

Celebes Sea

Overview

The Celebes Sea is located in the western Pacific Ocean north of the Indonesian Island of Celebes and south of the Sulu Sea and the Philippines (Figure 1). It is a deep-water sea, roughly circular with several exits to the Sulu Sea (to the north), the Makassar Strait (to the south), and the Philippine and Molucca Seas (to the east).

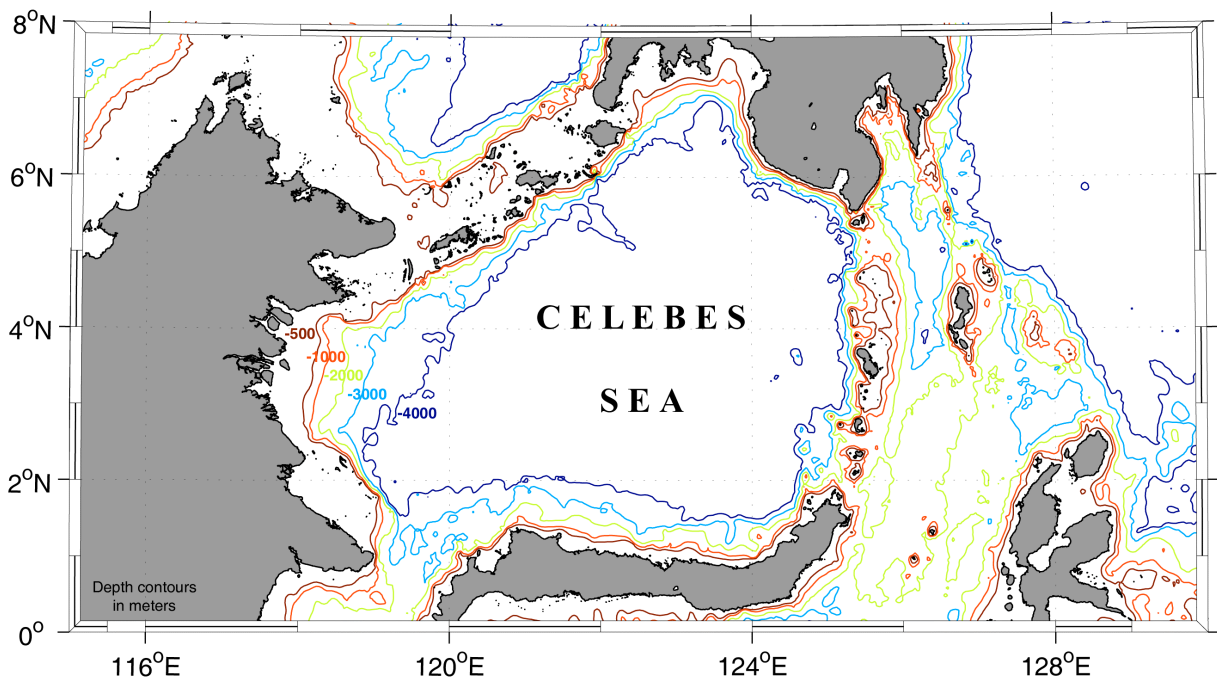


Figure 1. Bathymetry of the Celebes Sea. [Smith and Sandwell, 1997]

Observations

Like the Sulu Sea to the north, the Celebes Sea has a depth of over 4000 meters. It is surrounded by a shallow water regime along the edges of the adjacent landmasses and islands. The water depth in the northern region changes rapidly, from over 4000 m in Sulu Sea to approximately 100 m in the area across the Sulu Archipelago, returning to over 4000 m in the Celebes Sea. These bathymetric changes take place over approximately 150-km of horizontal distance. A similar situation takes place at the eastern end among the Kepulauan Sangi Islands. Both of these areas appear to be the sources of the internal waves observed in the Celebes Sea.

There has been very little scientific research on the internal waves in the Celebes Sea. Satellite imagery indicates the internal waves are similar in character to those observed in the Sulu Sea. Internal waves are expected to occur all year round in the Celebes Sea, similar to other regions of the tropical Pacific (Table 1).

