

## Kuril Islands

### Overview

The Kuril Islands are a chain of more than 30 volcanic islands stretching 1245 km between the southern tip of the Kamchatka Peninsula (51°N, 157°E) and the Japanese Island of Hokkaido (42°N, 146°E). The area is influenced by the Oyashio (Kurile) current that flows south along the Pacific side of the southern Kurile Islands. The region develops seasonal thermocline at a depth shallower than 50 meters during the summer [LME 2004].

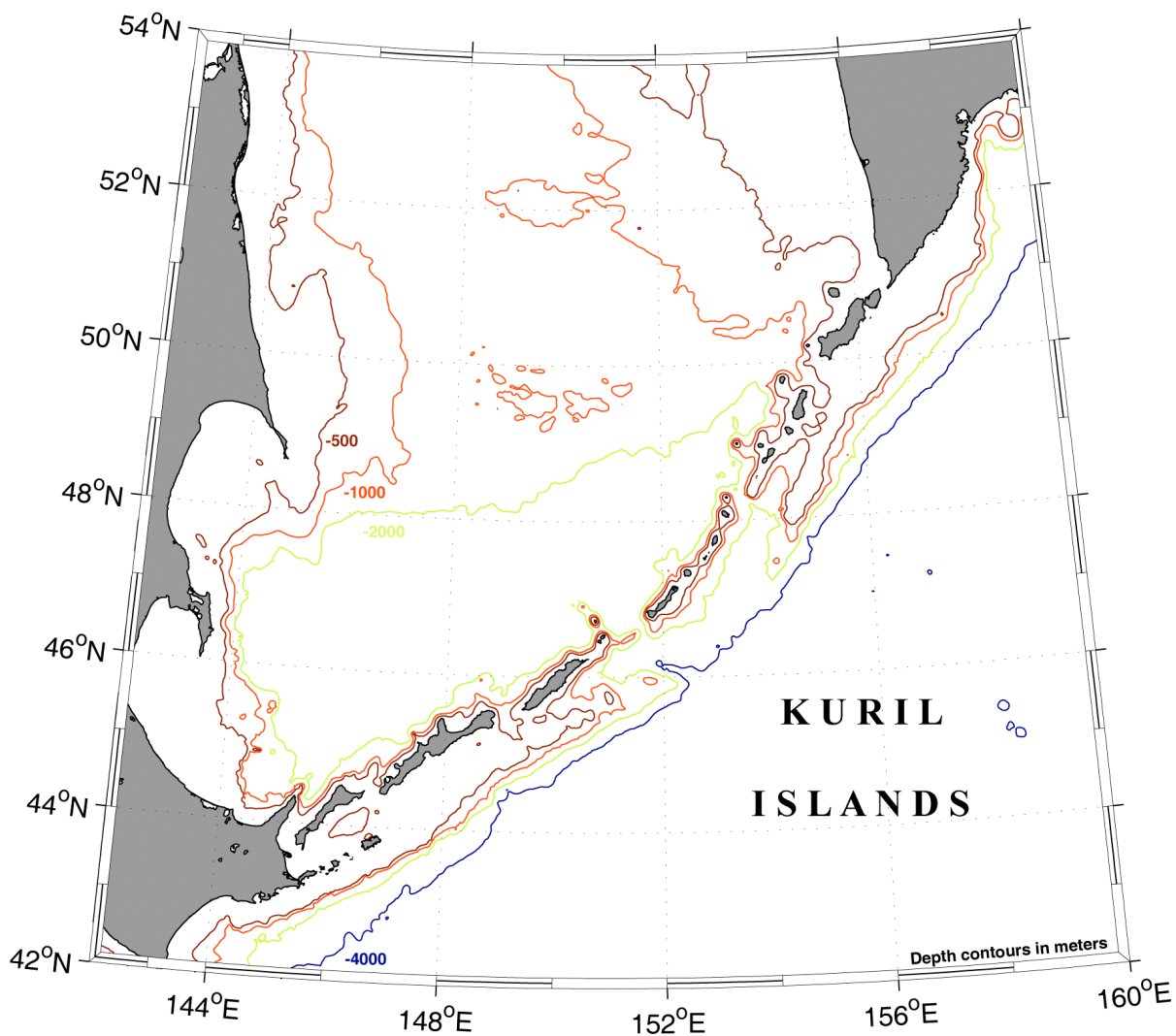


Figure 1. Bathymetry of the Kuril Islands [Smith and Sandwell, 1997].

