously deep and warm winter mixed layer. The 20°C surface water shown at 750-800km on Fig. 3a is South-Coral Sea surface water advected south round the western edge by the eddy current.

There is a cyclonic meander at 30.5°S, 162°E on Fig. 1a which was fairly well delineated by AXBT's filled circles) partial circumnavigation (cruise track) and a second visit by HMAS Diamantina (open circles). Tasman Sea surface water of about 18°C lay within the meander and the ship's course around DE was chosen in large part by a desire to criss-cross the surface temperature front. This meander contains closed orbits for water particles but intensification, or eddy closure is very poorly developed when compared with, say, the two anticyclones just previously discussed.

We see the next stage of development, namely the beginning of the reformation of the Tasman Front behind a detaching feature, in the cyclonic eddy centred at 30.5°S, 158°E in Fig. 1a. The ship's track crossed this feature centred near the 600km mark on Fig. 3a. This shows the elevation of the isotherms in the thermocline together with the 18°C surface water indicative of Tasman Sea water. There appears to be a swift eastward current south of this eddy along 33°S on Fig. 1a as well as the zonal cyclonic eddy current along 29.5°S. The dynamic height data are too sparse for us to state definitely that the Tasman Front was
reforming south of the cyclonic eddy. However surface mixed layer temperatures show anomalously warm water drawn out along 33°S to 159.5°E and this reinforces the contoured interpretation we have put on the surface pressure field of Fig. 1a.

The discussion now turns to eddies in the final stage of complete isolation from the Tasman Front. The literature contains many examples of detached anticyclones south of Sydney, adjacent to the Australian coast. Nilsson and Cresswell (in preparation) give a particularly full account of their evolution and even of anticyclone reabsorption by the Tasman Front. Figure 1a shows one such typical high pressure cell near 34.5°S with Fig. 3a showing the vertical structure extending 120km out from B, typical of a winter eddy. Figure 1d shows a typical summer anticyclone south of the Front near 36°S. A trough separates the current ring in the south from the zonal jet in the north and it is worth noting that between 36° and 35°S the baroclinic pressure falls 50cm and then rises 100cm between 35 and 34°S. There is another isolated anticyclone in the south east corner of Fig. 1d. It is elliptical with a major axis parallel to the coastline and a dynamic height relief, from centre to edge, of only 15cm. We know from the shapes of the XBT profiles that it originated from South-Coral Sea water passing through the Front but most of the excess heat has been lost from the thermocline and the central surface temperature anomaly is only slight (see Fig. 4).

The cyclonic eddy shown in Fig. 1c centred on 32°S, 157.5°E has thermal profiles shown in Fig. 2c which identify its origin as the Tasman Sea. Vertical structure in Fig. 3c shows the very strong fronts near the 400 and 750km distance marks and a pool of anomalously cool surface water with a temperature near 24°C within the current loop. The
data do not extend sufficiently far in the south east corner of Fig. 1c to show whether the eddy was closed during the air and sea surveys of 8 to 19 February 1979. It was certainly closed and detached by the completion of the ship survey from 22 February to 12 March 1979: the isobar pattern for that survey, Fig. 1d, shows the Tasman Front reconstituted along latitude 34°S, thereby separating the cyclonic eddy to the north from its Sea of origin. The changing position of the Tasman Front can be inferred by considering Figs. 1c and 1d jointly. The most reasonable explanation is that the main current flowed south past Coffs Harbour and Sydney (Fig. 1c), diverted seaward at about 34°S latitude and the northward up 156°E longitude (Fig. 1d) to then flow around an elongated equatorward meander (Fig. 1c) which subsequently pinched off while the main current reformed along 34°S latitude (Fig. 1d).

In summarising this section we may say that eddies apparently are shed to the north and south of the Front as detached meanders. More particularly warm eddies are detached to the south near the coast and one half of a system wavelength further east cold eddies detach to the north. The process may repeat itself with the next sort being warm eddies at one full wavelength, and so on.

3.6. Surface temperature.

In this section the relationship between sea surface temperature and the baroclinic structure of the Front and its eddies is examined, particularly with a view to deciding whether the position of the Front can be monitored remotely (e.g. from satellites). We already know that newly formed winter anticyclones have warm anomalies within their current rings and that both summer and winter anticyclones have tongues of warm northern water advected round the forming eddies (Andrews and
Scully-Power, 1976; Nilsson, Andrews and Scully-Power, 1977; Andrews, 1979). These older data were taken within one half system wavelength of the Australian coast; the present data allow an analysis of cold core cyclones and also warm core anticyclones over a much larger area in both summer and in winter. The winter experimental data from 29 August to 11 September 1978 are shown in Figs. 1a and in Figs. 3a and b. On proceeding north along BC the surface temperature (Fig. 3a) fell from 18 to 17°C. The fall marks the passage into the trough separating the high pressure cell (at B on Fig. 1a) from the Tasman Front to the north. When the Front was crossed near the 150km mark on Fig. 3a the surface temperature rose about 4°C at a maximum rate of 3°C over 6km. The surface temperature north of the Front, within the high pressure cell near C on Fig. 1a, stayed about 3°C higher than the Tasman Sea surface water immediately south of the Front (near B, or 18°C). About 75km along CD (near the 525km mark) the surface temperature fell, just as abruptly as it had risen, back to about 18°C, to mark entry into the almost detached cyclonic eddy. This eddy is marked by the elevated isotherms in Fig. 3a and is bounded to the south by the isobars and the warm mixed layer water extruding along 32.5°S in Fig. 1a. The cool surface water in the cyclonic eddy then merged fairly slowly with a warm peak near the 750km mark on Fig. 3a; the vertical isotherm section shows that the peak, with a temperature near 20°C marks the transition from the cyclone to the anticyclone north east of Lord Howe Island in Fig. 1a. The anticyclone contains surface water about 1°C warmer than that near B. Figure 3a breaks off where the surface temperature fell as the anticyclone's eastern edge was crossed and partial circumnavigation of the cold feature near 162°E on Fig. 1a began.
We have described a sequence of warm and cold patches of surface water associated with cyclonic and anticyclonic eddies near and in the Tasman Front in winter. The story continues across the Tasman Sea with Fig. 3b which has a different sort of thermal signature to Fig. 3a. There is a continual trend of falling surface temperature along EF. The slopes of the isotherms and the coherence of the wavy structure in the thermocline also decline along EF. The data on Fig. 1a in the eastern Tasman Sea are too sparse to allow us to draw many conclusions about the nature of the Tasman Front there, except to say that we think the track EF only cuts across the southern portion of the meander pattern.

One might expect the ocean currents in summer, when surface warming occurs, to be obscured in the sense that the surface temperature signature of deeper baroclinic events might be overlain by surface thermal noise and so be undetectable from ships or satellites. The data from experiments three (8 to 19 February 1979) and four (22 February to 12 March 1979) show that this is not the case and surface temperatures reveal the position of the East Australian Current and the Tasman Front just as clearly in summer as they do in winter.

Surface temperatures are displayed in different fashions for experiments three and four in Figs 3c and 4. Since the data were gathered over a month, Figs. 3c and 4 should not necessarily be expected to match in more than a qualitative fashion. However there is an obvious overall fall of surface temperature from north to south of about 6°C in about 1000km: Near 28°S, on leg KL of Figs. 1c and 3c we have the northernmost data and the highest temperatures near 26°C while the southernmost leg of Fig. 4 has temperatures near 20°C.

The cruise track GHIJKL cuts into the poleward meander on Fig. 3c.
about 150km from G. The strong front in the thermocline shows the southward baroclinic current which advects hot water from northern latitudes. The surface temperature peaks near the 150km mark at about 26.5°C, so it has obviously been carried south from Brisbane's latitude. This was confirmed by measurements made while HMAS Kimbla returned from Brisbane to Sydney during 24 to 27 February 1979: the GEK showed a current from 3 to 4 knots flowed south from Brisbane to Coffs Harbour and then west of south from Coffs Harbour to Sydney where it joined the Front depicted in Fig. 1d. Surface temperature peaked near 26°C where the current was strongest and fell off by about 1°C on the seaward side of the southward flow. This behaviour is seen in Fig. 3c where the temperature falls towards the centre of the ridge near the 225km mark. Proceeding further, the surface temperature climbs back to a peak of 26°C at the position of the northward baroclinic current on the eastern side of the poleward meander near the 350km mark. The cooler surface water near 24°C residing within the cyclonic current ring, lies between the 375 and 675 km marks. Once again as the baroclinic current rises the surface temperature rises to peak near 26°C at the 750km mark. We have therefore traced hot northern water advected on the strong currents shown in Fig. 1c, south from Brisbane, around the poleward meander near Sydney, and then north and east around the cyclonic eddy centred on 157.5°E. This warm stream has a temperature from 1 to 4°C higher than adjacent surface water.

The final summer surface temperature data discussed in this paper are those for experiment 4, Fig. 4, which may be correlated with the dynamic height pattern of Fig. 1d. One notes immediately the extrusion of very warm (greater than 25°C) surface water along the 190 dyn cm isobar.
representing the Front near 34°S; this feature thins and splits near 155.5°E into a northward branch around the high in Fig. 1d and a south eastward branch along the Front. This hot water advected from the north is only one of the two sea surface temperature markers which show the position of the Front. The second identifying marker is horizontal temperature gradient which, on Fig. 4, lies just south of the band of 25-26°C water out to 156°E and then marks the south eastward stream.

The distortion of isothermal surfaces in the thermocline has been shown to be most marked near the Tasman Front and there is an instance here where we are persuaded that deep-sea upwelling occurred. We believe this produced the crescent of very cool 21-22°C water near 34°S, 155°E on Fig. 4. The vertical isotherm section (not shown here) from the cruise track cutting the Tasman Front shows a wedge of cool water rising from about 120m depth north of the 190 dyn cm isobar to surface south of the Front.

Careful comparison of Figs. 4 and 1d shows other correlations mainly in the form of pooling of isothermal water near centres of pressure anomaly and stretching of surface isotherms along regions of strong geostrophic currents. Without the benefit of hindsight supplied by Fig. 1d these correlations, far from the Front, could not be automatically forecast with confidence. One can be reasonably confident however that sea surface temperature patterns near the East Australian Current and the Tasman Front can be interpreted usefully.

3.7. Some satellite observations.

In this section we present two satellite infra red photographs of areas in the Tasman sea which coincide with oceanographic data taken from surface vessels, thereby allowing comparisons to be made. We are
seeking to show that the surface temperature effects observed from ships can also be observed remotely, from satellites.

Figure 5 is a NOAA-4, VHRR photograph taken on 13 October 1977. HMAS Diamantina was steaming in consort with HMNZS Tui from Brisbane to the site of an acoustic experiment east of Sydney near that time. Ships' thermograph and XBT data show that the warm plume in Fig. 5 along 153.5°E north of 32°S marks the East Australian coastal current with a surface temperature higher than the flanking water by 2 to 2.5°C, being advected by a geostrophic current increasing from 70cm s⁻¹ at 30°S to 150cm s⁻¹ at 32°S. Ships' XBT data also confirm that the current left the coast at 31.5°S to become a zonal stream crossing 154°E at 32°S. Figure 5 shows that out near 156.5°E the zonal stream bifurcates to form one segment heading north with a warm branch centred on 156.5°E and one segment heading south and then east to terminate at about 157.5°E. The northward branching may be linked to the topography as suggested by Godfrey and Robinson's (1971) numerical study; the edge of the Tasman abyssal plain has seamounts along 156°E between 30 and 34°S while in broader terms the edge of the Tasman abyssal plain lies roughly parallel to the Australian coast between 26 and 34°S. The bifurcation is quite like that shown in Fig. 1d and also the termination of the warm plume in the southward and eastward branch near 157.5°E on Fig. 5 is quite like the termination of the 25-26°C water near 156-157°E in Fig. 4. Notice that further east in Fig. 4 the Front is then marked by a straightforward surface temperature gradient. If similar behaviour applies in Fig. 5 then the Front is visible out to 161°E along the interface between South-Coral and Tasman Sea surface water. If we accept this then we can postulate that the cold water forms an equatorward
(cyclonic) meander with a trough lying along the line 35°S, 160°E to 32°S, 160.5°E.