Table 1 - Months when internal waves have been observed in the Celebes Sea.
(Numbers indicate unique dates in that month when waves have been noted)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
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Figures 2 – 4 are MODIS images acquired over Celebes Sea during 2003. The imagery indicates that the internal waves originate in the northeast and northwest corners of the Celebes Sea and propagate to the southeast and southwest, respectively. Interpacket separations are on the order of 100 km with implied propagation speeds greater than 2 m/s.

Figure 6 is a MODIS image Kepulauan Taland. While not strictly part of the Celebes Sea, it along with the other islands Kepulauan Sangi, separate the Celebes and Molucca Seas. The image shows the signature of recently formed internal wave packets (one north and one south) of the Island propagating into the Molucca Sea, highlighting the wave sources in this area.

References

Smith, W. H. F., and D. T. Sandwell, 1997; Global seafloor topography from satellite altimetry and ship depth soundings, *Science*, v. 277, 1957-1962
http://topex.ucsd.edu/marine_topo/mar_topo.html

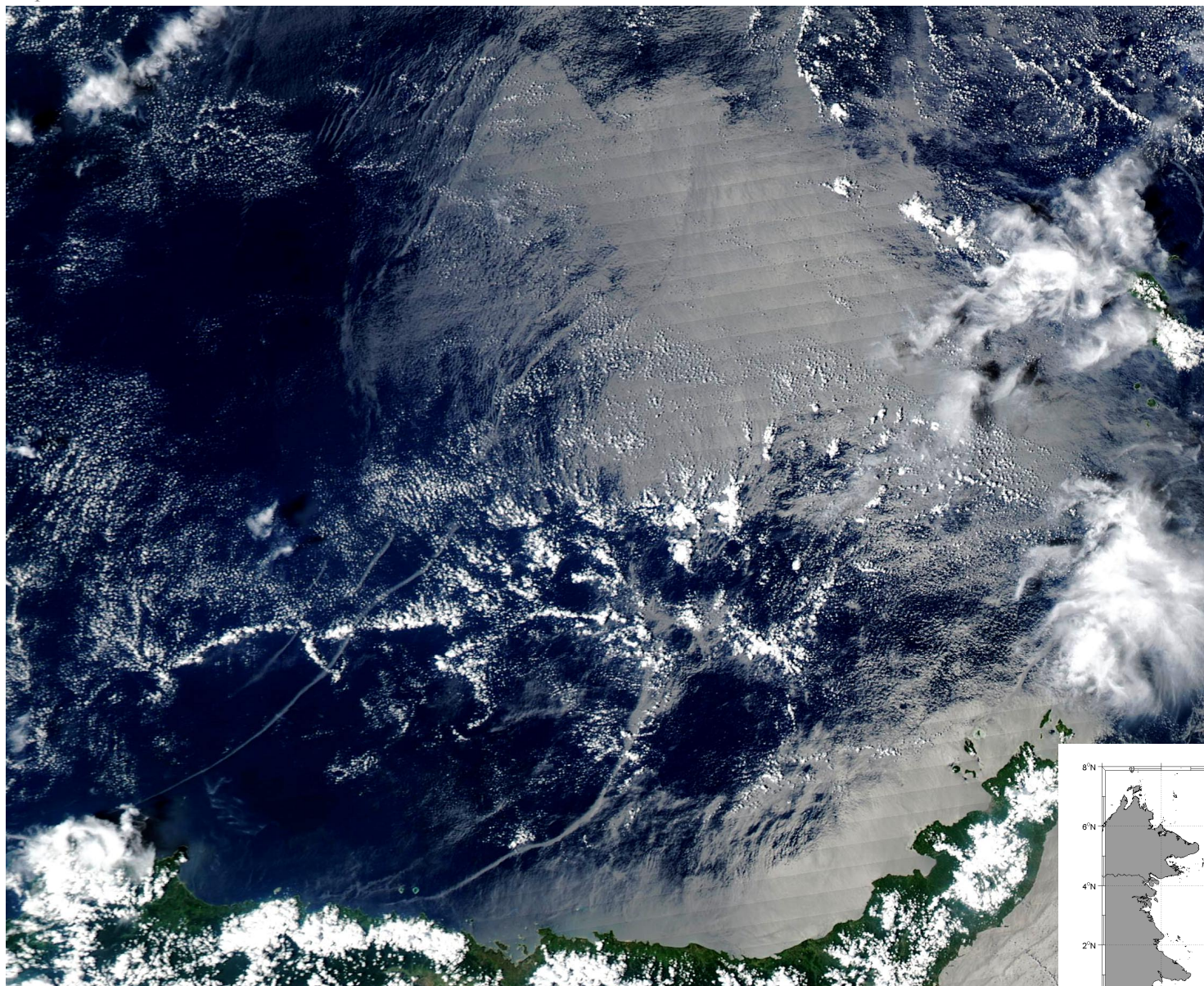


Figure 2. MODIS (Bands 1,3,4) 250-m resolution visible image of the Celebes Sea acquired on 28 October 2003 at 0500 UTC. The image shows three packets of internal waves propagating the southeast. Imaged area is approximately 590 km x 455 km.

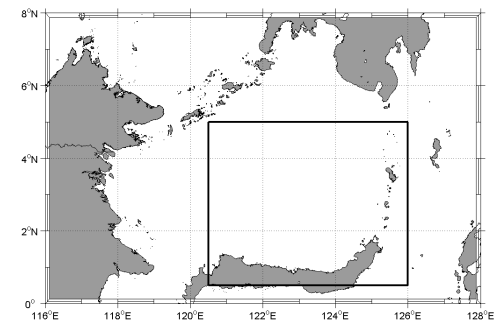
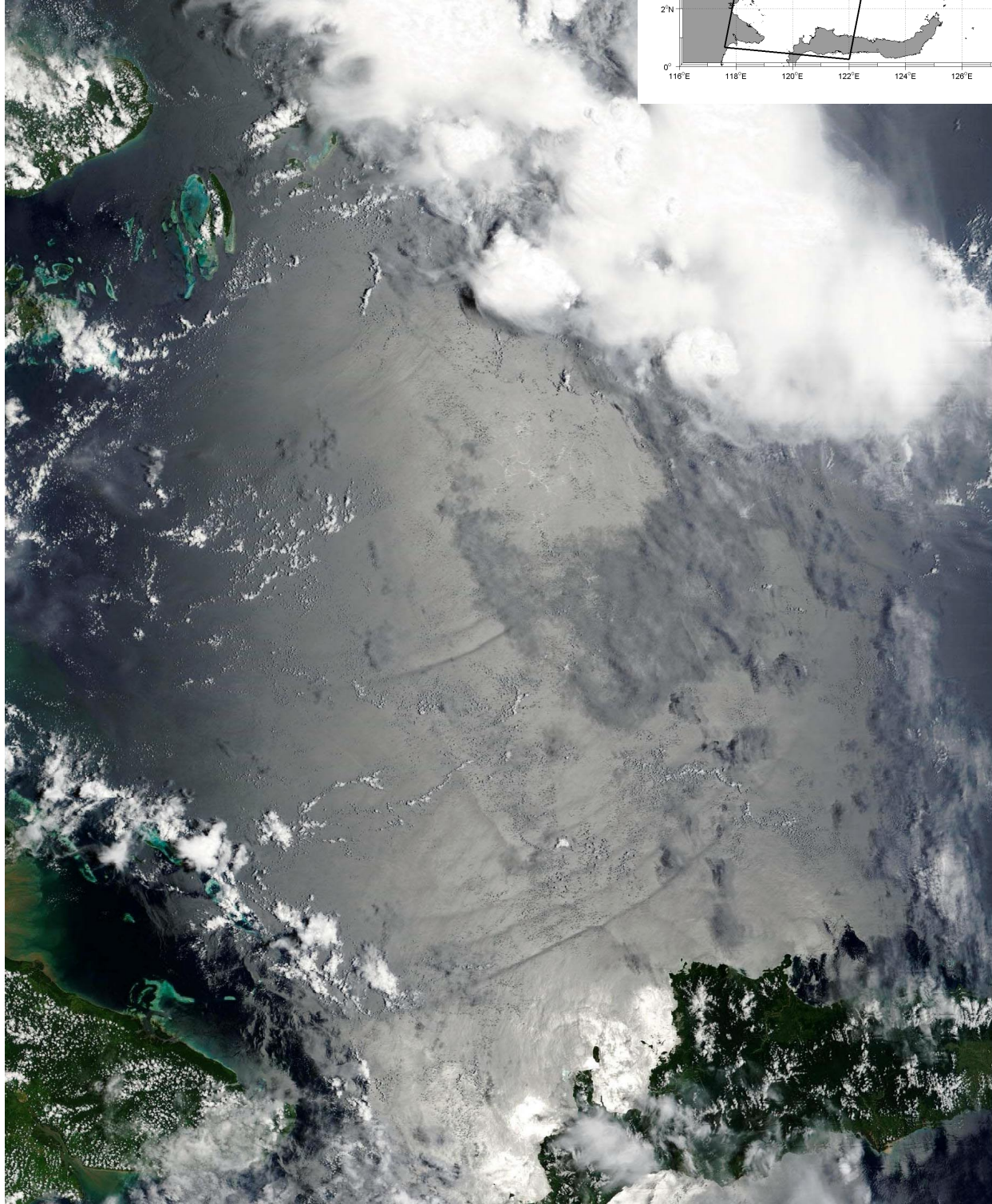