## Observations

There has been some scientific study on internal waves around the Kuril Islands. Mitnik et al. [1997] used 42 ERS-1 SAR images acquired between April and June 1995 over the southern Okhotsk Sea to study mesoscale and fine-scale structures at the sea surface. The analysis recognized that strong tidal currents in the straits and the breaking of tidal waves are responsible for formation of rips, headland vortices and packets of internal waves. Thawing of sea ice and freshening of the surface waters in the spring, along with radiative heating, create the vertical stratification necessary for internal wave generation

Overall the satellite imagery shows the internal wave signatures to be very irregular. This is the result of the irregular bottom topography around the islands that provide for many internal wave generation sites. Similar characteristics have been observed around other islands (e.g. Galapagos and Azores)

Due to the relatively high latitude of the Kuril Islands, internal wave activity is expected to take place primarily during the northern summer and early fall (June through September) when a solar heating develops a thermocline or the thawing of sea ice creates the stratification necessary for internal wave development.

Table 1 - Months when internal waves have been observed in the Kuril Islands.  
 (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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## References

Large Marine Ecosystems of the World: LME #51: Oyashio Current, January 2004

<http://na.nefsc.noaa.gov/lme/text/lme51.htm>

Mitnik, L. M., V. B. Lobanov, N. V. Bulatov M. K. Hsu, 1997: Oceanic Phenomena In The Southern Okhotsk Sea From ERS SAR Data. 3rd ERS SYMPOSIUM Florence 97.  
<http://earth.esa.int/symposia/papers/hsu1/>

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](http://topex.ucsd.edu/marine_topo/mar_topo.html)

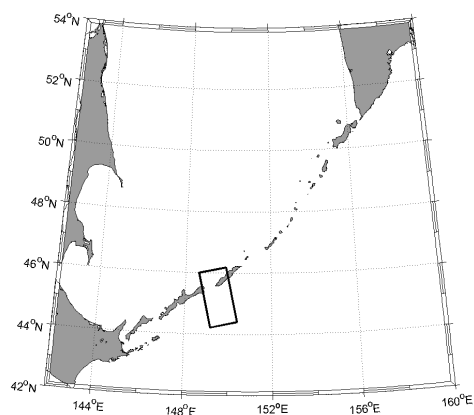
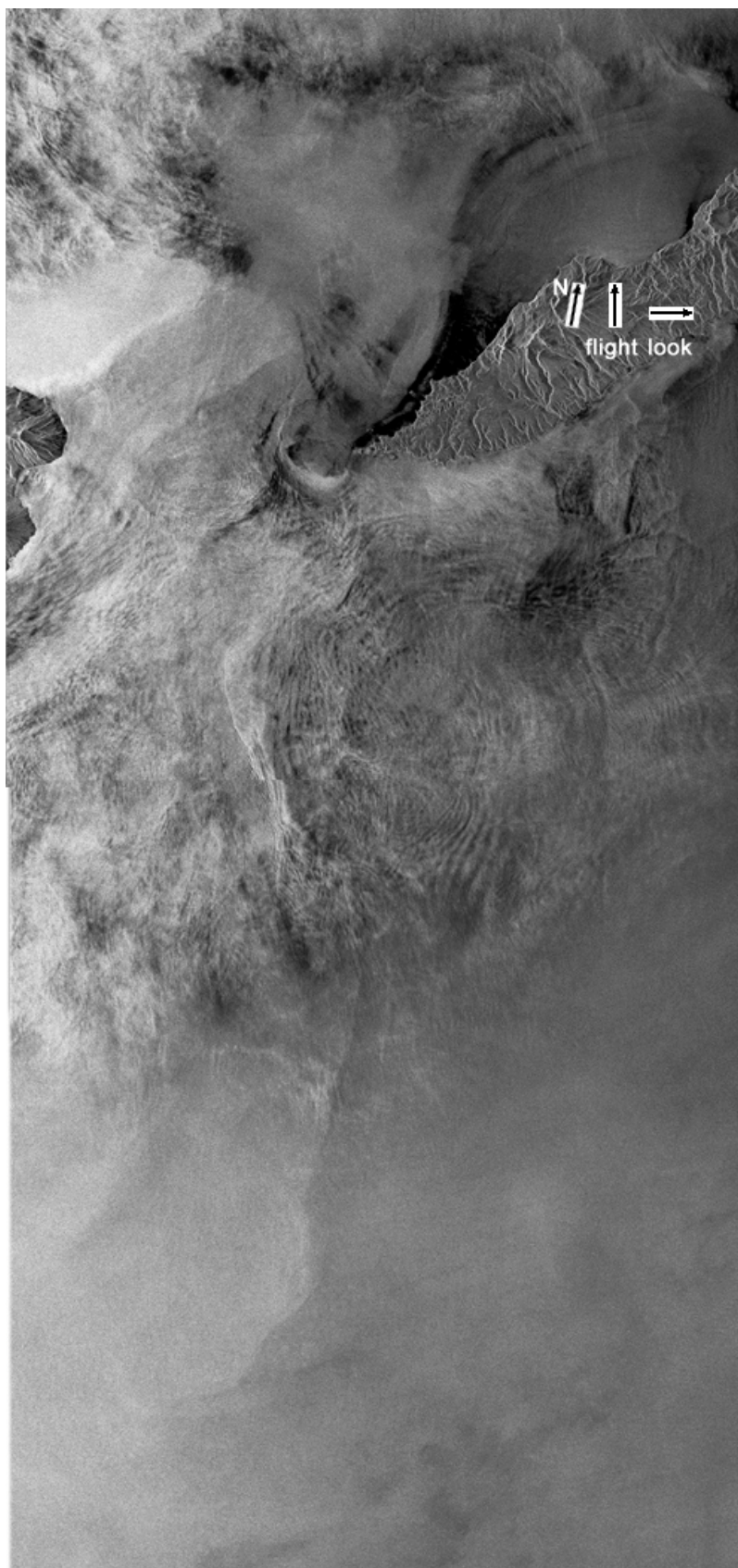