Figure 6 is a HCMM day infra red photograph for 14 November 1978 and the interpretation is far less straightforward than for Fig. 5. We rely on some CSIRO cruise results (RV Sprightly cruises SP15/78, 17-29 November 1978; SP 17/78, 9-11 December 1978) for a preliminary description although these data were taken only within 100km of the coast. The Sprightly data show that the East Australian Current flowed south between 27 and 29°S along the coast at speeds of about 1m s⁻¹; the current then left the coast at 29.5°S and diverted to the south east. This explains the origin of the thermal front on Fig. 6 entering the top of the picture at 154°E. This front converges with the coastline at 28.5°S, (off the photograph) as observed from RV Sprightly on 24-25 November 1978. We see on Fig. 6 that this branch of the current continues seaward across 155°E at 30.5°S and then the front meanders eastward between 30° and 31°S. South of this thermal front there is a very large pool of cool surface water centred near 31.5°S, 155°E. A filament of this surface water is advecting to the north east across 31°S, 157°E and beyond, where one can see billows as if the filament was contorted by a shear current. To the west of the pool of cool water, along the coast there is a thin stream of hot water parallel to the coast from 29.5°S to Sugarloaf Point (32.5°S) and continuing southward to 34°S where it blends with an intense eastward front. The data from SP 15/78 and SP 17/78 show there was a south east to eastward jet near 34°S, 152°E fed by (and lying between) a cyclonic disturbance to the south and an anticyclonic disturbance to the north. On Fig. 6 we see what we call the Tasman Front between 34° and 35°S out to 157°E where
cloud cover obscures the picture. Finally, there is a cool equatorward intrusion of Tasman Sea water between the eastern edge of the photograph and about 158°E, extending north to 31°S.

Apparently the East Australian Current system was split into two eastward meandering components. One component left the coast near 28.5°S to meander east along 30-31°S while the Tasman Front lay between 34 and 35°S to then meander north around the cyclonic intrusion. It is reasonable to assume these two branches joined at the top of the intrusion to flow across 159°E near 30-31°S. It is interesting to compare Figs. 5 and 1b which show data taken four weeks apart. The main feature of the Tasman Front in mid November (Fig. 5) is still present in mid December (Fig. 1b): in Fig. 1b the Front leaves the coast near 34°S and then meanders north around a cyclonic intrusion, as it did in mid November.

In this section we have seen that a satellite study of the Tasman Front will be valuable and that there are two key features to be seen from space which can be easily associated with the Front: one is very warm northern water advected south along the path of the current while the other is the inherent difference in temperature between surface waters of South-Coral and Tasman Sea origin near the Front.

3.8. Scales of the motion and linearity.

The zonal wavelength of the meander patterns in Figs. 1 can be determined easily by eye and is about 370km, with not much variation between the four experiments. This is in good agreement with determinations made from structure function analyses (Andrews, 1979). We now consider propagation speeds and the linearity of an internal baroclinic wave model for these meanders.
Assume the baroclinic pressure anomaly is given by
\[ y = y_0 \exp(i(kx+yt+wt)) \quad , \quad (3) \]
where \( y_0 \) is the amplitude; \( k = 2\pi/370 \text{km} = 1.7 \times 10^{-3} \text{m}^{-1} \) and \( w \) is the angular frequency. If we use Lighthill's (1969) normal mode theory, and the observation that \( k \) is much larger than \( \ell \), the classical dispersion relation for the first internal mode is
\[ w = \frac{\partial}{k^2 + 1/\mu^2} \quad , \quad (4a) \]
where
\[ \mu = (gH_1/f^2)^{1/2} \quad , \quad (4b) \]
is the Rossby radius of deformation, \( H_1 \) is the eigendepth for the first mode, and \( f \) is the Coriolis parameter with a gradient of \( \beta \). Andrews (1979) has computed the eigendepth off Sydney, \( H_1 = 79 \text{cm} \), so the Rossby radius of deformation is \( \mu = 33.4 \text{km} \) at latitude 35°S. The ratio of the wavelength of the meanders of the Tasman Front to deformation scale meanders is therefore \( 1/k\mu = 1.8 \). The phase speed,
\[ c_p = \frac{w}{k} = \frac{\partial}{(k^2 + 1/\mu^2)} \quad , \quad (5a) \]
is 1.6 cm s\(^{-1}\) westward while the group velocity,
\[ c_g = \frac{\partial w}{\partial k} = c_p \left( 1-(\mu k)^2 \right)/(1+(\mu k)^2) \quad (5b) \]
is 0.8 cm s\(^{-1}\) westward. These phase and group velocities of about 1.4 and 0.7 km day\(^{-1}\) are an order of magnitude smaller than the speeds at which fronts are generally observed to move, albeit sporadically; and the time scale \( T = 370 \text{km}/c_p = 9 \) months is an order of magnitude too large:
Hamon (1962, 1968b) found a period more like 20 to 50 days applied while Hamon, Godfrey and Greig (1975) found fronts, or current patterns, move at around 9 km day\(^{-1}\). Indeed, the front near J on Fig. 1c moved south at 15 km day\(^{-1}\) during the four days between the aircraft survey and crossing by HMAS Kimbla while the front near H similarly moved west at about 20
We cannot then look to linear theory to explain observed rates of change. Nonlinear processes transfer energy between wavenumbers by causing small eddies to cluster into ordered, deformation scale motion, or by destabilising large length scale planetary waves and zonal flows. Rhines (1973, 1977) uses the wave steepness, \( \varepsilon \), as a measure of the importance of these nonlinear processes. In the present case steepness is calculated from the ratio of the field accelerations to the local accelerations:

\[
\varepsilon = \frac{\frac{\partial U_i}{\partial x_j}}{\frac{\partial u_i}{\partial t}}
\]

where \( U \) and \( u \) may belong to different spectral components and the \( i \) and \( j \) directions may be different. Repeated indices do not imply summation.

For a zonal meandering current we should investigate \( u_j = \) northward geostrophic current and \( x_i = \) east distance, whereupon (6), (3) and (4) give

\[
\varepsilon = \frac{U}{k \omega} = \frac{U}{(k^2 + 1/\mu^2)}/P
\]

Here \( U \) is the r.m.s. depth-averaged velocity associated with the zonal flow.

We know that separated eddies in the East Australian Current system originate from a system with a wavelength of 1.8 times the deformation scale wavelength and we know that, on separating, they collapse to deformation scale eddies (Andrews and Scully-Power, 1976; Andrews, 1979). So we might, a priori, expect wave steepness of order unity or greater.

The averaged pressure drop across the Front was earlier noted to be about 30 cm; while the eddies and meanders disperse this across a band up to, at most, 600 or 700 km wide. A scale for \( U \), from the geostrophic relation and the shapes of current profiles (Andrews, 1979) is about 2 cm s\(^{-1}\). On using this value in eq(7) we find \( \varepsilon \) is about 1.25 and we
conclude that nonlinear processes are important in any dynamical interpretation of the Tasman Front.

To recapitulate, the ratio of the length scale of the meander pattern to the natural length scale (Rossby radius of deformation) is 1.8 so that it is only after the eddies detach from the Front that they assume the natural length scale. Secondly the steepness of the wave pattern is about 1.25 so the frontal dynamics are nonlinear; in simple terms it seems that the effects of the meanders is to disperse the dynamic height change sufficiently broadly that the nonlinear influence is kept within reasonable bounds.

3.9. Discussion.

It seems clear that a zonal band about 600km wide centred near 33 or 34°S contains a meandering front stretching from Australia to New Zealand. Prior to our experiments, one could have expected this to be the case for a number of reasons. Firstly, time and space averaged maps of dynamic height in the south west Pacific show a broad zonal flow (e.g. Reid, 1961 but notably Wyrtki 1962, 1974) which passes north of New Zealand. Secondly, spatial fluctuations appear in single cruise data from these latitudes when they have not been averaged; we have two complete temperature sections across the Tasman between Sydney and North Island (20-25 March 1976 and 3-7 April 1978; not presented here) which show essentially the same behaviour as Figs. 3a and 3b. Furthermore we have a temperature section (4-7 September 1978) from Bass Strait to the North Cape of North Island which does not show significant fluctuations. Thus there seemed to us to be a southern limit to the area where eddies are formed. The possibility of the existence of a northern limit as well and therefore of a zonal band, was established by the CSIHO in
1961 (Anon., 1962). They took a section at latitude 34°S from Sydney to New Zealand (3-8 February 1960) which showed typical eddy fluctuations and a similar section along 30°S from Australia to 170°E (18-22 March 1960) wherein there were no regular eddy fluctuations.

Now these historical data are fragmented and only present a case for conducting the present investigation. However, if we couple the historical data with the data we present here and with Stanton's (1976) investigation, there is no doubt that the Tasman Front is a permanent feature joining the East Australian Current across the top of North Island (presumably) into the southern limb of the South Pacific subtropical gyre. Thus our faith in the integrity of the East Australian Current is restored; if an observer stands on the Australian coast near Coffs Harbour he will see a southward current at times near the coast (Fig. 1c) and at times further out to sea (Fig. 1a). It appears from present and historical data that the current will rarely cross the Tasman after leaving the coast further north. Whichever the case, it seems likely to us that a complex meandering system will always be found through which a western boundary current threads its way into the Tasman Front. It is the complexity of the meanders which led Hamon and Tranter (1971) to question the significance of the East Australian Current in the total circulation in the western South Pacific.

Warren's (1970) arguments are now very compelling. Essentially he took Welander's (1959) Sverdrup solution, which ignored the meridional barrier posed by New Zealand, and pondered the most likely real effect of New Zealand on that solution: Welander's interior solution across the portion of the South Pacific between New Zealand and South America would require a supply of water to the equatorward circulation from a
western boundary current at the partial barrier (New Zealand). This in
turn must be fed from the Tasman Sea west of New Zealand; but since
there is no local wind stress curl there, the only flow can be zonal.
This in turn implies the East Australian Current must leave the
Australian coast at the latitude of the North Cape of North Island
(34°S) where a zonal flow is required to supply the New Zealand western
boundary current. We conclude that topography (New Zealand) and wind
stress (the Sverdrup solution) play the dominant role in establishing
the Tasman Front observed by us and others. This has been a brief
presentation of Warren's argument which suffered from deficiencies in
the wind stress data, and the spatial scale (5 degree squares) used by
Welander (1959) and from excluding both the effects of stratification
and bottom topography.

Cox (1975) was able to quantify Warren's (1970) arguments by using a
2 degree grid with Hellerman's (1967) improved annual mean wind stress
field. Although he ran a full numerical model of the world ocean he paid
particular attention to the circulation in the South Pacific and he used
Warren's paper as a framework for discussing the circulation there. His
first experiment with a homogeneous ocean reproduced neither the East
Australian Current nor the Tasman Front. In his second experiment he
used the observed averaged stratification and constrained it to be
invariant with time. The result was the same; no Current and no Front
developed west of New Zealand. He started his third experiment with the
same averaged stratification but allowed it to change with time; i.e. he
allowed baroclinic adjustment to evolve. In this case a broad East
Australian Current developed transporting 22X10⁶ m³ s⁻¹ south, all of
which abruptly turned east as a zonal flow at the latitude of the North
Cape of North Island and continued as a western boundary current along east New Zealand. This set of three numerical experiments strongly suggests the following roles for wind stress, topography and stratification: the curl of the wind stress produces a basic Sverdrup circulation in the interior which is qualitatively and quantitatively adequate as a first approximation for the time averaged transport. New Zealand and Australia form the western meridional barrier along which must flow the western boundary current required to close the interior solution. A baroclinic adjustment (the Tasman Front) is required across the Tasman Sea to connect the two separated boundary currents; the baroclinic adjustment is responsible for differences like those on Figs. 2. Thus we may say that the difference in density structure (i.e. the Tasman Front) is maintained essentially because of the wind driven circulation in the central and eastern South Pacific Ocean and the nature of the split western boundary.

This is the circulation picture on time and space scales which exclude eddying mesoscale motion. In discussing these smaller scales we would have to consider the creation and intensification of meanders in a zonal baroclinic flow over topography. It is fairly clear now that wind stress is important only insofar as it sets up the interior circulation over the South Pacific Ocean, and does not play a primary role in the creation of meanders. We find that we cannot progress much further than simple scale arguments and these merely show that both baroclinic and topographic processes can be important. The exclusivity of poleward meanders near the Australian continental separation point simply results from the poleward flowing coastal current being forced to flow eastward near latitude 34°S, and this exclusivity is probably aided by the
peculiar channel-like topography described in section 7. We would also expect the currents to meander on crossing the Lord Howe Rise and the Norfolk Ridge. Even on a flat bottomed ocean, the wave steepness is sufficiently large that eddy formation, as simulated numerically by Rhines (1977) must occur. There is sufficient observational data now to investigate the relative effects of the bottom and baroclinic adjustment in this region of the western South Pacific by constructing a baroclinic-barotropic-topographic numerical model.

