

Galapagos Islands

Overview

The Galapagos Islands are composed of thirteen primary islands located in the equatorial Pacific (between approximately 2° S. and 1° N. latitude and 88° and 92° W. longitude). The islands are volcanic in origin and are scattered over an area of approximately 72000 sq. km about 965 km west of Ecuador (Figure 1).

ERS, SIR-C and Space Shuttle photography have shown a complex distribution of internal wave signatures around the archipelago. This kind of complex wave distribution has been observed around other volcanic islands (e.g. the Azores) and is the result of a large number of internal wave sources. Sources for the waves include the sills between islands and seamounts.

Figures 2a and 2b presents the SIR-C data collected in April 1994. These images show two different internal wave patterns between Isabela Island and Santa Maria Island. Figure 2a (13 April 1994) shows a large recently formed soliton packet with 4 oscillations traveling to the right (northwest). The wavelength of the lead soliton is approximately 2.2 km. The sill between the islands, near the 500-meter break is the most likely source (Figure 3). Two other packets are visible propagating toward the top left of the image (west). Interpacket pacing of approximately 34 km gives a propagation speed near 0.9 m/s. In figure 2b, (11 April 1994) the large soliton is absent and a complex collection of packets can be seen propagating toward Isabela Island. Both figures show significant internal wave activity in the lower part of the images (to the south and southeast of Santa Maria Island).

Figure 5 is an ERS-1 image of the area between Santa Maria Island and Santa Cruz Island. The image shows internal waves propagating in most every direction, testifying to the number of source locations around the islands. An interpacket separation, for two wave packets from the same source, is around 32 km.

Figure 6 is a Space Shuttle photograph near the eastern end of the archipelago. An internal wave packet, with an along crest length of approximately 60 km, can be seen propagating north (toward San Christobel Island and west. The wavelength of the lead soliton is approximately 1 km. The wave appears to be a combination of two waves that formed at different locations near the 500 isobath. This is type of combination is common and often seen in continental shelf internal waves.