Figure 2. ERS-2 (C-band VV) SAR image of the southern Kuril Islands acquired on 25 September 1998 at 1212 UTC (orbit 17942, frames 891, 909). The image shows a variety of internal wave signatures near the islands. Imaged area is 100 km x 200 km. ©ESA 1998 [Image courtesy of ADIDAS Radar Image Preview Database. <http://adidas.iki.rssi.ru>]



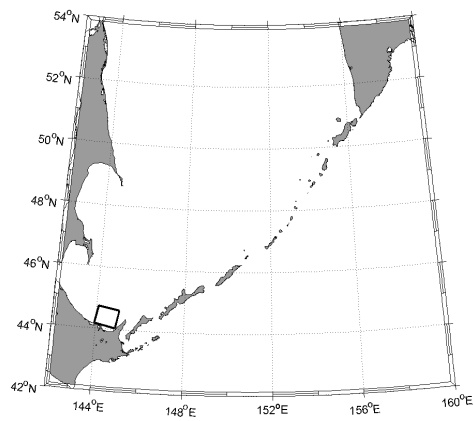
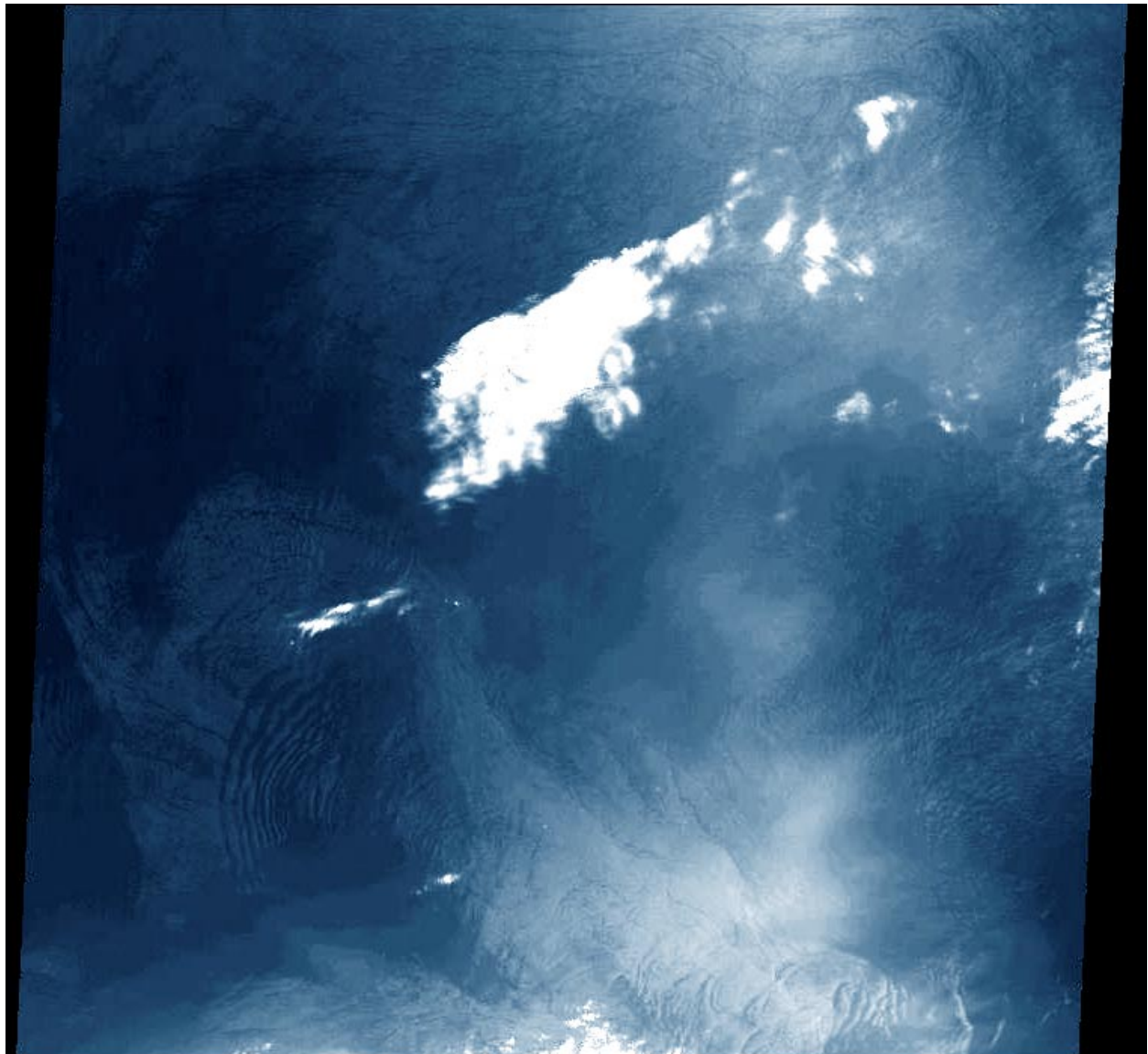