A potential tool for monitoring the currents and eddies exists with satellite photographs. The two thermal effects, advected hot northern water and a horizontal jump in temperature across the Front, are associated with a baroclinic front in the thermocline and swift geostrophic currents. It should be possible to obtain valuable satellite time series data on the positions of the thermocline fronts through the correlation between surface and deep structure; the major drawback is the extreme cloudiness of the area. We shall know more about the possibilities of infrared monitoring at the conclusion of the Heat Capacity Mapping Mission investigation.

We have given only approximate figures for current speeds and volume transports because we were interested principally in demonstrating that the continuous or time averaged flow from Australia into the subtropical South Pacific gyre is only about half the figure generally assumed. It is usual to take a compilation of volume transport calculations and treat them statistically to obtain a figure for the mean transport; typically then, (see Andrews, 1979) for the East Australian Current one arrives at a figure of between $20 \times 10^6 m^3 s^{-1}$ for a reference level of 1300 dbar from 35 individual transport calculations. Our data show
that the larger transport calculations are associated with eddies near the Tasman Front which recirculate a lot of the water and a more realistic figure for the trans-Tasman transport is $15 \times 10^6 \, \text{m}^3\text{s}^{-1}$. This figure is small compared with transports in other western boundary currents and with what is expected for the western South Pacific. It seems quite possible therefore that there are other contributions to the subtropical gyral transport southward from flows along meridional barriers like the Lord Howe Rise and the Norfolk and Kermadec Ridges.

4. STATUS OF HCM-051 IMAGE PROCESSING

4.1 Photographic Image Processing

To date (30 April 1980) we have received over 400 IR images and about half that number of daylight visual images in photographic form. These photographic images are needed to assess the potential of the IR image. They are of limited scientific use in so far as direct comparison with ground truth data is concerned, because the photographic image has too low a temperature resolution to pick up anything but major (oceanographic) fronts. However, these images are essential to data assessment, choice of priority and co-ordinate correction. The process of photographic image processing at the user end is far from trivial and a flow chart is shown in Fig. 7 to the point where an order for a computer-compatible tape (CCT) is dispatched to NASA. The significant achievements of this process are

a. filing and listing the image information with assessed priority,

b. construction of a coordinate grid to cover the image, along with calculated corrections to NASA coordinates based on known landmarks and,

c. dispatch of CCT order to NASA.

4.2 Computer-compatible Tape (CCT) Processing

Upon receipt of a CCT the process shown in Fig. 8 is begun. Apart from bookkeeping, the first aim of this process is to map the tape and identify the various files. Following this, a "statistics" program is run on the IR image. This program obtains a mean temperature $\bar{t}$ and standard deviation $s$ over $20 \times 20$ pixel squares over the complete image. That is, $\bar{t}$ and $s$ are calculated for 6048 elements of the image. These maps of $\bar{t}$ and $s$ are printed out in matrix form such that the print-out sheets can be put together to conform approxi-
mately to the shape of the original image. Thus the photographic image and the matrix printout can be studied side by side and in a matter of seconds the desired range of apparent (HCM-IR) temperature for an enhanced image can be read off. Naturally, for 20 x 20 pixel elements that cover boundaries such as land/sea or cloud/surface, the values of \( \overline{t} \) are meaningless. However, these values are characterised by a high value of \( s \) and in these cases a series of asterisks is substituted. We are presently using 2°C as the allowable limit for \( s \).

It is quite possible, although not usually needed, to contour the matrix. Portion of this printout is shown, contoured and colour-coded for temperature, in Fig. 9 for image 117-03470-2. We shall use this particular image to illustrate the rest of the enhancement process. Note that except for every tenth value, the tens of degrees figure is omitted from the output. We can see from Fig. 9 that the useful temperature range (as recorded on the HCM-CCT) is 10.0 to 14.8°C. In this case we are only interested in the top right-hand quarter of the total image. Land and cloud are of no use to us. The whole, un-enhanced, image as supplied by NASA is reproduced as Fig. 11, together with the overlay coordinate grid computed by us (Fig. 10). Moreton and N. Stradbroke Is. (off Brisbane, Qld.) are clearly visible at about 27° 30'S, 153° 30' E with colder water (cold is white, hot black in these images) between the islands and the mainland.

The next step in CCT processing is to create an enhanced image tape in a format suitable to CSIRO's Division of Mineral Resources Photowrite image facility. This task has two main elements. Firstly, the required tape data has a totally different format to the original CCT. Secondly, we require enhanced data. The images we obtain from the photowrite are based on the 19 step exponential grey scale. Each step corresponds to an increase of \( \exp(0.1732) \) in the corresponding digital level with level 19 (RANRL notation, which is the reverse of that of CSIRO) corresponding to black from a digital value of 255. All levels below 8 (value of 40) are virtually clear and indistinguishable (running under CSIRO program "Denis") leaving about 10 useful grey level steps. To date, the useful temperature range from each image has been confined to a range of less than 5°C. Thus we can let each grey level step correspond to a change of 0.5°C.

To transform the original CCT data to enhance (0.5°C step
values) we apply the following transformations:

\[ \text{CCT digital values} \rightarrow \text{temp. values } t \text{ (according to NASA formula)} \]

Choose the mid-range temp., \( t_m \), from the "State" printout.

\[
\begin{align*}
\text{let } t' &= t - t_m \\
\text{and } t_k &= 2t' + 14 \quad (0.5^\circ \text{ steps}) \\
\text{then } V_{e} &= \exp (0.1732 \times (13.0 + t_k))
\end{align*}
\]

where \( V_{e} \) is the digital value \( 0 \leq V_{e} \leq 255 \) for CSIRO Photowrite.

For example, for image 1'7-03470-2, we chose the mid temperature \( t_m = 13.0^\circ \text{C} \) (actually we should have used 12.5^\circ \text{C}). Level 19 (black) is then generated for all \( t > 15.5^\circ \text{C} \) and the image becomes essentially clear (level 8) for all \( t < 10.0^\circ \text{C} \). This enhanced image is reproduced as Fig. 12.

5. **AN ENHANCED IR IMAGE 21 AUG 1978.**

Fig. 12 shows a daytime IR image digitally enhanced by the process outlined in the previous section. It can be compared to the image prior to this enhancement shown in Fig. 11. The image shows a front marking the southern edge of a broad tongue of water warmer (on the surface) than 13.0^\circ \text{C} (according to HCM data). This tongue extends south to about 29^\circ 15'S and has an eastern boundary around 156^\circ \text{E}. It would appear that HCM IR temperatures are under-reading by at least 5.5^\circ \text{C} and the tongue really represents surface water warmer than 18.5^\circ \text{C}. Fronts are maintained by current shear, so this demarkation is indicative of a current flowing south just offshore from Moreton Island, moving further offshore as we progress south and flowing eastward by latitude 29^\circ 15'S. The current then turns and flows northward at about 155^\circ 45'E. At latitude 27^\circ 20'S the front (and current) swings eastward again. Considerable structure is evident inside the tongue. At the top of the image surface water warmer than 14.5^\circ \text{C (HCM)} can be seen extending northward. A patch of cooler (< 12.5^\circ \text{C}) water intrudes into the warm tongue between 26^\circ and 27^\circ \text{S, 154^\circ to 155^\circ E. This patch ends in a narrow ribbon of cool water which}
is only visible in the enhanced image. It winds southward to 27°30'S, 154°E, almost joining the cool water east of the coast. It is too narrow to register on the \( \tau \) plot in Fig. 9 and cannot be readily seen in the un-enhanced image (Fig. 10). Just visible through the cloud southeast of 29°S, 156°E is a patch of water that is noticeably warmer than that further north or west around 154°E. This may be indicative of a separate eddy, but close examination of the image suggests that this patch of warm surface water may be connected to the northern tongue by a narrow neck around 29°10’S, 155°20’E. If so, we may conclude that the warm tongue expands out again under the cloud cover south of 29°30’S in the vicinity of 156°E.

South of Cape Byron (28°40’S) there appears to be little evidence of any East Australian Current running southward off the coast. The image clearly shows cooler water on the continental shelf adjacent to the coastline, but that is all. This interpretation of the IR image is confirmed by the oceanographic data about two weeks prior to 21 August by CSIRO; these data are discussed in the next section.

6. **COMPARISON OF IR IMAGE AND GROUND TRUTH DATA**

As yet we have no enhanced images available for direct comparison (coincident time and place) with ground truth data. However, we can come close to that with the image for 21 Aug 78 (Fig. 9 - Fig. 12) C.S.I.R.O. conducted an oceanographic survey over this area during the period 5-18 August 1978. Fig. 13 shows a contour map of surface dynamic height obtained from this quasi-synoptic survey. The contours are in dynamic metres (rel. 1300 dbar) and clearly show a tongue of warm (sub-surface) water extending from 26°S to 31°S between 154°E and 157°E. This is a dynamic "high" zone (maximum dynamic height anomaly 2.30 m), as compared to, say, the dynamic "low" of 1.80 m marked as L1. The current flow turns east at about 31°S, 154°30’E, which is further south than our initial estimate of 29°15’S from the IR image. However, we should note that the oceanographic section east along 31°S was taken during the period 6-9 August, nearly two weeks before the IR image. We know that these fronts can move south/north at least 30 km/day, so it is quite possible that this front retreated from 31°S to 29°S in that period.
The close-spaced dynamic height contours running south from 27°S to 31°S in the vicinity of 154-155°E indicate a strong southward surface current. We can expect this current to draw warm surface water around the tongue from the Coral Sea. Indeed this was the case and the warmer water is shown as a stippled region in Fig. 13. This water was measured to be in the range 22.1 to 22.7°C, the maximum reading being in the centre of the northern edge of the stippled region (in the vicinity of the dynamic high of 2.30m). Temperatures outside this main current flow were some 2°C cooler, typically 19.5 to 21.6°C. Now, we would not expect this water to cool more than 0.5°C/month in August, so the maximum surface temperature north-east of Brisbane (≈ 26°30', 154°30') would be unlikely to have been cooler than 21.5°C on 21 August 78, the time of the IR image. We conclude that in this case the IR data are under-reading by nearly 7°C.

While major fronts may move 200 km in a week or two, the body of warm water shown by the oceanographic survey cannot disappear in that time. Thus it is encouraging to see that, with respect to this comparison of IR image and survey data, the same major features are evident in both sets of data. The IR data has the advantage of being synoptic and continuous. There are many minor features in the enhanced image that no program of surveying by ship could hope to uncover.

7. THE NEED FOR SYNOPTIC (IR) DATA

The mesoscale features of the ocean such as these warm tongues, the EAC and the associated eddies can be considered as the "weather" of the ocean. These features are analogous in many ways to atmospheric weather patterns. Consider the time and distance scales: an atmospheric weather pattern may typically have a diameter of 2000 km and may move 500-1000 km/day. The time scale for these features is thus 2-4 days. The equivalent oceanographic features have wavelengths ≈ 250 km and will move, say, 20 km/day. The time scale per pattern is thus ≈ 12 days. We can say that one week in the ocean is approximately equivalent to one day in the atmosphere. Now, in order to predict the weather the various meteorological bureaux around the world have many thousands of observers making truly synoptic observations several times each day. In order to similarly predict the movement of ocean currents and eddies, we should observe them several times each week. Now consider that the sparse survey shown in Fig. 13 took 13 days to complete.
Contouring such data is often difficult because the mesoscale patterns shift while the observations are being made! While the time scale is, say, seven times easier for oceanographic work, the density of observations needed is \( \sim 100 \) times that required for meteorological work. Thus the task of providing oceanographic forecasts on any kind of regular basis is obviously beyond classical oceanographic capabilities. Satellite observations solve both the spatial density and synoptic problems and also should solve the time sampling problem. It only remains to relate the IR observations adequately with the oceanographic structures and some giant steps can be taken toward regular oceanographic forecasting.

8. PRIORITIES OF HCM DATA PROCESSING AND JUSTIFICATION OF DATA NEEDS

Our first task is to maintain "good housekeeping" with respect to the flow of HCM-051 data. This means that images for any time/location can be readily identified, retrieved and the status of processing ascertained. This we have achieved and a status list for most of our data is given in the Appendix.

Our next priority is to compare HCM images with ground truth data so that we determine what we can and cannot see with the HCM images relative to our previous oceanographic analyses and to learn how to use HCM data to infer subsurface oceanographic structure. This problem will not be solved immediately, but we expect that HCM data will take us a good way along that path. It is apparent that to make these comparisons, we need CCT data in order to obtain enhanced images. We have noted many standard order images in which mesoscale structure appears to be absent because the sea surface temperature has not suited the standard grey scale. The CCT data required for this task have been listed as priority AA in the Appendix.