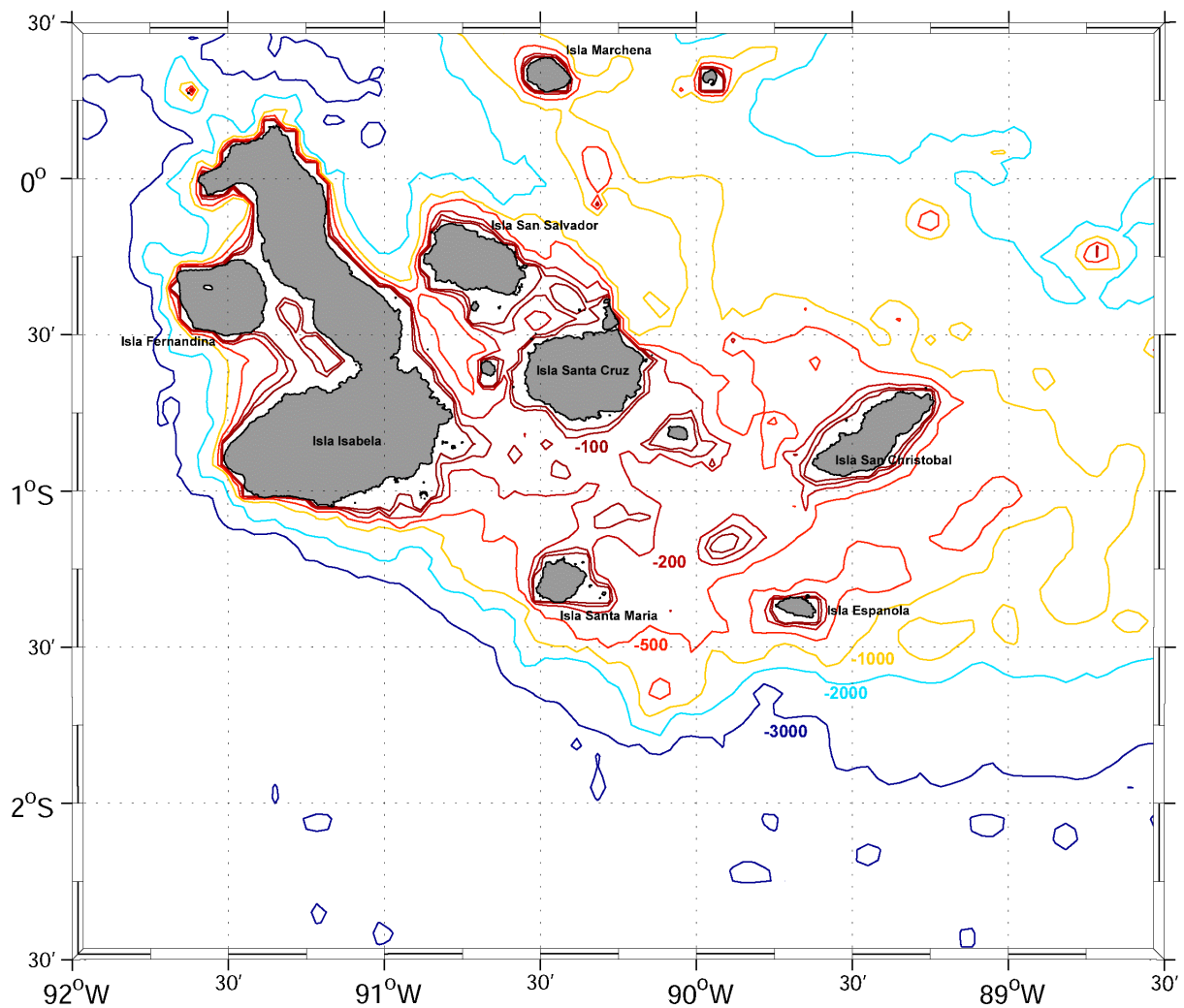
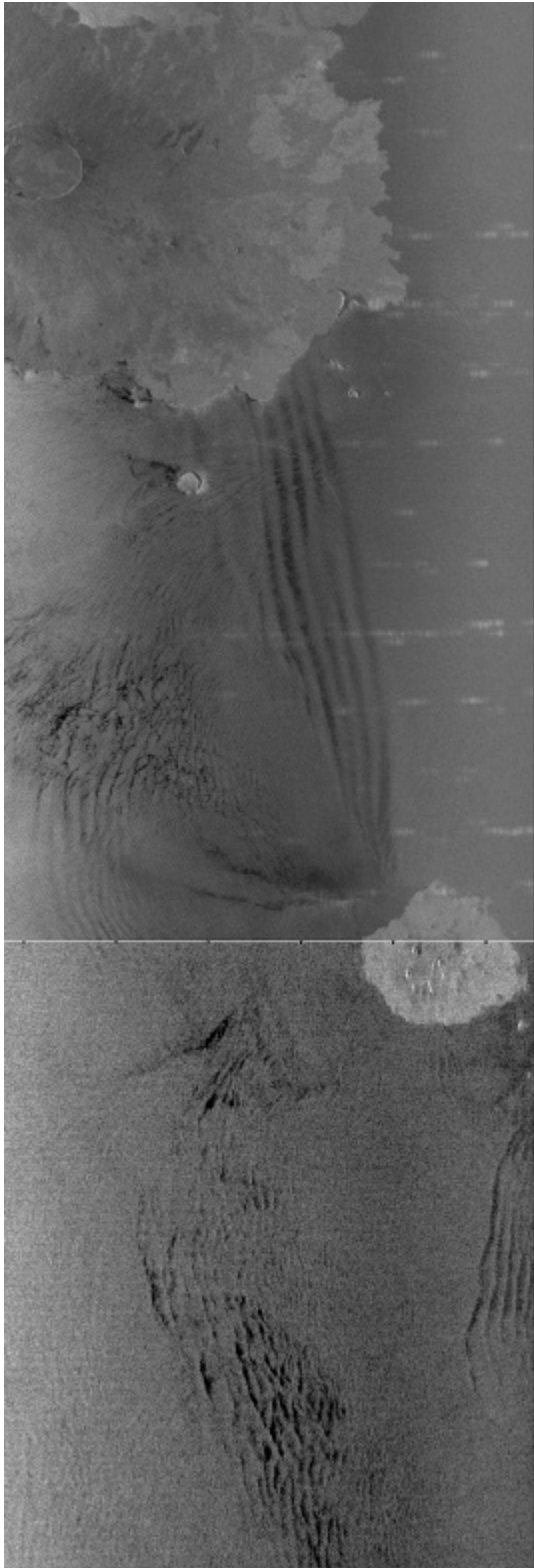