Figure 3. MODIS (Bands 1,3,4) 250-m resolution visible image of the western Celebes Sea acquired on 21 March 2003 at 0235 UTC. The image shows the signature of two internal wave packets propagating the southeast along with one propagating to the southwest. Imaged area is approximately 455 km x 570 km.



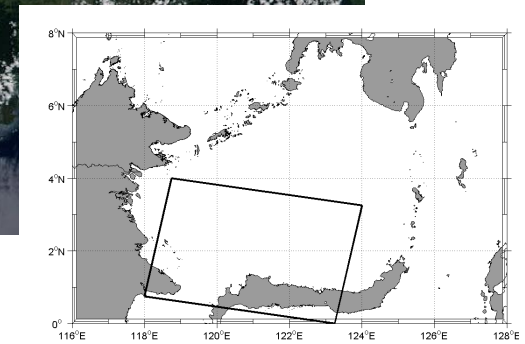
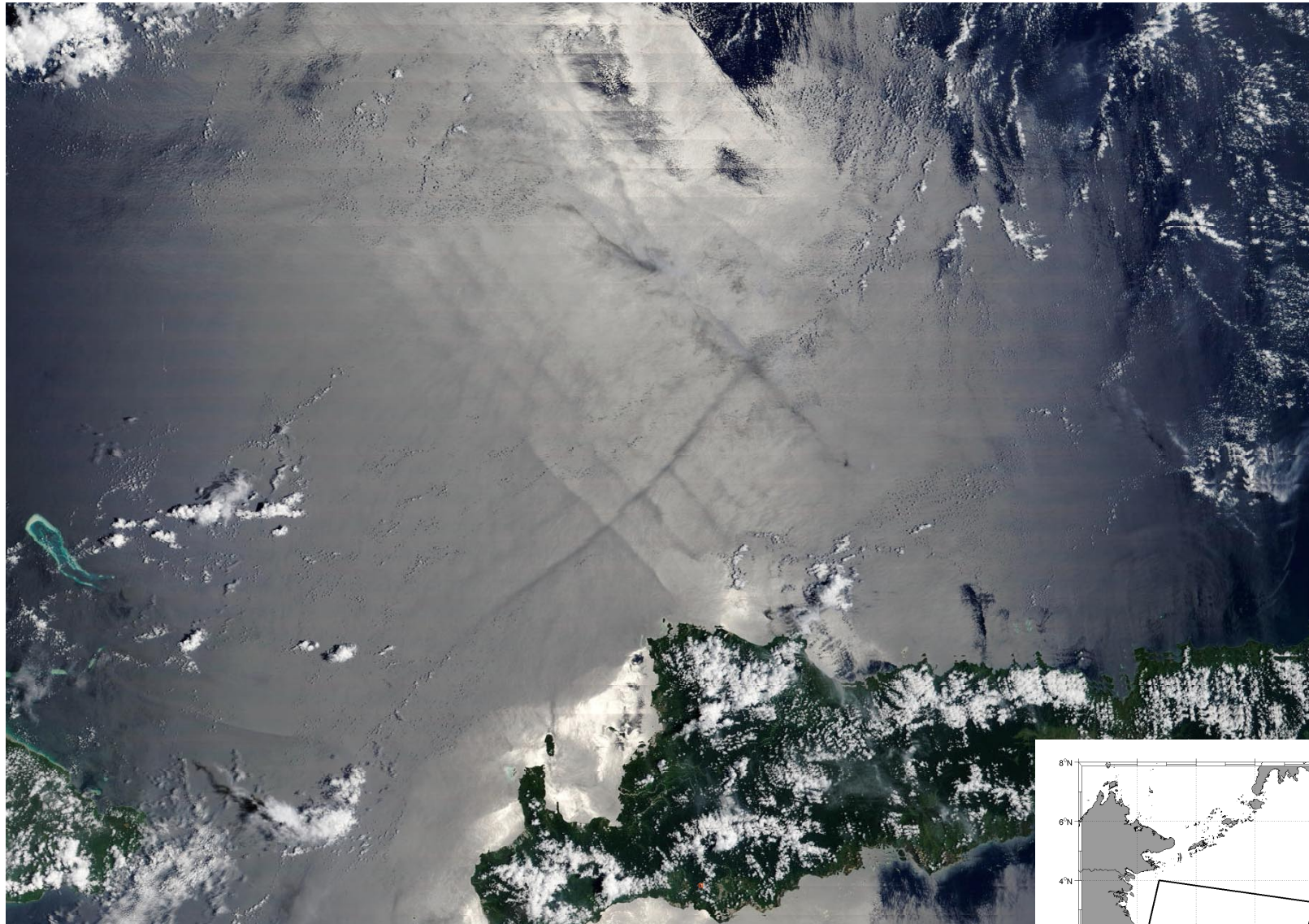


Figure 4. MODIS (Bands 1,3,4) 250-m resolution visible image of the western Celebes Sea acquired on 5 March 2003 at 0235 UTC. The image shows two crossing internal wave packets just north of Celebes Island. Imaged area is approximately 455 km x 320 km