Figure 3. ASTER false-color VNIR image near the Japanese Island of Hokkaido near the Kuril Islands acquired on 22 June 2001 0127 UTC. The image shows a small wave packet propagating to the west-northwest along with several other surface signatures. Imaged area is approximately 60 km x 60 km.





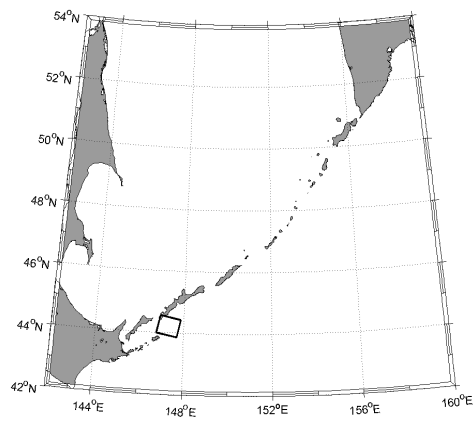


Figure 4. ASTER false-color VNIR image near the southern Kuril Islands acquired on 17 May 2002 at 0114 UTC. The image shows internal wave signatures indicating propagation to the southeast off the shelf area between the islands. Imaged area is approximately 60 km x 60 km.



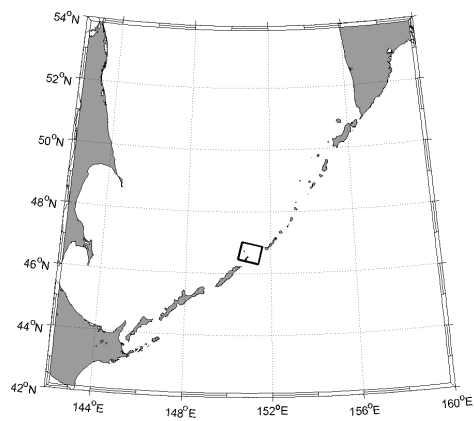
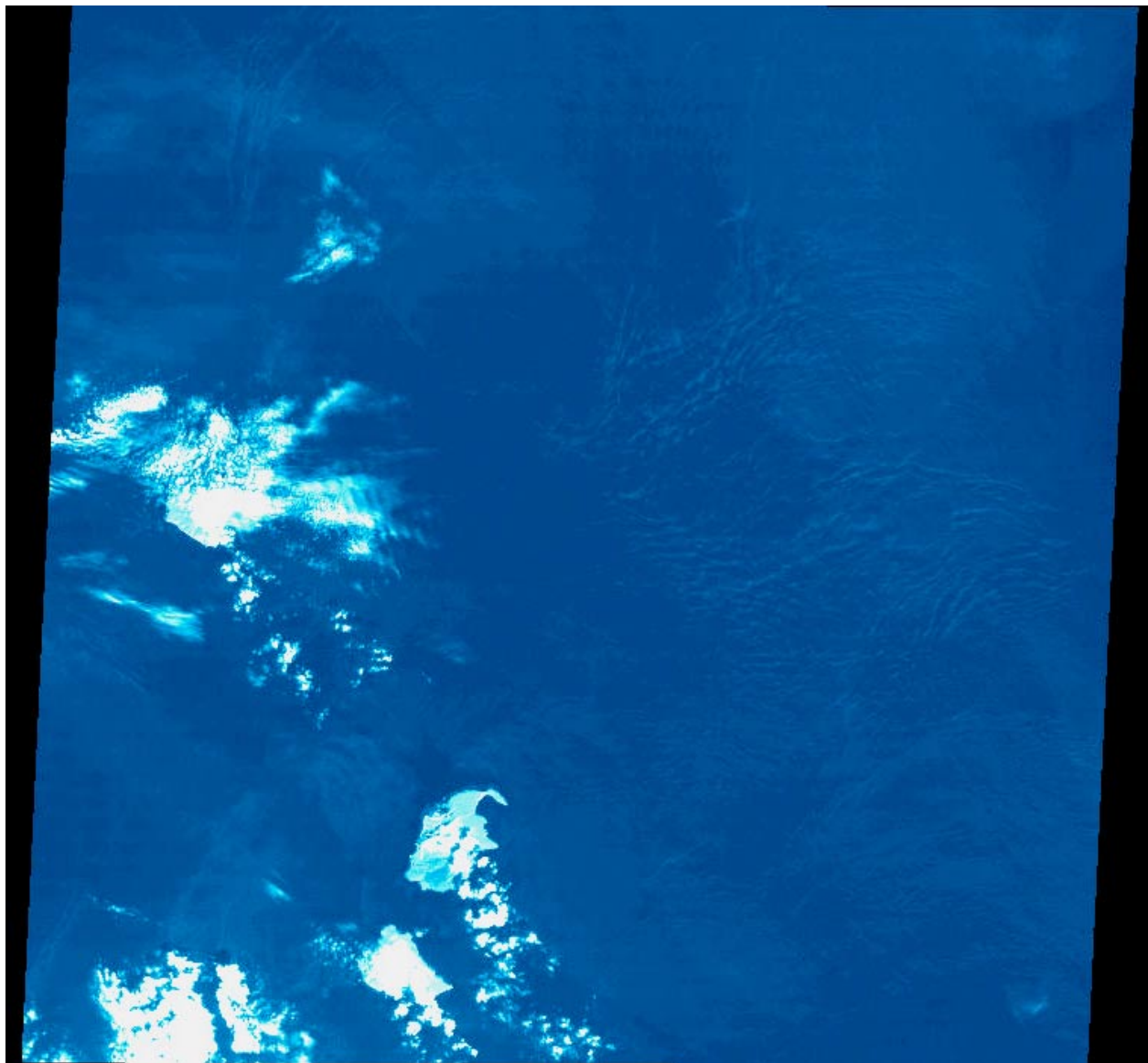


Figure 5. ASTER false-color VNIR image near the Kuril Islands acquired on 9 September 2000 at 0121 UTC. The image shows a variety of internal wave signatures near the islands. Imaged area is approximately 60 km x 60 km.