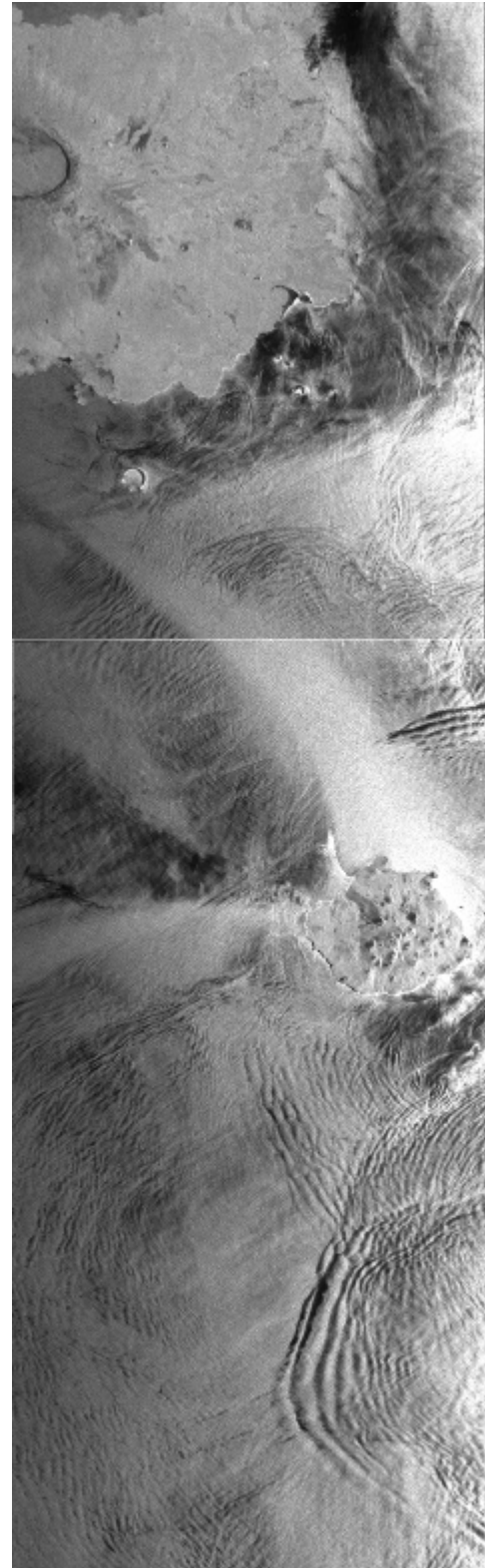