We already have some theories about the behaviour of the East Australian Current (EAC) and the Tasman Front. In particular, one of us (C.S.N.) believes that the flow of the EAC down the east coast of Australia may well be able to be predicted up to one year ahead by periodic monitoring of the Tasman Front. Initially we need to study the position of the Tasman Front on a regular (time-series) basis in order to see how the wave-like patterns moves with time. We believe that this front is an example of a baroclinic Rossby wave and as such, it should show a westward phase velocity. The only practicable way of confirming this movement (and
indeed the regular existence of the front) is by a time series of satellite IR data. The HCM-051 data offer a unique opportunity to achieve this. For this we need a good time-series of observations extending over a year and we have selected the HCM data for this task as priority A.

There are many good images sufficiently clear of cloud that cover areas outside that of the Tasman Front or EAC and its associated eddies. Typically these are south of 38°S and some of them clearly show mesoscale features associated with the Sub-tropical Convergence. This is an area of considerable interest, but is outside the immediate aims of HCM-051. We have classified these as priority B for CCT data. There is no doubt that important scientific work could be achieved using these data, both on the formation of eddies along this front and in determining the short-term and seasonal variations in the latitude of the convergence.

9. PUBLICATIONS

Section 3 has been submitted to the Journal of Physical Oceanography for publication under the title, "Observations of the Tasman Front" by J.C. Andrews, M.W. Lawrence and C.S. Nilsson.

10. ACKNOWLEDGEMENTS

This work is a contribution to the Australian Defence Science and Technology Organisation's project DST 78/071 and DST 80/006 and the National Aeronautics and Space Administration's project HCM-051: Heat Capacity Mapping Mission. Data were collected at sea from HMAS Diamantina and HMAS Kimbla and from the air by Orion aircraft of 11 Squadron, 92 Wing based at RAAF Edinburgh. The AXBT surveys were supported by the U.S. Office of Naval Research and we wish particularly to thank Dr. R.E. Stevenson for his support. Mr. R. Schenk is thanked for his grid computing analyses. Dr. D.G. Nichol produced the digitally enhanced NOAA-4 infrared photograph. CSIRO Division of Mineral Resources produced the enhanced HCM photograph and have been particularly helpful.

11. APPENDIX: STATUS OF CCT PROCESSING (02 APR 80)

This section contains the output lists from the sorted image data on computer file.
These images are needed for IMMEDIATE COMPARISON with existing GROUND-TRUTH data.

Image status data are divided into three groups for this priority, these groups are for CCT data which (1) have not yet been ordered, but soon will be, (2) have been ordered but not yet received, and (3) have been received.

Status data can be interpreted as follows: G = grid made, 0 = CCT ordered, R = CCT received; absence of appropriate letters indicate the negative.

GROUP (1): C/C TAPE: HAVE NOT YET BEEN ORDERED, BUT SOON WILL BE.

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE LAT LONG DAY HHHH T FL A7</th>
<th>P</th>
<th>STATUS</th>
<th>POS FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>415</td>
<td>160779 -2937 15547</td>
<td>0A1-15040-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>130</td>
<td>210779 -3001 15716</td>
<td>0A6-15010-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>028</td>
<td>220779 -3035 15236</td>
<td>0A7-15190-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>004</td>
<td>250779 -3154 15450</td>
<td>090-03470-2</td>
<td>31 317 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>037</td>
<td>260779 -3651 15131</td>
<td>091-04040-2</td>
<td>27 320 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>035</td>
<td>260779 -3044 14955</td>
<td>091-04050-2</td>
<td>32 316 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>040</td>
<td>260779 -2644 15942</td>
<td>001-14530-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>041</td>
<td>260779 -3250 15812</td>
<td>001-14540-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>039</td>
<td>270779 -3057 15404</td>
<td>092-15120-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>040</td>
<td>270779 -3702 15232</td>
<td>092-15130-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>317</td>
<td>310779 -3822 15332</td>
<td>096-03560-2</td>
<td>26 320 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>311</td>
<td>310779 -3715 16154</td>
<td>096-03580-2</td>
<td>32 316 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>300</td>
<td>310779 -2607 15075</td>
<td>096-03590-2</td>
<td>38 311 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>152</td>
<td>310779 -2723 16114</td>
<td>096-14460-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>153</td>
<td>310779 -3330 15943</td>
<td>096-14470-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>073</td>
<td>090779 -3646 14946</td>
<td>096-15240-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>043</td>
<td>270779 -3805 15231</td>
<td>123-03560-2</td>
<td>34 312 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>061</td>
<td>270779 -3200 16053</td>
<td>123-03580-2</td>
<td>39 307 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>062</td>
<td>270779 -2714 16014</td>
<td>123-14460-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>069</td>
<td>270779 -3322 15444</td>
<td>123-14470-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>013</td>
<td>280779 -3109 15442</td>
<td>124-15050-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>014</td>
<td>280779 -3716 15305</td>
<td>124-15070-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>046</td>
<td>280779 -3047 15256</td>
<td>125-15110-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>047</td>
<td>280779 -3654 15120</td>
<td>135-15130-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>068</td>
<td>090779 -2856 16022</td>
<td>286-02560-2</td>
<td>64 261 AA</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>145</td>
<td>090779 -3244 15209</td>
<td>288-03320-2</td>
<td>62 285 AA G</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>159</td>
<td>100779 -4046 14549</td>
<td>290-04050-2</td>
<td>55 292 AA G</td>
<td>28 -21</td>
</tr>
<tr>
<td>05</td>
<td>008</td>
<td>100779 -311P 15142</td>
<td>290-14570-3</td>
<td>AA G</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>009</td>
<td>100779 -3723 15005</td>
<td>290-14580-3</td>
<td>AA G</td>
<td>38 -35</td>
</tr>
<tr>
<td>05</td>
<td>029</td>
<td>120779 -3629 15913</td>
<td>292-03060-2</td>
<td>60 288 AA G</td>
<td>43 -25</td>
</tr>
<tr>
<td>05</td>
<td>027</td>
<td>120779 -2823 15741</td>
<td>292-03080-2</td>
<td>64 282 AA G</td>
<td>259 -48</td>
</tr>
<tr>
<td>10</td>
<td>204</td>
<td>130279 -3155 15400</td>
<td>293-03250-2</td>
<td>61 286 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>202</td>
<td>130279 -2548 15231</td>
<td>293-03270-2</td>
<td>65 280 AA</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>230</td>
<td>140279 -2853 15449</td>
<td>298-03190-2</td>
<td>62 285 AA G</td>
<td>48 -35</td>
</tr>
<tr>
<td>10</td>
<td>024</td>
<td>190279 -3817 15243</td>
<td>299-03340-2</td>
<td>55 293 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>022</td>
<td>190279 -3211 15105</td>
<td>299-03360-2</td>
<td>60 288 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>095</td>
<td>210279 -3039 15000</td>
<td>301-15010-3</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>054</td>
<td>230279 -3301 15728</td>
<td>303-03110-2</td>
<td>58 290 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>052</td>
<td>230279 -2653 15558</td>
<td>303-03120-2</td>
<td>63 285 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>045</td>
<td>240279 -3858 15434</td>
<td>304-03270-2</td>
<td>53 295 AA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>247</td>
<td>240279 -3544 15340</td>
<td>304-03280-2</td>
<td>56 293 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>043</td>
<td>240279 -3252 15255</td>
<td>304-03290-2</td>
<td>58 290 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>041</td>
<td>240279 -2645 15124</td>
<td>304-03300-2</td>
<td>63 285 AA</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>240</td>
<td>240279 -2938 15205</td>
<td>304-03300-2</td>
<td>61 287 AA</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>057</td>
<td>250279 -381A 14952</td>
<td>305-03450-2</td>
<td>53 295 AA</td>
<td></td>
</tr>
</tbody>
</table>
## PRIORITY AA GROUP(1) CONTINUED

<table>
<thead>
<tr>
<th>RF</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHHH</th>
<th>TEL</th>
<th>A7</th>
<th>P STATUS</th>
<th>POS</th>
<th>ERR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>063</td>
<td>250279</td>
<td>-3020</td>
<td>15416</td>
<td>305-14350-3</td>
<td>AA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>064</td>
<td>250279</td>
<td>-3626</td>
<td>15441</td>
<td>305-14370-3</td>
<td>AA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>134</td>
<td>010379</td>
<td>-2917</td>
<td>15346</td>
<td>309-03220-2 59</td>
<td>289</td>
<td>AA G</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF IMAGES PRIORITY AA, GROUP(1) = 48**

## GROUP (2): C/C TAPES HAVE BEEN ORDERED BUT NOT RECEIVED AS OF 02 APR 80

<table>
<thead>
<tr>
<th>RF</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHHH</th>
<th>TEL</th>
<th>A7</th>
<th>P STATUS</th>
<th>POS</th>
<th>ERR</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>434</td>
<td>240778</td>
<td>-3016</td>
<td>15858</td>
<td>089-03290-2</td>
<td>32</td>
<td>316</td>
<td>AA 80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF IMAGES PRIORITY AA, GROUP(2) = 1**

## GROUP (3): C/C TAPES HAVE BEEN RECEIVED FOR THE FOLLOWING IMAGES

<table>
<thead>
<tr>
<th>RF</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHHH</th>
<th>TEL</th>
<th>A7</th>
<th>P STATUS</th>
<th>POS</th>
<th>ERR</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>131</td>
<td>210778</td>
<td>-3606</td>
<td>15541</td>
<td>086-15020-3</td>
<td>AA</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>041</td>
<td>010778</td>
<td>-3001</td>
<td>15602</td>
<td>097-15040-3</td>
<td>AA 50</td>
<td>53</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>042</td>
<td>010778</td>
<td>-3606</td>
<td>15420</td>
<td>097-15060-3</td>
<td>AA 50</td>
<td>34</td>
<td>-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>015</td>
<td>290778</td>
<td>-3112</td>
<td>15005</td>
<td>125-15230-3</td>
<td>AA 50</td>
<td>45</td>
<td>-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>016</td>
<td>290778</td>
<td>-3719</td>
<td>14829</td>
<td>125-15250-3</td>
<td>AA 50</td>
<td>34</td>
<td>-6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF IMAGES PRIORITY AA, GROUP(3) = 5**

**NUMBER OF IMAGES PRIORITY AA = 54**
These images are needed for IMMEDIATE AIMS of HCM-051.

Image status data are divided into three groups for this priority, these groups are for CCT data which (1) have not yet been ordered, but soon will be, (2) have been ordered but not yet received and (3) have been received.

Status data can be interpreted as follows: G = grid made, O = CCT ordered, R = CCT received; absence of appropriate letters indicates the negative.