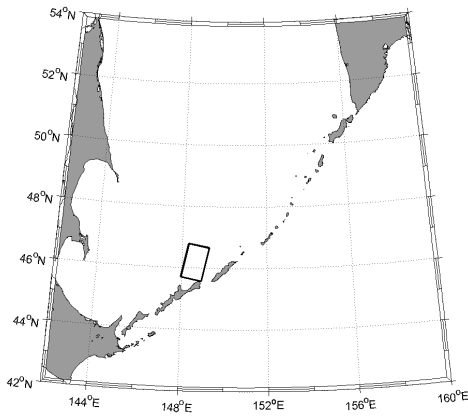
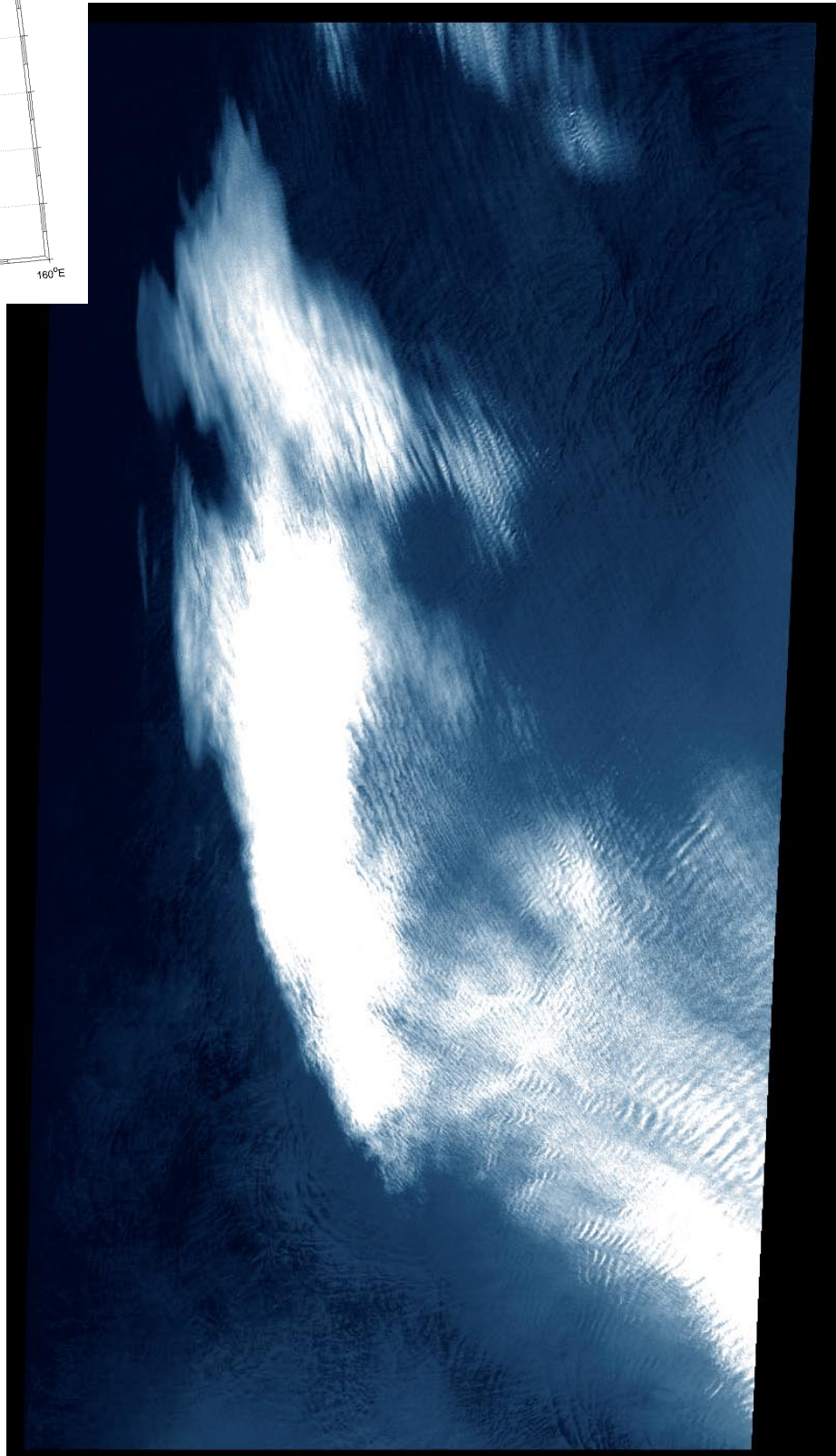


Figure 6. ASTER false-color VNIR image near the Kuril Islands acquired on 10 July 2001 at 0114 UTC. The image shows several internal wave signatures indicating propagation into the Sea of Okhotsk. Imaged area is approximately 60 km x 120 km.