Figure 1: Bathymetry map of the Galapagos Islands (Derived from Smith and Sandwell version 8.2)



SIR-C April 13, 1994
(Data Take 72.7) 20:52 GMT.



X-SAR April 11, 1994
(Data Take 40.5) 21:31 GMT

Figure 2. SIR-C / X-SAR survey data showing two different internal wave patterns between Isabela Island and Santa Maria Island (Galapagos)

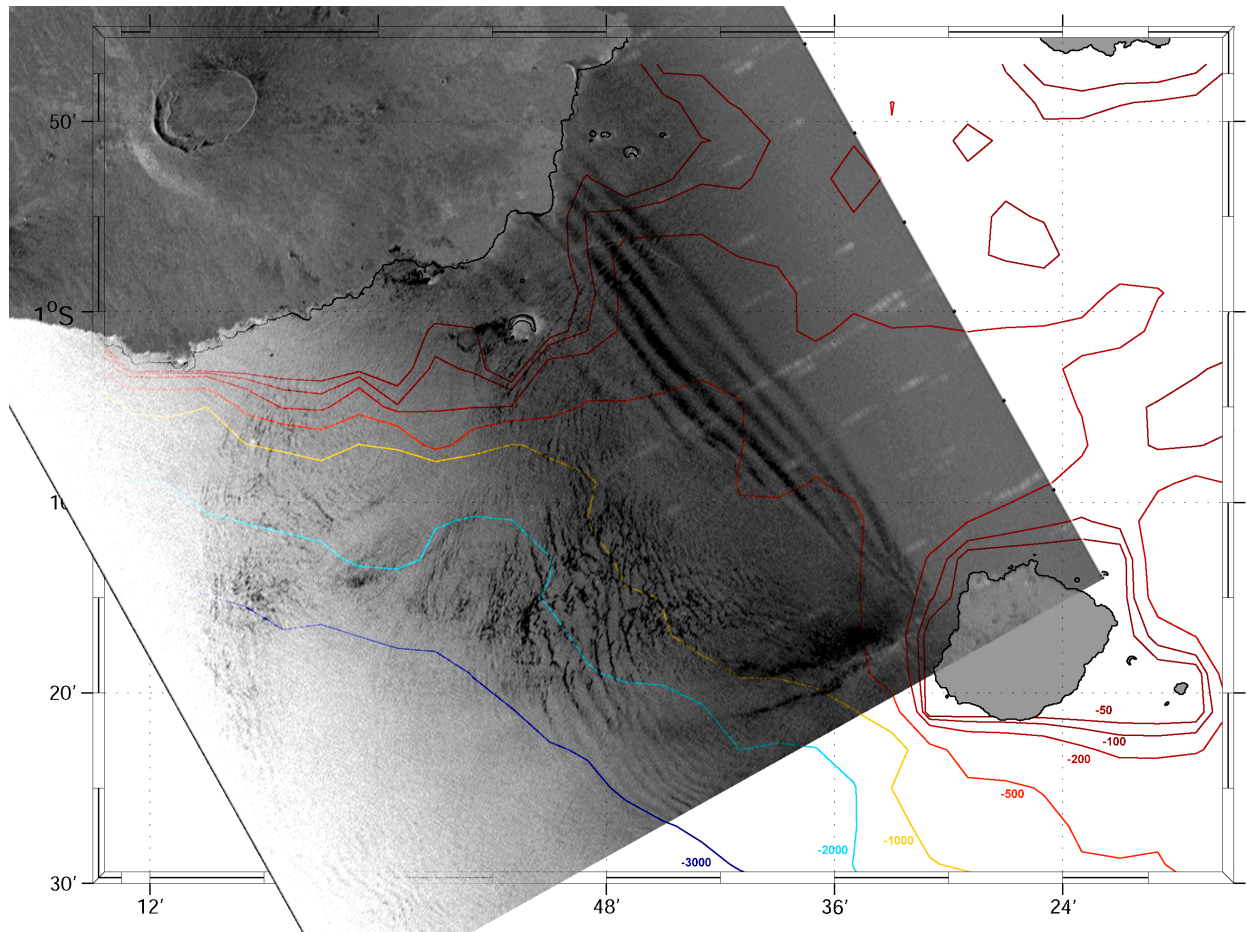


Figure: 3. SIR-C survey image showing an of internal wave train between Isabela Island and Santa Maria Island (Galapagos) acquired on April 13, 1994 (Data Take 72.7) 20:52 GMT. The image is 85 km wide