**GROUP (1): C/C TAPES HAVE NOT YET BEEN ORDERED, BUT SOON WILL BE**

<table>
<thead>
<tr>
<th>R</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HMM</th>
<th>T</th>
<th>FL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>09 494</td>
<td>23057A</td>
<td>-3654</td>
<td>15231</td>
<td>027-04100-2</td>
<td>22</td>
<td>0</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 492</td>
<td>23057A</td>
<td>-3249</td>
<td>14062</td>
<td>027-04120-2</td>
<td>27</td>
<td>316</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 255</td>
<td>24057A</td>
<td>-3052</td>
<td>15430</td>
<td>024-15190-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 254</td>
<td>24057A</td>
<td>-3700</td>
<td>15254</td>
<td>024-15210-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 615</td>
<td>09067A</td>
<td>-3102</td>
<td>15407</td>
<td>044-15190-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 614</td>
<td>09067A</td>
<td>-3700</td>
<td>15254</td>
<td>044-15200-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 633</td>
<td>18047A</td>
<td>-3147</td>
<td>15310</td>
<td>053-03590-2</td>
<td>27</td>
<td>319</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 000</td>
<td>22067A</td>
<td>-3307</td>
<td>15931</td>
<td>057-03340-2</td>
<td>26</td>
<td>320</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 051</td>
<td>06077A</td>
<td>-3612</td>
<td>15102</td>
<td>071-15230-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 414</td>
<td>16077A</td>
<td>-3542</td>
<td>15413</td>
<td>081-15090-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 054</td>
<td>19077A</td>
<td>-3057</td>
<td>15732</td>
<td>084-03360-2</td>
<td>31</td>
<td>317</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 137</td>
<td>21077A</td>
<td>-4210</td>
<td>15355</td>
<td>086-15040-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 047</td>
<td>23077A</td>
<td>-3636</td>
<td>15632</td>
<td>088-15380-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 002</td>
<td>25077A</td>
<td>-2544</td>
<td>15321</td>
<td>090-03490-2</td>
<td>37</td>
<td>312</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 227</td>
<td>05077A</td>
<td>-3540</td>
<td>16042</td>
<td>101-14410-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 013</td>
<td>09057A</td>
<td>-2400</td>
<td>15810</td>
<td>105-03270-2</td>
<td>40</td>
<td>309</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 014</td>
<td>10057A</td>
<td>-3241</td>
<td>15515</td>
<td>106-03430-2</td>
<td>34</td>
<td>313</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 049</td>
<td>11057A</td>
<td>-2632</td>
<td>16009</td>
<td>107-14490-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 056</td>
<td>11057A</td>
<td>-3229</td>
<td>15640</td>
<td>107-14510-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 051</td>
<td>11057A</td>
<td>-3845</td>
<td>15701</td>
<td>107-14520-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 039</td>
<td>13057A</td>
<td>-3111</td>
<td>14956</td>
<td>109-15260-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 270</td>
<td>15057A</td>
<td>-3748</td>
<td>15817</td>
<td>111-03340-2</td>
<td>31</td>
<td>315</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 228</td>
<td>15057A</td>
<td>-3141</td>
<td>15640</td>
<td>111-03360-2</td>
<td>34</td>
<td>311</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 228</td>
<td>15057A</td>
<td>-2533</td>
<td>15511</td>
<td>111-03380-2</td>
<td>34</td>
<td>307</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 048</td>
<td>16057A</td>
<td>-3838</td>
<td>15359</td>
<td>112-03500-2</td>
<td>30</td>
<td>316</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 044</td>
<td>16057A</td>
<td>-3231</td>
<td>15220</td>
<td>112-03540-2</td>
<td>34</td>
<td>311</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 044</td>
<td>16057A</td>
<td>-2622</td>
<td>15051</td>
<td>112-03560-2</td>
<td>41</td>
<td>307</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 014</td>
<td>16057A</td>
<td>-2715</td>
<td>16137</td>
<td>112-14420-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 015</td>
<td>16057A</td>
<td>-3322</td>
<td>16008</td>
<td>112-14440-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 035</td>
<td>17057A</td>
<td>-3025</td>
<td>15618</td>
<td>113-15010-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 004</td>
<td>18057A</td>
<td>-4242</td>
<td>14822</td>
<td>114-15220-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 061</td>
<td>20057A</td>
<td>-3008</td>
<td>15757</td>
<td>116-03290-2</td>
<td>39</td>
<td>308</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 136</td>
<td>22057A</td>
<td>-3173</td>
<td>15744</td>
<td>118-14540-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 224</td>
<td>24507A</td>
<td>-3756</td>
<td>14456</td>
<td>120-15310-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 015</td>
<td>06097A</td>
<td>-3917</td>
<td>15536</td>
<td>133-03440-2</td>
<td>35</td>
<td>309</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 053</td>
<td>17097A</td>
<td>-2736</td>
<td>16105</td>
<td>144-14390-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 054</td>
<td>17097A</td>
<td>-3344</td>
<td>15934</td>
<td>144-14410-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 055</td>
<td>17097A</td>
<td>-3950</td>
<td>15752</td>
<td>144-14420-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 036</td>
<td>24097A</td>
<td>-3037</td>
<td>15239</td>
<td>151-15100-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 020</td>
<td>29097A</td>
<td>-3010</td>
<td>15407</td>
<td>156-15030-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 021</td>
<td>29097A</td>
<td>-3437</td>
<td>15231</td>
<td>156-15050-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 022</td>
<td>29097A</td>
<td>-4242</td>
<td>15043</td>
<td>156-15070-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 026</td>
<td>30097A</td>
<td>-3723</td>
<td>14744</td>
<td>157-15230-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 212</td>
<td>03107A</td>
<td>-3312</td>
<td>15201</td>
<td>160-03490-2</td>
<td>48</td>
<td>294</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 210</td>
<td>03107A</td>
<td>-2707</td>
<td>15030</td>
<td>160-03510-2</td>
<td>52</td>
<td>289</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

37
<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHHH</th>
<th>T FL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>155</td>
<td>051078</td>
<td>-2710</td>
<td>15154</td>
<td>162-15140-3</td>
<td>A</td>
<td>G</td>
<td>114</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>154</td>
<td>051077</td>
<td>-3317</td>
<td>15023</td>
<td>162-15150-3</td>
<td>A</td>
<td>G</td>
<td>52</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>107</td>
<td>301078</td>
<td>-3957</td>
<td>16394</td>
<td>147-14390-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>344</td>
<td>081178</td>
<td>-2458</td>
<td>15137</td>
<td>226-15050-3</td>
<td>A</td>
<td>G</td>
<td>52</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>054</td>
<td>191178</td>
<td>-2622</td>
<td>15040</td>
<td>237-15090-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>059</td>
<td>191178</td>
<td>-3229</td>
<td>14910</td>
<td>237-15110-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>060</td>
<td>191178</td>
<td>-3436</td>
<td>14731</td>
<td>237-15120-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>124</td>
<td>011079</td>
<td>-3559</td>
<td>15604</td>
<td>250-03230-2</td>
<td>62</td>
<td>279</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>122</td>
<td>011079</td>
<td>-2953</td>
<td>15430</td>
<td>250-03250-2</td>
<td>64</td>
<td>274</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>026</td>
<td>020179</td>
<td>-4487</td>
<td>15357</td>
<td>251-03390-2</td>
<td>57</td>
<td>286</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>024</td>
<td>020179</td>
<td>-3802</td>
<td>15206</td>
<td>251-03410-2</td>
<td>61</td>
<td>281</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>022</td>
<td>020179</td>
<td>-3157</td>
<td>15029</td>
<td>251-03430-2</td>
<td>63</td>
<td>276</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>249</td>
<td>091179</td>
<td>-2638</td>
<td>15953</td>
<td>251-14300-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>290</td>
<td>091179</td>
<td>-3247</td>
<td>15323</td>
<td>251-14320-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>014</td>
<td>031179</td>
<td>-3211</td>
<td>15402</td>
<td>252-14500-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>040</td>
<td>061179</td>
<td>-3900</td>
<td>15834</td>
<td>255-03150-2</td>
<td>60</td>
<td>2A2</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>039</td>
<td>061179</td>
<td>-3255</td>
<td>15654</td>
<td>255-03170-2</td>
<td>63</td>
<td>277</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>034</td>
<td>061179</td>
<td>-2649</td>
<td>15523</td>
<td>255-03190-2</td>
<td>65</td>
<td>272</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>029</td>
<td>071179</td>
<td>-3014</td>
<td>16047</td>
<td>256-14260-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>137</td>
<td>110179</td>
<td>-3241</td>
<td>15902</td>
<td>260-03100-2</td>
<td>63</td>
<td>27A</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>135</td>
<td>110179</td>
<td>-2635</td>
<td>15732</td>
<td>260-03110-2</td>
<td>65</td>
<td>272</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>033</td>
<td>130179</td>
<td>-2701</td>
<td>15914</td>
<td>262-14330-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>034</td>
<td>130179</td>
<td>-3308</td>
<td>15742</td>
<td>262-14350-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>057</td>
<td>160179</td>
<td>-3156</td>
<td>16036</td>
<td>265-03020-2</td>
<td>64</td>
<td>27A</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>055</td>
<td>160179</td>
<td>-2550</td>
<td>15907</td>
<td>265-03040-2</td>
<td>66</td>
<td>273</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>043</td>
<td>180179</td>
<td>-3810</td>
<td>15316</td>
<td>267-03360-2</td>
<td>60</td>
<td>2A4</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>044</td>
<td>180179</td>
<td>-2714</td>
<td>16056</td>
<td>267-14260-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>114</td>
<td>191179</td>
<td>-3027</td>
<td>15537</td>
<td>26A-14440-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>444</td>
<td>210179</td>
<td>-2943</td>
<td>16147</td>
<td>270-02560-2</td>
<td>65</td>
<td>277</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>044</td>
<td>240179</td>
<td>-3751</td>
<td>15404</td>
<td>277-03260-2</td>
<td>63</td>
<td>282</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>132</td>
<td>020279</td>
<td>-3252</td>
<td>15523</td>
<td>282-03200-2</td>
<td>63</td>
<td>283</td>
<td>A</td>
<td>G</td>
<td>109</td>
<td>-9</td>
</tr>
<tr>
<td>05</td>
<td>130</td>
<td>020279</td>
<td>-2646</td>
<td>15355</td>
<td>282-03210-2</td>
<td>66</td>
<td>278</td>
<td>A</td>
<td>G</td>
<td>134</td>
<td>-24</td>
</tr>
<tr>
<td>09</td>
<td>092</td>
<td>030279</td>
<td>-3958</td>
<td>15229</td>
<td>283-03360-2</td>
<td>58</td>
<td>289</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>090</td>
<td>030279</td>
<td>-3253</td>
<td>15050</td>
<td>283-03380-2</td>
<td>62</td>
<td>284</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>090</td>
<td>040279</td>
<td>-3011</td>
<td>15432</td>
<td>284-14450-3</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>214</td>
<td>140279</td>
<td>-3649</td>
<td>15118</td>
<td>294-03410-2</td>
<td>56</td>
<td>292</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>076</td>
<td>260279</td>
<td>-4350</td>
<td>14705</td>
<td>306-04020-2</td>
<td>44</td>
<td>300</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>140</td>
<td>010379</td>
<td>-3524</td>
<td>15519</td>
<td>309-03200-2</td>
<td>55</td>
<td>294</td>
<td>A</td>
<td>G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>318</td>
<td>230379</td>
<td>-3530</td>
<td>15136</td>
<td>331-03300-2</td>
<td>48</td>
<td>303</td>
<td>A</td>
<td>G</td>
<td>31</td>
<td>11</td>
</tr>
<tr>
<td>11</td>
<td>132</td>
<td>270379</td>
<td>-3208</td>
<td>15647</td>
<td>335-03040-2</td>
<td>49</td>
<td>301</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>130</td>
<td>270379</td>
<td>-2602</td>
<td>15519</td>
<td>335-03080-2</td>
<td>55</td>
<td>296</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>014</td>
<td>090579</td>
<td>-3034</td>
<td>15346</td>
<td>37A-03120-2</td>
<td>38</td>
<td>315</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF IMAGES:** 87

**GROUP (2):** C/C TAPFS HAVE BEEN ORDERED BUT NOT RECEIVED AS OF 02 APR 80

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHHH</th>
<th>T FL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>014</td>
<td>110678</td>
<td>-2531</td>
<td>15921</td>
<td>046-03310-2</td>
<td>32</td>
<td>314</td>
<td>A</td>
<td>G0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>036</td>
<td>140678</td>
<td>-3131</td>
<td>15526</td>
<td>049-15120-3</td>
<td>A</td>
<td>G0</td>
<td>5A</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>006</td>
<td>170678</td>
<td>-3317</td>
<td>15406</td>
<td>052-03400-2</td>
<td>25</td>
<td>320</td>
<td>A</td>
<td>G0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>247</td>
<td>200678</td>
<td>-3004</td>
<td>15241</td>
<td>055-15240-3</td>
<td>A</td>
<td>G0</td>
<td>52</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>243</td>
<td>200678</td>
<td>-3611</td>
<td>15107</td>
<td>055-15250-3</td>
<td>A</td>
<td>G0</td>
<td>52</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>244</td>
<td>200678</td>
<td>-4216</td>
<td>14920</td>
<td>055-15270-3</td>
<td>A</td>
<td>G0</td>
<td>12</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>153</td>
<td>240678</td>
<td>-3359</td>
<td>15743</td>
<td>059-15000-3</td>
<td>A</td>
<td>G0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>436</td>
<td>240778</td>
<td>-3623</td>
<td>16033</td>
<td>069-03280-2</td>
<td>27</td>
<td>320</td>
<td>A</td>
<td>G0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Number of Images Priority A, Group(2) = 16

Priority A Group(2) continued

<table>
<thead>
<tr>
<th>R</th>
<th>FP</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>FL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>121</td>
<td>22078A</td>
<td>-3054</td>
<td>15752</td>
<td>118-14530-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>244</td>
<td>26078A</td>
<td>-3234</td>
<td>15928</td>
<td>153-03200-2</td>
<td>46</td>
<td>296</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>247</td>
<td>26078A</td>
<td>-2628</td>
<td>15758</td>
<td>153-03220-2</td>
<td>51</td>
<td>P67</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>462</td>
<td>21078A</td>
<td>-3400</td>
<td>15043</td>
<td>155-03560-2</td>
<td>46</td>
<td>297</td>
<td>A</td>
<td>GO</td>
<td>35</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>030</td>
<td>26078A</td>
<td>-3122</td>
<td>15248</td>
<td>183-15040-3</td>
<td>A</td>
<td>GO</td>
<td>109</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>031</td>
<td>26078A</td>
<td>-3728</td>
<td>15111</td>
<td>183-15060-3</td>
<td>A</td>
<td>GO</td>
<td>40</td>
<td>-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>127</td>
<td>31078A</td>
<td>-2614</td>
<td>16017</td>
<td>147-14370-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>301</td>
<td>12178A</td>
<td>-2607</td>
<td>15819</td>
<td>230-14400-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Images Priority A, Group(3) = 16