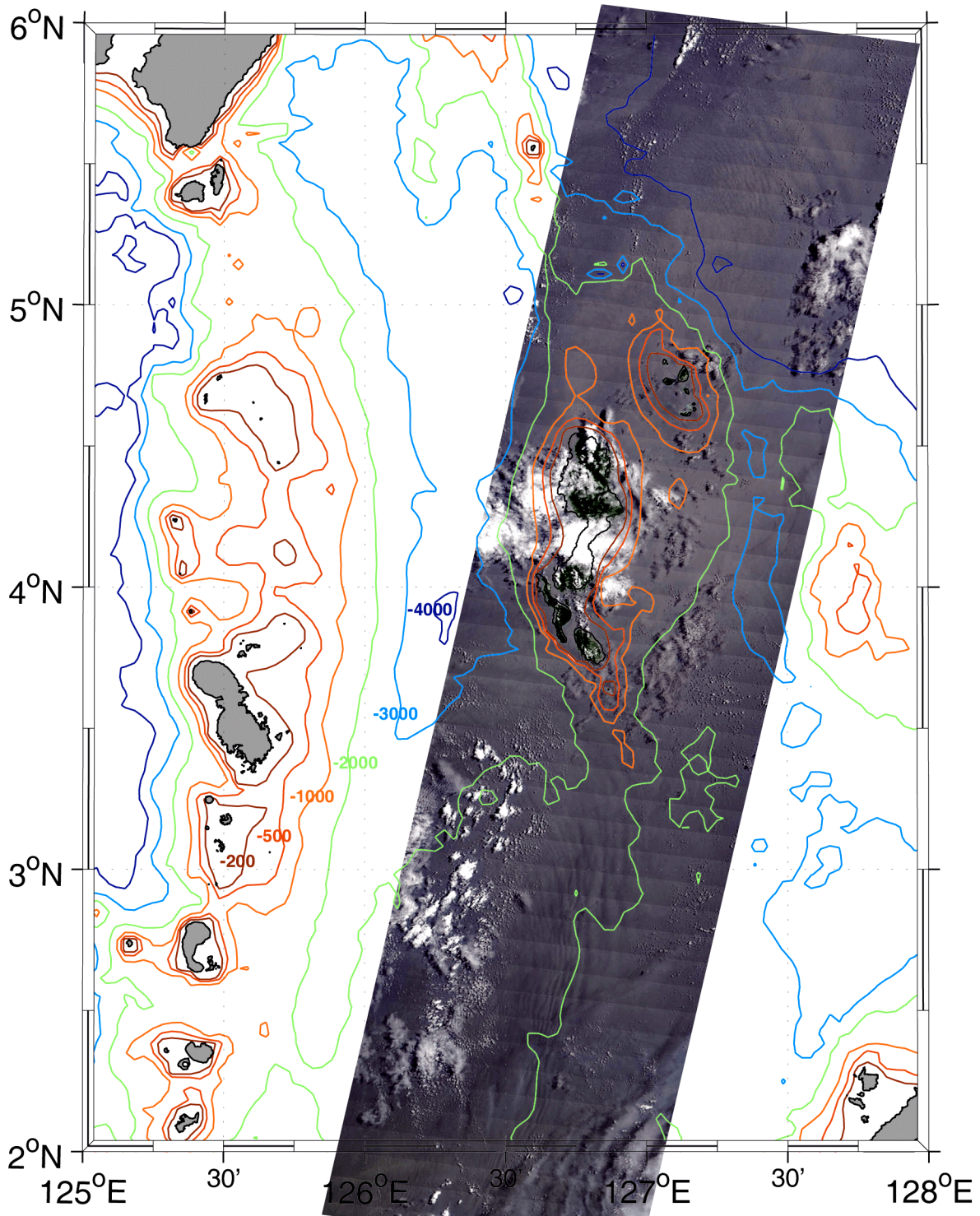


Figure 5. MODIS visible image of Kepulauan Taland in the region between the Celebes and Molucca Seas from 16 August 2003 shown with the local bathymetry [Smith and Sandwell, 1997]