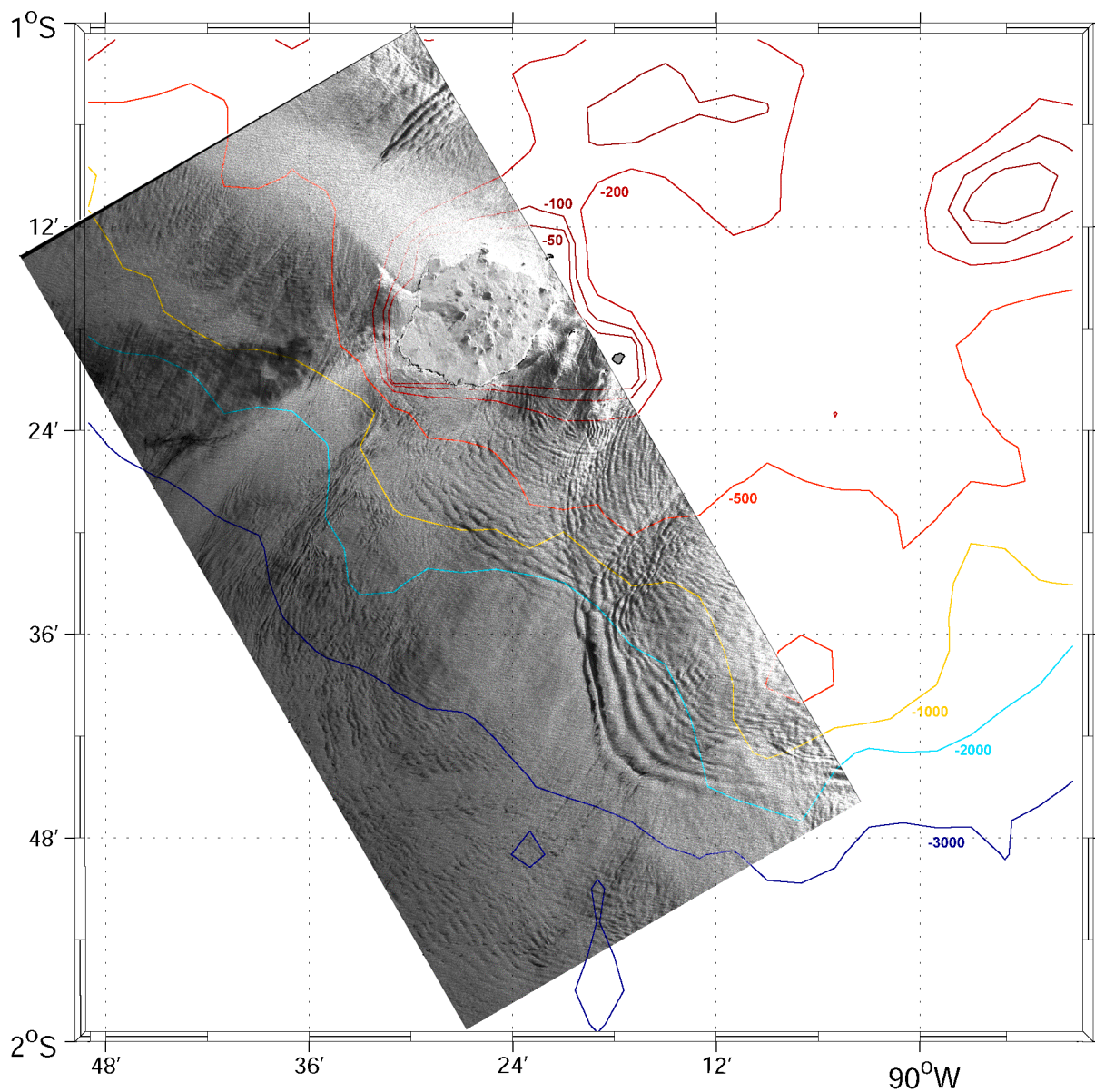


Figure: 4. SIR-C survey image of internal waves southeast of Santa Maria Island (Galapagos) acquired on April 11, 1994 (Data Take 40.5) 21:31 GMT. The image dimensions are 100 km x 50.7 km.