### Group (3), C/C Tapes have been received for the following Images

<table>
<thead>
<tr>
<th>R</th>
<th>FP</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>FL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>08</td>
<td>105</td>
<td>27078A</td>
<td>-3313</td>
<td>16102</td>
<td>062-03270-2</td>
<td>26</td>
<td>320</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>103</td>
<td>27078A</td>
<td>-2706</td>
<td>15932</td>
<td>062-03290-2</td>
<td>31</td>
<td>316</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>088</td>
<td>28078A</td>
<td>-3320</td>
<td>15631</td>
<td>063-03450-2</td>
<td>26</td>
<td>320</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>047</td>
<td>29078A</td>
<td>-2714</td>
<td>15501</td>
<td>063-03470-2</td>
<td>31</td>
<td>316</td>
<td>A</td>
<td>GO</td>
<td>114</td>
<td>-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>079</td>
<td>30078A</td>
<td>-3028</td>
<td>15533</td>
<td>065-15100-3</td>
<td>A</td>
<td>GO</td>
<td>56</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>027</td>
<td>02078A</td>
<td>-2649</td>
<td>16100</td>
<td>067-03220-2</td>
<td>32</td>
<td>316</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>070</td>
<td>04078A</td>
<td>-3946</td>
<td>15514</td>
<td>069-03550-2</td>
<td>20</td>
<td>323</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>025</td>
<td>04078A</td>
<td>-3361</td>
<td>15334</td>
<td>069-03560-2</td>
<td>26</td>
<td>320</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>023</td>
<td>04078A</td>
<td>-2734</td>
<td>15204</td>
<td>069-03580-2</td>
<td>32</td>
<td>316</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>003</td>
<td>10078A</td>
<td>-3940</td>
<td>15609</td>
<td>075-14500-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>164</td>
<td>16078A</td>
<td>-3007</td>
<td>15540</td>
<td>081-15080-3</td>
<td>A</td>
<td>GO</td>
<td>14</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>169</td>
<td>16078A</td>
<td>-3611</td>
<td>15405</td>
<td>081-15090-3</td>
<td>A</td>
<td>GO</td>
<td>35</td>
<td>-9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>004</td>
<td>18078A</td>
<td>-2852</td>
<td>16134</td>
<td>083-03190-2</td>
<td>33</td>
<td>316</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>017</td>
<td>22078A</td>
<td>-2940</td>
<td>15250</td>
<td>087-15190-3</td>
<td>A</td>
<td>GO</td>
<td>53</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>043</td>
<td>01078A</td>
<td>-4211</td>
<td>15241</td>
<td>097-15040-3</td>
<td>A</td>
<td>GO</td>
<td>13</td>
<td>-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>133</td>
<td>21078A</td>
<td>-3016</td>
<td>15226</td>
<td>117-03470-2</td>
<td>39</td>
<td>308</td>
<td>A</td>
<td>GO</td>
<td>105</td>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>176</td>
<td>23078A</td>
<td>-3021</td>
<td>15328</td>
<td>119-15110-3</td>
<td>A</td>
<td>GO</td>
<td>55</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>177</td>
<td>23078A</td>
<td>-3628</td>
<td>15153</td>
<td>119-15130-3</td>
<td>A</td>
<td>GO</td>
<td>33</td>
<td>-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>054</td>
<td>16078A</td>
<td>-3546</td>
<td>15725</td>
<td>143-03320-2</td>
<td>41</td>
<td>303</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>054</td>
<td>16078A</td>
<td>-2940</td>
<td>15552</td>
<td>143-03360-2</td>
<td>46</td>
<td>298</td>
<td>A</td>
<td>GO</td>
<td>58</td>
<td>-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>034</td>
<td>17076A</td>
<td>-3314</td>
<td>15041</td>
<td>144-14100-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>033</td>
<td>17076A</td>
<td>-2707</td>
<td>16112</td>
<td>144-14390-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>144</td>
<td>23078A</td>
<td>-2716</td>
<td>15802</td>
<td>150-14510-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>165</td>
<td>23078A</td>
<td>-3323</td>
<td>15631</td>
<td>150-14520-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>238</td>
<td>25078A</td>
<td>-3655</td>
<td>14625</td>
<td>152-15300-3</td>
<td>A</td>
<td>GO</td>
<td>20</td>
<td>-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>192</td>
<td>29078A</td>
<td>-3008</td>
<td>15413</td>
<td>156-15030-3</td>
<td>A</td>
<td>GO</td>
<td>57</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>193</td>
<td>29078A</td>
<td>-3615</td>
<td>15237</td>
<td>156-15050-3</td>
<td>A</td>
<td>GO</td>
<td>35</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>151</td>
<td>30078A</td>
<td>-3072</td>
<td>14744</td>
<td>157-15230-3</td>
<td>A</td>
<td>GO</td>
<td>31</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>023</td>
<td>19178A</td>
<td>-3332</td>
<td>15217</td>
<td>176-03460-2</td>
<td>51</td>
<td>288</td>
<td>A</td>
<td>GO</td>
<td>29</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>021</td>
<td>19178A</td>
<td>-2726</td>
<td>15045</td>
<td>176-03480-2</td>
<td>55</td>
<td>284</td>
<td>A</td>
<td>GO</td>
<td>57</td>
<td>-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>033</td>
<td>20178A</td>
<td>-3001</td>
<td>15558</td>
<td>177-14530-3</td>
<td>A</td>
<td>GO</td>
<td>51</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>034</td>
<td>20178A</td>
<td>-3607</td>
<td>15423</td>
<td>177-14550-3</td>
<td>A</td>
<td>GO</td>
<td>44</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>015</td>
<td>25178A</td>
<td>-3047</td>
<td>15728</td>
<td>182-14460-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>016</td>
<td>25178A</td>
<td>-3653</td>
<td>15552</td>
<td>182-14480-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>128</td>
<td>31078A</td>
<td>-3220</td>
<td>15467</td>
<td>187-14390-3</td>
<td>A</td>
<td>GO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| 141178 | 0 | 202-03280-2 | A | R |
| 01 | 138 | 141178 | -2704 | 15422 | 202-03300-2 | 59 | 275 | A | GO | 118 | -14 |
| 06 | 120 | 151178 | -2625 | 16027 | 203-14350-3 | A | GO |
| 06 | 121 | 151178 | -3231 | 15857 | 203-14360-3 | A | GO |
| 06 | 122 | 151178 | -3837 | 15719 | 203-14380-3 | A | GO |
| 06 | 092 | 171178 | -3038 | 15013 | 205-15120-3 | A | GO | 59 | 8 |
| 01 | 084 | 181178 | -4317 | 16441 | 206-03010-3 | A | GO |</p>
<table>
<thead>
<tr>
<th>AFR</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>EL</th>
<th>A7</th>
<th>POS FPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>06</td>
<td>135</td>
<td>191178</td>
<td>-3235</td>
<td>15701</td>
<td>207</td>
<td>03220-2</td>
<td>57</td>
<td>27°</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>133</td>
<td>191178</td>
<td>-2628</td>
<td>15531</td>
<td>207</td>
<td>03240-2</td>
<td>59</td>
<td>27°</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>116</td>
<td>241176</td>
<td>-3153</td>
<td>15012</td>
<td>212</td>
<td>03170-2</td>
<td>58</td>
<td>27°</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>114</td>
<td>241176</td>
<td>-2545</td>
<td>15463</td>
<td>212</td>
<td>03190-2</td>
<td>60</td>
<td>27°</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>007</td>
<td>291178</td>
<td>-3646</td>
<td>16052</td>
<td>217</td>
<td>03090-2</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>005</td>
<td>291178</td>
<td>-3039</td>
<td>15915</td>
<td>217</td>
<td>03110-2</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>114</td>
<td>051278</td>
<td>-3301</td>
<td>15644</td>
<td>223</td>
<td>03220-2</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>157</td>
<td>061278</td>
<td>-2713</td>
<td>16109</td>
<td>224</td>
<td>14280-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>153</td>
<td>061278</td>
<td>-3320</td>
<td>15938</td>
<td>224</td>
<td>14300-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>510</td>
<td>131278</td>
<td>-4423</td>
<td>14746</td>
<td>231</td>
<td>04070-2</td>
<td>6°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>011</td>
<td>191278</td>
<td>-2552</td>
<td>15047</td>
<td>237</td>
<td>15090-3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF IMAGES PRIORIT A, GROUP(3) =**

**NUMBER OF IMAGES PRIORIT A = 156**
These images are needed for LONG-TERM AIDS of HCM-051.

Image status data are divided into three groups for this priority, these groups are for CCT data which (1) have not yet been ordered, but soon will be, (2) have been ordered but not yet received and (3) have been received.

Status data can be interpreted as follows: G = grid made, O = CCT ordered, R = CCT received; absence of appropriate letters indicates the negative.

GROUP (1). C/C TAPES HAVE NOT YET BEEN ORDERED, BUT SOON WILL BE.