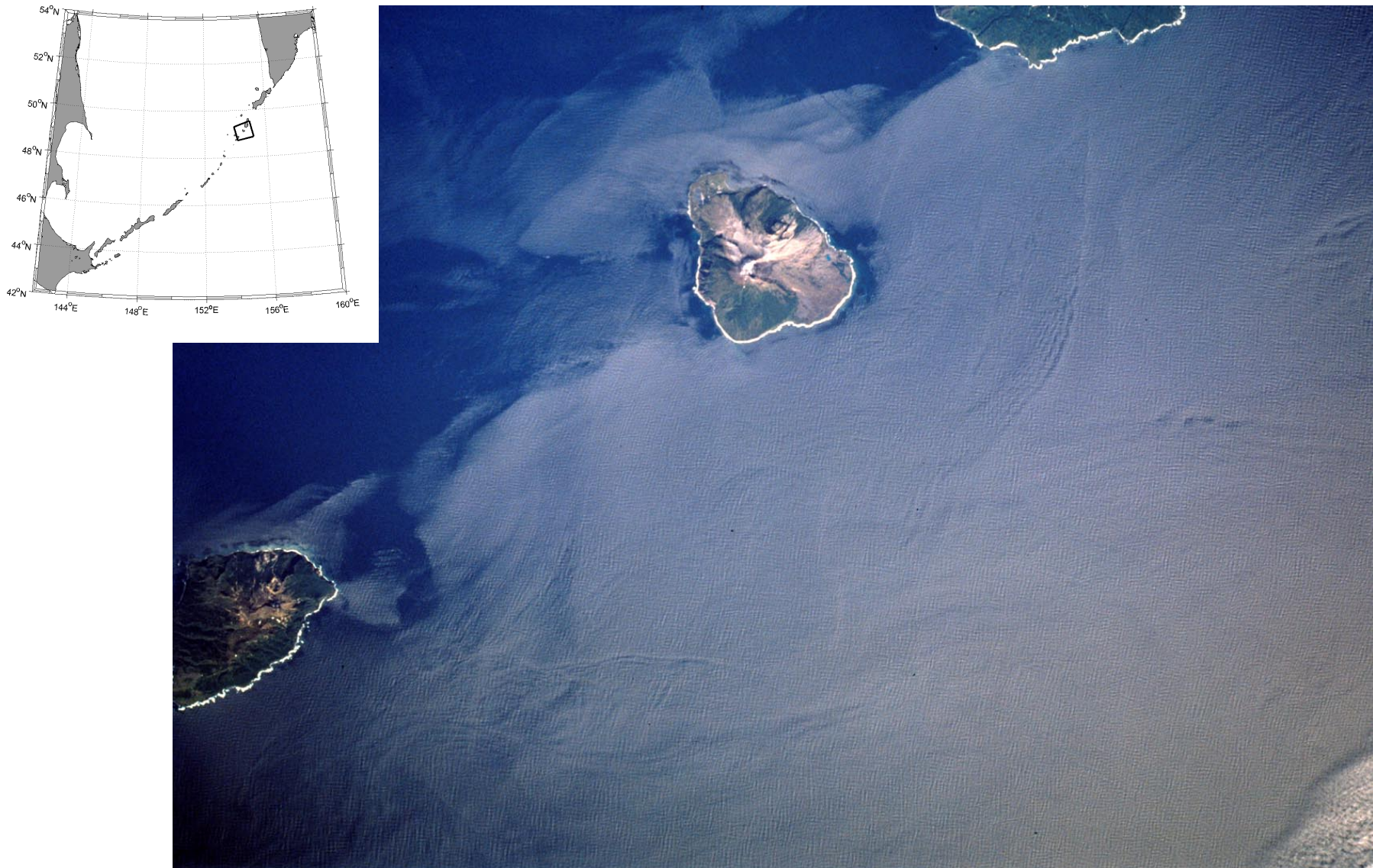


Figure 8. Astronaut Photograph (STS047-090-085) over three of the northern Kuril Islands acquired on 14 September 1992 at 2351 UTC. The image shows well-organized internal wave packets propagating both toward and away from the islands. Imaged area is approximately 80 km x 57 km. [Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (<http://eol.jsc.nasa.gov>)].