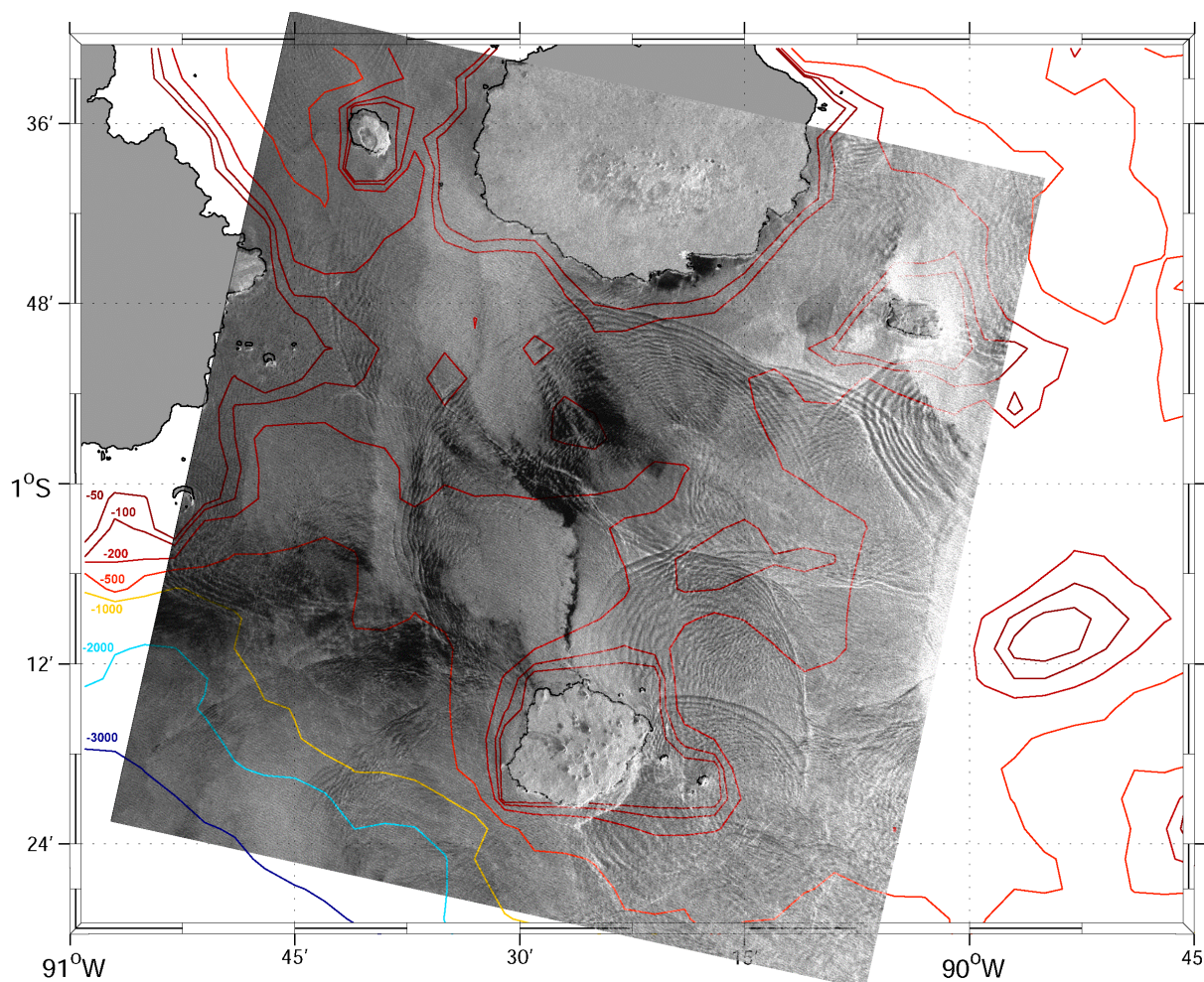


Figure 5. Internal waves between Santa Cruz Island and Santa Maria Island (Galapagos). ERS-1 C-band VV SAR image (Orbit 02027, Frame 3627) acquired November 18, 1992, 16:20 GMT. Image dimensions are 100 km x 100 km. [Original image ©1997 ESA from The Tropical and Subtropical Ocean Viewed by ERS SAR <http://www.ifm.uni-hamburg.de/ers-sar/>]