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HMM</th>
<th>T</th>
<th>EL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>09 400</td>
<td>230578</td>
<td>-2442</td>
<td>1928</td>
<td>077-04140-2</td>
<td>33 312</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 126</td>
<td>250578</td>
<td>-4720</td>
<td>14602</td>
<td>029-04450-2</td>
<td>14 322</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 174</td>
<td>250578</td>
<td>-4116</td>
<td>14002</td>
<td>026-04460-2</td>
<td>19 320</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 151</td>
<td>100578</td>
<td>-4058</td>
<td>14357</td>
<td>045-04450-2</td>
<td>1A 323</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 04A</td>
<td>220578</td>
<td>-2700</td>
<td>15802</td>
<td>057-03350-2</td>
<td>31 316</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 268</td>
<td>01778</td>
<td>-4023</td>
<td>14447</td>
<td>066-04370-2</td>
<td>19 324</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 482</td>
<td>05778</td>
<td>-3722</td>
<td>15001</td>
<td>070-04130-2</td>
<td>23 322</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 052</td>
<td>06778</td>
<td>-4216</td>
<td>14916</td>
<td>071-15250-3</td>
<td>R G 26 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 445</td>
<td>12078</td>
<td>-3131</td>
<td>14913</td>
<td>077-15330-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 447</td>
<td>12778</td>
<td>-4339</td>
<td>1586</td>
<td>077-15350-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 077</td>
<td>16078</td>
<td>-3604</td>
<td>14811</td>
<td>081-04180-2</td>
<td>25 321</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 417</td>
<td>16078</td>
<td>-4146</td>
<td>15227</td>
<td>081-15110-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 428</td>
<td>17078</td>
<td>-4550</td>
<td>1638</td>
<td>082-04330-2</td>
<td>16 325</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 431</td>
<td>17078</td>
<td>-3125</td>
<td>15048</td>
<td>082-15260-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 433</td>
<td>17078</td>
<td>-4333</td>
<td>14722</td>
<td>082-15290-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 055</td>
<td>19078</td>
<td>-3704</td>
<td>15909</td>
<td>084-03350-2</td>
<td>25 321</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 037</td>
<td>22078</td>
<td>-4203</td>
<td>14650</td>
<td>087-04270-2</td>
<td>21 323</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 048</td>
<td>23078</td>
<td>-4240</td>
<td>14444</td>
<td>089-15400-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 008</td>
<td>25078</td>
<td>-4407</td>
<td>15819</td>
<td>090-03440-2</td>
<td>19 323</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 064</td>
<td>25078</td>
<td>-3801</td>
<td>15628</td>
<td>090-03450-2</td>
<td>25 320</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 039</td>
<td>26078</td>
<td>-4257</td>
<td>15319</td>
<td>091-04020-2</td>
<td>21 323</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 042</td>
<td>26078</td>
<td>-3855</td>
<td>15632</td>
<td>091-14560-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 027</td>
<td>27078</td>
<td>-4230</td>
<td>14838</td>
<td>092-04200-2</td>
<td>21 322</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 041</td>
<td>27078</td>
<td>-4306</td>
<td>15044</td>
<td>092-15150-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 604</td>
<td>28078</td>
<td>-2529</td>
<td>15055</td>
<td>093-15280-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 604</td>
<td>28078</td>
<td>-3740</td>
<td>14750</td>
<td>093-15320-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 607</td>
<td>28078</td>
<td>-4344</td>
<td>14600</td>
<td>093-15330-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 154</td>
<td>31078</td>
<td>-3935</td>
<td>15803</td>
<td>096-14490-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 048</td>
<td>02078</td>
<td>-4050</td>
<td>14511</td>
<td>098-04310-2</td>
<td>24 320</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 074</td>
<td>02078</td>
<td>-4250</td>
<td>14769</td>
<td>098-15260-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 072</td>
<td>10078</td>
<td>-4453</td>
<td>15849</td>
<td>106-03400-2</td>
<td>23 321</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 020</td>
<td>10078</td>
<td>-3648</td>
<td>15655</td>
<td>106-03410-2</td>
<td>28 317</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 016</td>
<td>10078</td>
<td>-2633</td>
<td>15346</td>
<td>106-03450-2</td>
<td>40 309</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 039</td>
<td>13078</td>
<td>-3717</td>
<td>14819</td>
<td>109-15280-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 040</td>
<td>13078</td>
<td>-4323</td>
<td>14630</td>
<td>109-15300-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 237</td>
<td>15078</td>
<td>-4353</td>
<td>16088</td>
<td>111-03330-2</td>
<td>25 319</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 031</td>
<td>17078</td>
<td>-4211</td>
<td>15032</td>
<td>113-04090-2</td>
<td>27 317</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 036</td>
<td>17078</td>
<td>-3631</td>
<td>15443</td>
<td>113-15020-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 037</td>
<td>17078</td>
<td>-4237</td>
<td>15285</td>
<td>113-15040-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 093</td>
<td>18078</td>
<td>-3637</td>
<td>15010</td>
<td>114-15200-3</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 226</td>
<td>24078</td>
<td>-2542</td>
<td>15002</td>
<td>120-15280-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 205</td>
<td>28078</td>
<td>-4321</td>
<td>15116</td>
<td>124-15280-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 010</td>
<td>02078</td>
<td>-4235</td>
<td>15038</td>
<td>129-04070-2</td>
<td>31 312</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 098</td>
<td>02078</td>
<td>-3630</td>
<td>14850</td>
<td>129-04090-2</td>
<td>37 308</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 017</td>
<td>06078</td>
<td>-4521</td>
<td>15730</td>
<td>133-03420-2</td>
<td>30 312</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>FR</td>
<td>DATE</td>
<td>LAT</td>
<td>LONG</td>
<td>DAY</td>
<td>HHNM</td>
<td>T</td>
<td>FL</td>
<td>AZ</td>
<td>P</td>
<td>STATUS</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>---</td>
<td>--------</td>
</tr>
<tr>
<td>10</td>
<td>059</td>
<td>06097A</td>
<td>-4632</td>
<td>15735</td>
<td>133-14390-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>048</td>
<td>04097A</td>
<td>-4300</td>
<td>14932</td>
<td>135-15140-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>003</td>
<td>09097A</td>
<td>-3858</td>
<td>14609</td>
<td>136-15310-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>056</td>
<td>17097A</td>
<td>-4555</td>
<td>15556</td>
<td>144-14440-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>094</td>
<td>19097A</td>
<td>-4054</td>
<td>14513</td>
<td>146-04250-2</td>
<td>3A 305</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>119</td>
<td>24097A</td>
<td>-4147</td>
<td>16654</td>
<td>151-04180-2</td>
<td>3A 303</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>037</td>
<td>24097A</td>
<td>-3644</td>
<td>15103</td>
<td>151-15110-3</td>
<td>B 8</td>
<td>34</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>038</td>
<td>24097A</td>
<td>-4249</td>
<td>16915</td>
<td>151-15130-3</td>
<td>B 8</td>
<td>20</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>011</td>
<td>28097A</td>
<td>-4334</td>
<td>15330</td>
<td>155-03530-2</td>
<td>38 303</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>093</td>
<td>28097A</td>
<td>-3731</td>
<td>15140</td>
<td>155-03550-2</td>
<td>43 299</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>026</td>
<td>30097A</td>
<td>-3117</td>
<td>14921</td>
<td>157-15220-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>216</td>
<td>03107A</td>
<td>-4519</td>
<td>15536</td>
<td>160-03460-2</td>
<td>38 302</td>
<td>R 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>214</td>
<td>03107A</td>
<td>-3916</td>
<td>15341</td>
<td>160-03480-2</td>
<td>43 298</td>
<td>R 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>157</td>
<td>05107A</td>
<td>-3922</td>
<td>14843</td>
<td>162-15170-3</td>
<td>B 6</td>
<td>43</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>447</td>
<td>15107A</td>
<td>-4300</td>
<td>14851</td>
<td>172-04090-2</td>
<td>43 296</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>244</td>
<td>21107A</td>
<td>-4029</td>
<td>14509</td>
<td>178-04210-2</td>
<td>47 293</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>104</td>
<td>30107A</td>
<td>-2650</td>
<td>16008</td>
<td>187-14380-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>026</td>
<td>30107A</td>
<td>-3902</td>
<td>15648</td>
<td>187-14410-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>103</td>
<td>31107A</td>
<td>-2632</td>
<td>15543</td>
<td>188-14550-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>104</td>
<td>31107A</td>
<td>-3843</td>
<td>15234</td>
<td>188-14590-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>018</td>
<td>16117A</td>
<td>-4159</td>
<td>14910</td>
<td>204-04020-2</td>
<td>52 287</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>016</td>
<td>16117A</td>
<td>-3553</td>
<td>14723</td>
<td>204-04040-2</td>
<td>55 282</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>083</td>
<td>27117A</td>
<td>-4017</td>
<td>14444</td>
<td>215-04090-2</td>
<td>55 283</td>
<td>A 6</td>
<td>15</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>171</td>
<td>08127A</td>
<td>-4046</td>
<td>14509</td>
<td>226-04140-2</td>
<td>57 293</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>345</td>
<td>08127A</td>
<td>-3504</td>
<td>15003</td>
<td>226-15070-3</td>
<td>R 6</td>
<td>22</td>
<td>-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>346</td>
<td>08127A</td>
<td>-4110</td>
<td>14819</td>
<td>226-15080-3</td>
<td>B 6</td>
<td>13</td>
<td>-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>126</td>
<td>01017A</td>
<td>-4703</td>
<td>15750</td>
<td>250-03220-2</td>
<td>58 284</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>291</td>
<td>02017A</td>
<td>-3853</td>
<td>15643</td>
<td>251-14340-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>292</td>
<td>02017A</td>
<td>-4459</td>
<td>15449</td>
<td>251-14350-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>012</td>
<td>03017A</td>
<td>-4200</td>
<td>14844</td>
<td>252-03580-2</td>
<td>58 285</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>010</td>
<td>03017A</td>
<td>-3555</td>
<td>14659</td>
<td>252-03590-2</td>
<td>62 280</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>016</td>
<td>03017A</td>
<td>-2603</td>
<td>15532</td>
<td>252-14400-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>017</td>
<td>03017A</td>
<td>-3818</td>
<td>15222</td>
<td>252-14510-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>018</td>
<td>03017A</td>
<td>-4423</td>
<td>15029</td>
<td>252-14530-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>098</td>
<td>04017A</td>
<td>-4104</td>
<td>14356</td>
<td>253-04160-2</td>
<td>59 284</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>031</td>
<td>07017A</td>
<td>-4226</td>
<td>15720</td>
<td>256-14270-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>126</td>
<td>10017A</td>
<td>-4231</td>
<td>14204</td>
<td>259-04260-2</td>
<td>58 286</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>131</td>
<td>10017A</td>
<td>-3829</td>
<td>14528</td>
<td>259-15200-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>139</td>
<td>11017A</td>
<td>-3846</td>
<td>16041</td>
<td>260-03080-2</td>
<td>60 283</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>066</td>
<td>13017A</td>
<td>-3746</td>
<td>15124</td>
<td>262-03440-2</td>
<td>61 282</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>430</td>
<td>14017A</td>
<td>-4005</td>
<td>14733</td>
<td>263-04010-2</td>
<td>59 285</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>056</td>
<td>15017A</td>
<td>-4717</td>
<td>14523</td>
<td>264-04170-2</td>
<td>54 291</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>064</td>
<td>15017A</td>
<td>-4114</td>
<td>14325</td>
<td>264-04190-2</td>
<td>58 286</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>051</td>
<td>15017A</td>
<td>-3735</td>
<td>14727</td>
<td>264-15120-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>052</td>
<td>15017A</td>
<td>-4340</td>
<td>14537</td>
<td>264-15140-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>045</td>
<td>16017A</td>
<td>-4413</td>
<td>15506</td>
<td>267-03350-2</td>
<td>56 289</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>049</td>
<td>16017A</td>
<td>-3321</td>
<td>15924</td>
<td>267-14270-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>050</td>
<td>16017A</td>
<td>-3928</td>
<td>15742</td>
<td>267-14290-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>019</td>
<td>20017A</td>
<td>-3826</td>
<td>14855</td>
<td>269-15050-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>020</td>
<td>20017A</td>
<td>-4431</td>
<td>14702</td>
<td>269-15070-3</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>234</td>
<td>23017A</td>
<td>-4519</td>
<td>15623</td>
<td>272-03280-2</td>
<td>55 291</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>239</td>
<td>23017A</td>
<td>-3916</td>
<td>15479</td>
<td>272-03300-2</td>
<td>59 286</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>230</td>
<td>23017A</td>
<td>-3311</td>
<td>15249</td>
<td>272-03310-2</td>
<td>63 281</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>228</td>
<td>23017A</td>
<td>-2705</td>
<td>15120</td>
<td>272-03330-2</td>
<td>66 275</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>126</td>
<td>25017A</td>
<td>-3932</td>
<td>14523</td>
<td>274-04060-2</td>
<td>59 287</td>
<td>B 6</td>
<td>11</td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PRIORIT Y R GROUP(1) CONTINUED

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>EL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>08A</td>
<td>020179</td>
<td>-4500</td>
<td>15735</td>
<td>277-03220-2</td>
<td>55</td>
<td>292</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>08A</td>
<td>280179</td>
<td>-3856</td>
<td>15543</td>
<td>277-03240-2</td>
<td>59</td>
<td>287</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>145</td>
<td>00179</td>
<td>-3632</td>
<td>15132</td>
<td>279-14530-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>146</td>
<td>00179</td>
<td>-4237</td>
<td>14946</td>
<td>279-14560-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>136</td>
<td>002079</td>
<td>-4501</td>
<td>15855</td>
<td>282-03160-2</td>
<td>54</td>
<td>293</td>
<td>B</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>134</td>
<td>002079</td>
<td>-3857</td>
<td>15702</td>
<td>282-03180-2</td>
<td>56</td>
<td>288</td>
<td>B</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>094</td>
<td>003079</td>
<td>-4502</td>
<td>15421</td>
<td>283-03340-2</td>
<td>54</td>
<td>294</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>08A</td>
<td>003079</td>
<td>-2647</td>
<td>14919</td>
<td>283-03390-2</td>
<td>66</td>
<td>278</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>143</td>
<td>040279</td>
<td>-4306</td>
<td>14908</td>
<td>284-03530-2</td>
<td>55</td>
<td>292</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>091</td>
<td>040279</td>
<td>-3617</td>
<td>15258</td>
<td>284-14470-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>092</td>
<td>040279</td>
<td>-4222</td>
<td>15112</td>
<td>284-14480-3</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>057</td>
<td>050279</td>
<td>-4126</td>
<td>14402</td>
<td>285-04120-2</td>
<td>56</td>
<td>291</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>062</td>
<td>050279</td>
<td>-3637</td>
<td>14818</td>
<td>285-15050-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>063</td>
<td>050279</td>
<td>-4241</td>
<td>14631</td>
<td>285-15070-3</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>232</td>
<td>180279</td>
<td>-3500</td>
<td>15621</td>
<td>298-03170-2</td>
<td>5A</td>
<td>290</td>
<td>B</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>026</td>
<td>190279</td>
<td>-4422</td>
<td>15435</td>
<td>299-03330-2</td>
<td>50</td>
<td>294</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>056</td>
<td>230279</td>
<td>-3907</td>
<td>15908</td>
<td>303-0390-2</td>
<td>53</td>
<td>295</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>244</td>
<td>240279</td>
<td>-4150</td>
<td>15526</td>
<td>304-03620-2</td>
<td>51</td>
<td>298</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>074</td>
<td>260279</td>
<td>-3746</td>
<td>14514</td>
<td>306-04030-2</td>
<td>54</td>
<td>295</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>105</td>
<td>300279</td>
<td>-4017</td>
<td>14524</td>
<td>338-03580-2</td>
<td>41</td>
<td>309</td>
<td>R</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>017</td>
<td>280479</td>
<td>-2708</td>
<td>15458</td>
<td>367-03600-2</td>
<td>44</td>
<td>309</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>152</td>
<td>290479</td>
<td>-4171</td>
<td>15411</td>
<td>364-03200-2</td>
<td>30</td>
<td>320</td>
<td>R</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>152</td>
<td>300479</td>
<td>-4171</td>
<td>14910</td>
<td>364-03390-2</td>
<td>31</td>
<td>320</td>
<td>R</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>284</td>
<td>040579</td>
<td>-4429</td>
<td>15622</td>
<td>373-03140-2</td>
<td>25</td>
<td>323</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>278</td>
<td>040579</td>
<td>-2616</td>
<td>15126</td>
<td>373-03190-2</td>
<td>43</td>
<td>310</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>163</td>
<td>050579</td>
<td>-4228</td>
<td>15109</td>
<td>374-03330-2</td>
<td>27</td>
<td>323</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NUMBER OF IMAGES PRIORITY 9, GROUP(1) = 127