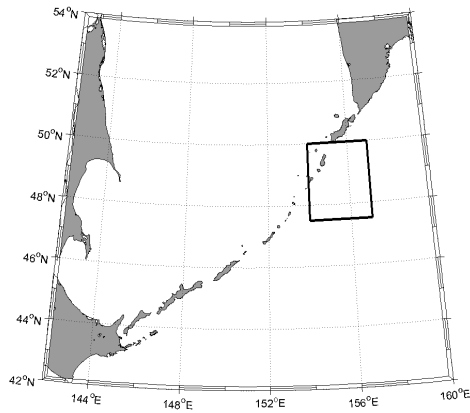
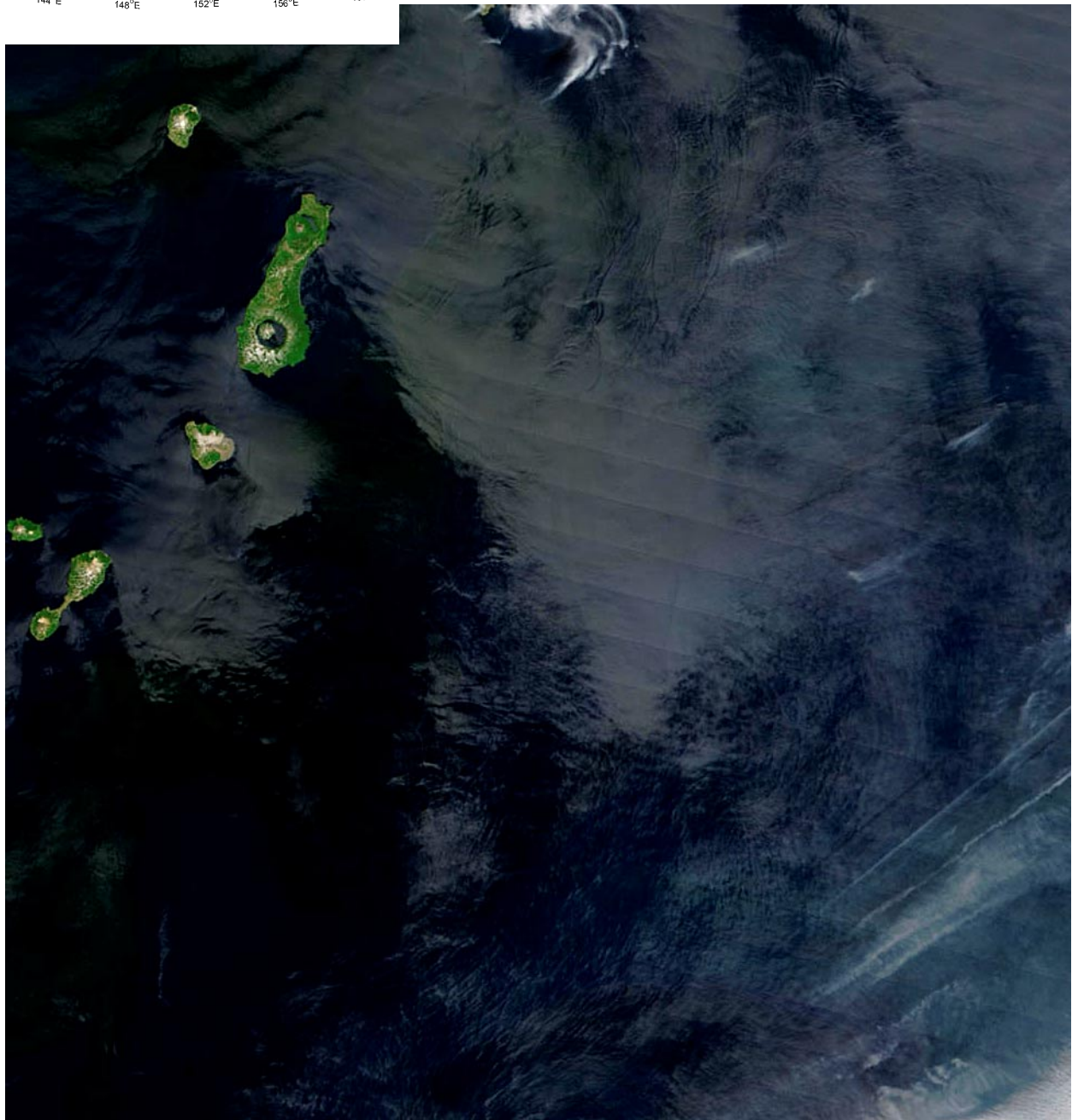


Figure 9. MODIS (Bands 1,3,4) 250-m resolution visible image over the northern Kuril Islands acquired on 2 July 2003 at 0050 UTC. The image shows internal wave signatures to the Pacific side of the islands. Imaged area is 245 km x 255 km.



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