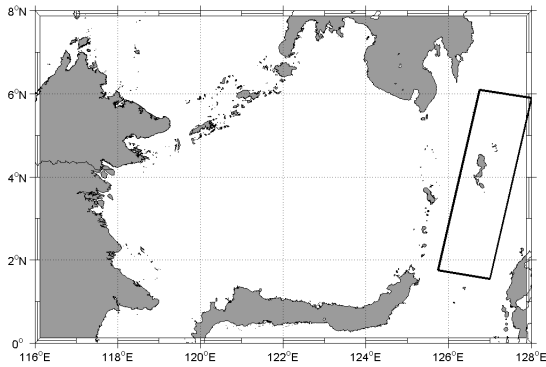
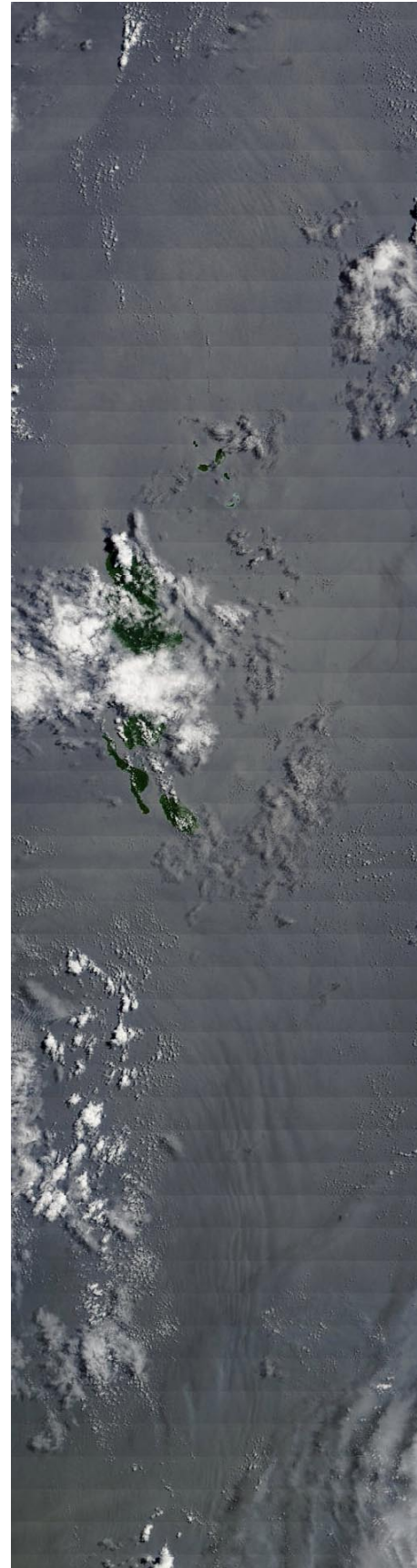
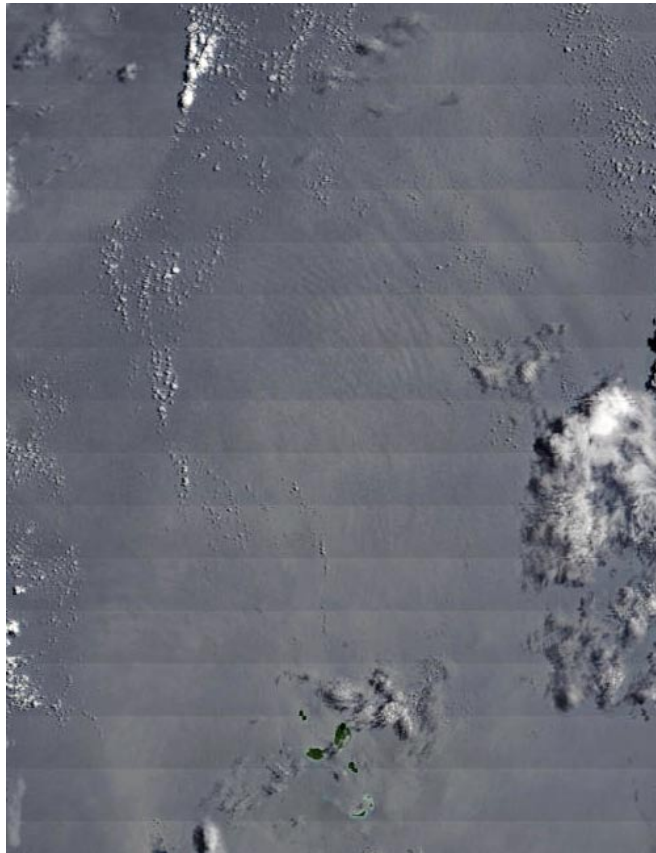


Figure 6. (Right) MODIS (Bands 1,3,4) 250-m resolution visible image Kepulauan Taland acquired on 16 August 2003 at 0210 UTC. The image shows the signature of two internal wave packets (one north, one south) of the island propagating east into the Molucca Sea. Imaged area is approximately 125 km x 480 km (Below) Enlargement showing the northern internal wave packet signature. Imaged area is approximately 125 km x 160 km.



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