GROUP(2), C/C TAPES HAVE BEEN ORDERED BUT NOT RECEIVED AS OF 02 APR 81

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>EL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>173</td>
<td>100678</td>
<td>-3711</td>
<td>14755</td>
<td>045-15340-3</td>
<td>A</td>
<td>60</td>
<td>26</td>
<td>-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>018</td>
<td>110678</td>
<td>-3138</td>
<td>16048</td>
<td>046-03290-2</td>
<td>27</td>
<td>318</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>309</td>
<td>120678</td>
<td>-3307</td>
<td>15637</td>
<td>047-03470-2</td>
<td>25</td>
<td>319</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>307</td>
<td>120678</td>
<td>-2701</td>
<td>15508</td>
<td>047-03480-2</td>
<td>31</td>
<td>315</td>
<td>P</td>
<td>60</td>
<td>125</td>
<td>-17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>069</td>
<td>150678</td>
<td>-3238</td>
<td>15032</td>
<td>050-15310-3</td>
<td>R</td>
<td>60</td>
<td>47</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>008</td>
<td>170678</td>
<td>-3921</td>
<td>15495</td>
<td>052-03390-3</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>267</td>
<td>200678</td>
<td>-4014</td>
<td>14619</td>
<td>055-04330-2</td>
<td>19</td>
<td>323</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>134</td>
<td>210678</td>
<td>-3623</td>
<td>15502</td>
<td>117-03450-1</td>
<td>33</td>
<td>313</td>
<td>R</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>117</td>
<td>210678</td>
<td>-4025</td>
<td>15947</td>
<td>117-14380-3</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>118</td>
<td>210678</td>
<td>-4630</td>
<td>15749</td>
<td>117-14400-3</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>264</td>
<td>260978</td>
<td>-3839</td>
<td>16108</td>
<td>153-03180-2</td>
<td>42</td>
<td>301</td>
<td>P</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>046</td>
<td>280978</td>
<td>-4607</td>
<td>15422</td>
<td>155-05200-2</td>
<td>36</td>
<td>305</td>
<td>R</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>044</td>
<td>280978</td>
<td>-4004</td>
<td>15225</td>
<td>155-03540-2</td>
<td>41</td>
<td>301</td>
<td>R</td>
<td>60</td>
<td>22</td>
<td>-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>194</td>
<td>290978</td>
<td>-4220</td>
<td>15050</td>
<td>156-15060-3</td>
<td>R</td>
<td>60</td>
<td>18</td>
<td>-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>139</td>
<td>311078</td>
<td>-4747</td>
<td>15121</td>
<td>148-15000-3</td>
<td>P</td>
<td>60</td>
<td>24</td>
<td>-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NUMBER OF IMAGES PRIORITY R, GROUP(2) = 15

GROUP(3), C/C TAPES HAVE BEEN RECEIVED FOR THE FOLLOWING IMAGES

<table>
<thead>
<tr>
<th>R</th>
<th>FR</th>
<th>DATE</th>
<th>LAT</th>
<th>LONG</th>
<th>DAY</th>
<th>HHMM</th>
<th>T</th>
<th>EL</th>
<th>AZ</th>
<th>P</th>
<th>STATUS</th>
<th>POS</th>
<th>FRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>08</td>
<td>021</td>
<td>150578</td>
<td>-3617</td>
<td>14546</td>
<td>019-15520-3</td>
<td>R</td>
<td>GOR</td>
<td>20</td>
<td>-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>113</td>
<td>230678</td>
<td>-4650</td>
<td>15820</td>
<td>058-14450-3</td>
<td>R</td>
<td>GOR</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>147</td>
<td>250678</td>
<td>-2959</td>
<td>15410</td>
<td>060-15170-3</td>
<td>E</td>
<td>GOR</td>
<td>53</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIORITY R GROUP(3) CONTINUED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P FR</td>
<td>DATE</td>
<td>LAT</td>
<td>LONG</td>
<td>DAY</td>
<td>HHMM</td>
<td>T</td>
<td>EL</td>
<td>AZ</td>
<td>POS</td>
<td>P</td>
<td>STATUS</td>
<td>FNR</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-----</td>
<td>---</td>
<td>---------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>209</td>
<td>040778</td>
<td>-4550</td>
<td>15410</td>
<td>049-03530-2</td>
<td>14</td>
<td>326</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>004</td>
<td>100778</td>
<td>-4543</td>
<td>15413</td>
<td>075-15010-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>027</td>
<td>210778</td>
<td>-2957</td>
<td>15717</td>
<td>046-15010-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>158</td>
<td>180778</td>
<td>-3626</td>
<td>15013</td>
<td>114-15200-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>159</td>
<td>180778</td>
<td>-4231</td>
<td>14826</td>
<td>114-15220-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>137</td>
<td>210778</td>
<td>-4229</td>
<td>15649</td>
<td>117-03440-2</td>
<td>2A</td>
<td>31A</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>135</td>
<td>210778</td>
<td>-3623</td>
<td>15502</td>
<td>117-03450-2</td>
<td>33</td>
<td>313</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>123</td>
<td>220778</td>
<td>-4306</td>
<td>15426</td>
<td>118-14570-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>178</td>
<td>230778</td>
<td>-4234</td>
<td>15005</td>
<td>119-15150-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>017</td>
<td>290778</td>
<td>-4325</td>
<td>14639</td>
<td>125-15270-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>235</td>
<td>070978</td>
<td>-4517</td>
<td>15253</td>
<td>134-04000-2</td>
<td>30</td>
<td>312</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>241</td>
<td>070978</td>
<td>-4258</td>
<td>15407</td>
<td>134-14560-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>012</td>
<td>120978</td>
<td>-4143</td>
<td>15552</td>
<td>139-14490-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>035</td>
<td>170978</td>
<td>-3921</td>
<td>16001</td>
<td>144-14420-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>146</td>
<td>230978</td>
<td>-3930</td>
<td>15450</td>
<td>150-15450-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>147</td>
<td>230978</td>
<td>-4535</td>
<td>15254</td>
<td>150-15460-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>233</td>
<td>250978</td>
<td>-4243</td>
<td>14238</td>
<td>152-04360-2</td>
<td>3A</td>
<td>304</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>190</td>
<td>051078</td>
<td>-4613</td>
<td>14648</td>
<td>162-04220-2</td>
<td>38</td>
<td>302</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>188</td>
<td>051078</td>
<td>-4010</td>
<td>14451</td>
<td>162-04240-2</td>
<td>43</td>
<td>298</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>047</td>
<td>141078</td>
<td>-4150</td>
<td>14356</td>
<td>173-04270-2</td>
<td>44</td>
<td>295</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>041</td>
<td>271078</td>
<td>-4206</td>
<td>14249</td>
<td>184-04310-2</td>
<td>47</td>
<td>297</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>129</td>
<td>301078</td>
<td>-3825</td>
<td>15709</td>
<td>187-14410-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>142</td>
<td>141178</td>
<td>-3917</td>
<td>15733</td>
<td>202-03270-2</td>
<td>53</td>
<td>285</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>137</td>
<td>191178</td>
<td>-3842</td>
<td>16841</td>
<td>207-03210-2</td>
<td>54</td>
<td>283</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>518</td>
<td>271178</td>
<td>-4019</td>
<td>16645</td>
<td>215-04090-2</td>
<td>55</td>
<td>283</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>039</td>
<td>111278</td>
<td>-4520</td>
<td>15419</td>
<td>219-03430-2</td>
<td>33</td>
<td>287</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>037</td>
<td>011278</td>
<td>-3915</td>
<td>15224</td>
<td>219-03450-2</td>
<td>56</td>
<td>282</td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>012</td>
<td>191278</td>
<td>-3200</td>
<td>14917</td>
<td>237-15110-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>013</td>
<td>191278</td>
<td>-3807</td>
<td>14739</td>
<td>237-15120-3</td>
<td></td>
<td></td>
<td>B</td>
<td>GOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NUMBER OF IMAGES PRIORITY R, GROUP(3) = 32

NUMBER OF IMAGES PRIORITY R = 174

TOTAL NUMBER OF IMAGES LISTED = 384

ORIGINAL PAGE IS OF POOR QUALITY.
References.


Reid, J.L.Jr., 1961: On the geostrophic flow at the surface of the Pacific Ocean with respect to the 1000 decibar surface. Tellus, 13, 489-502.


Scientific exploration of the South Pacific, Warren S. Wooster,

Wyrtki, K., 1962: Geopotential topographies and associated circulation
89-105.

Wyrtki, K., 1974: The dynamic topography of the Pacific Ocean and its
fluctuations. Hawaii Institute of Geophysics, Report HIG-74-5,
19pp.
Figure 1a: Dynamic height anomaly (0 re 1300 dbar in dyn cm) deduced from probes along ABCDEF (HMAS Diamantina, 4-11 Sept 78). The rectangle shows the location of the Tasman Front.
bar in dyn cm) deduced from AXBT probes (29 Aug 78, filled circles), XBT
w., 4-11 Sept 78), at open circles (HMAS Diamantina, 13-18 Sept 78). The
Tasman Front found by Stanton (1976).
Figure 2a: XBT profiles from quiescent regions north and south of the Tasman Front. The warm profiles are from leg KL of Fig. 1c between 155.4 and 156.3°E; the cold profiles are from the leg along 36°S in Fig. 1d between 155 and 156.2°E.
Figure 2b: XBT profiles from the centres of a warm eddy on the warm side and a cold eddy on the cold side of the Tasman Front. The profiles are from the leg along 34°S in Fig. 1d; the warm profiles lie between 157.7 and 158.7°E while the cool profiles lie between 159.6 and 160.5°E.
Figure 2c: XBT profiles from a detached warm eddy south of the Tasman Front and a detached cool eddy north of the Front. The warm profiles are from the leg along 36°S in Fig. 1d between 151.5 and 152.4°E; the cold profiles are from leg HIJ of Fig. 1c, 50km either side of I.
Figure 3a: Vertical isotherm section (°C) from XBT probes and a thermograph sea surface temperature trace along leg BCD of Fig. 1a.
Figure 3b: Vertical isotherm section (°C) from XBT probes and a thermograph sea surface temperature trace along leg EF of Fig. 1a.
Figure 4: Sea surface temperature patterns from thermograph along cruise track of Fig. 1. Individual isotherms have been drawn and the regions between have been shaded to show 1°C resolution zones according to the legend.
Figure 5. Digitally enhanced NOAA-4 IR image 13 Oct 77; cold is white.
Figure 6. Photographically enhanced HCM IR image 14 Nov 78; cold is white.
Figure 7. System flowchart for HCM Photo image processing.
Figure 8. System flowchart for HCM Computer-compatible Tape (CCT) processing.
Figure 9. Contoured output of the "statistics" program for image 117-03470-2. This program derives mean temperatures for each 20 X 20 pixel box of the CCT image data. Each such box is 2mm square on the photos.
Figure 11. Standard NASA HCM IR image 21 Aug 78 (daytime); solid black white.
Fig. 10. Corrected coordinate grid overlay for HCM image 117-03470-2 (Fig. 11).
Figure 12. Digitally enhanced HCM IR image from CCT data for 21 Aug 78 (daytime); cold is white.
Figure 13. Surface dynamic topography (dyn m re 1300 dbar) for CSIRO Cruise SP 11/78 (5-18 Aug 78). The warm core is shown by the stippled area; courtesy F.M. Boland and J.A. Church, CSIRO.