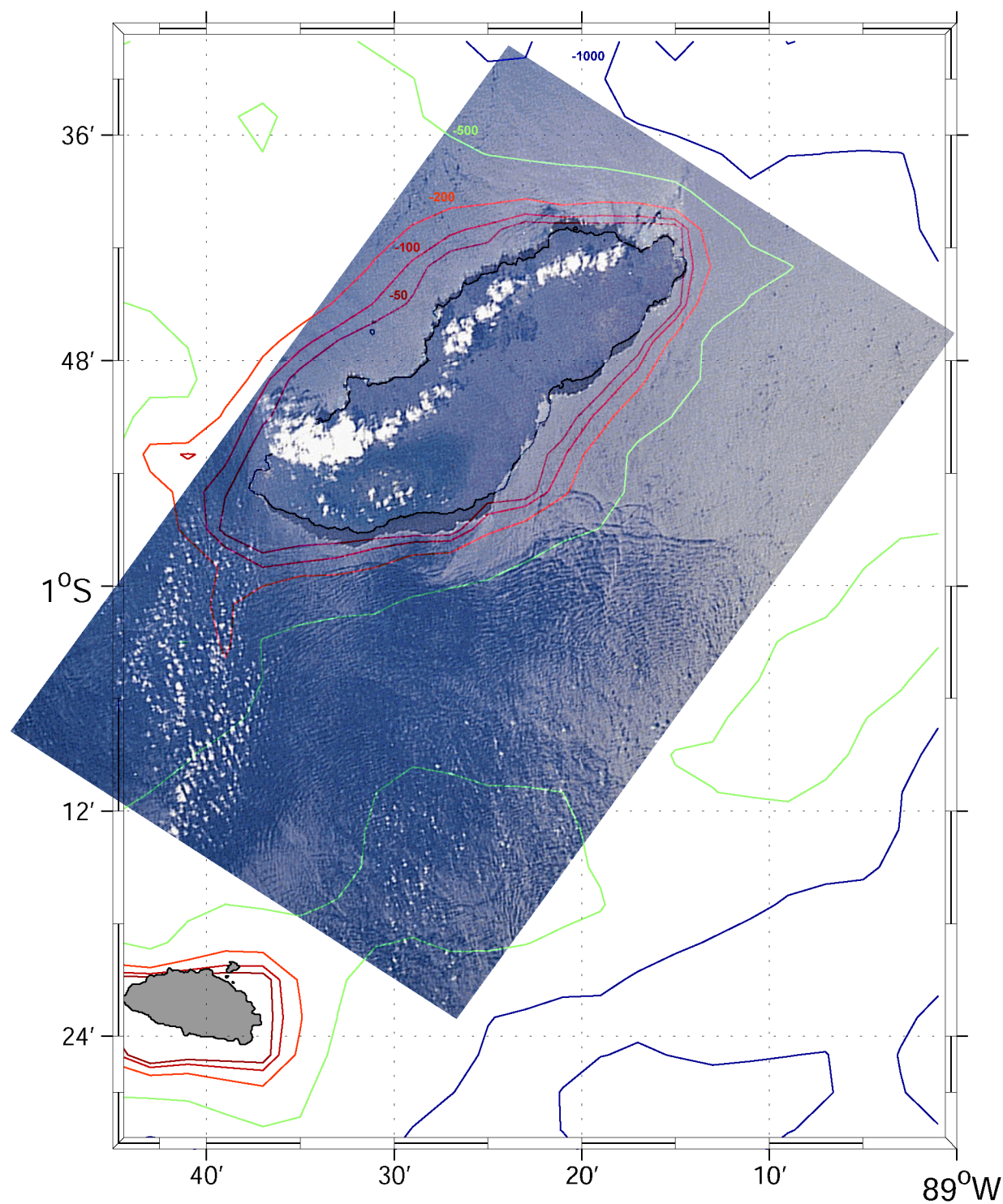


Figure 6. Internal waves south of San Cristobal Island (Galapagos). Space Shuttle Photographs (STS41b-031-1100) acquired February 3, 1984. Image dimensions are approximately 80 km x 60 km. Image Courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (<http://eol.jsc.nasa.gov>).

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