Sea of Okhotsk

Overview

The Sea of Okhotsk is a semi-enclosed sea in the Northwest Pacific. Its is almost entirely surrounded by Russia but boarders the Sea of Japan and the Japanese Island of Hokkaido in the southwest. A continental shelf exists along the east coast of Sakhalin Island. The shelf then extends from the northeast of the Island to the southern tip of Kamchatka. The sea is influenced by a complex current system that includes flow into the Sea through straits in the Kuril Islands.

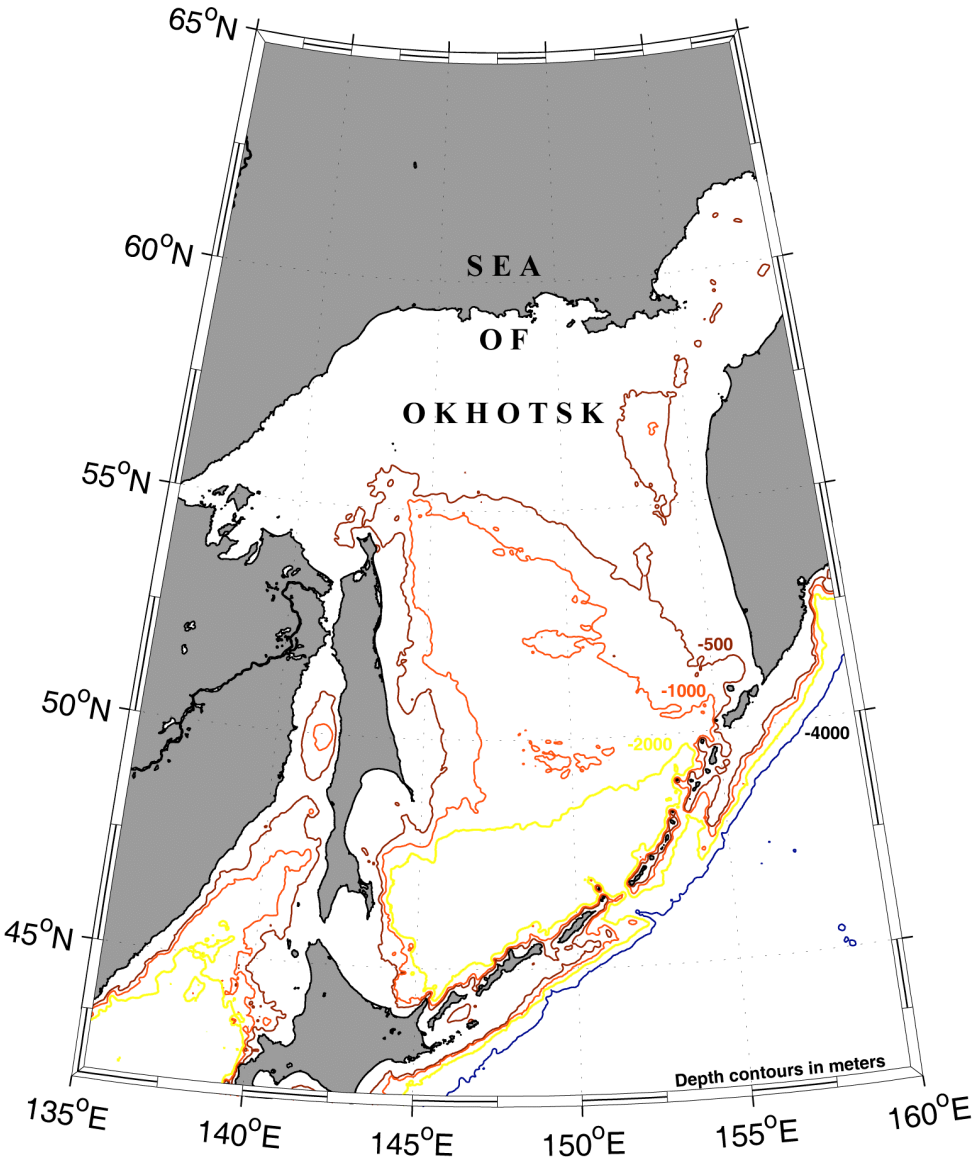


Figure 1. Bathymetry of the Sea of Okhotsk [Smith and Sandwell, 1997].

Observations

There has been some scientific study of internal waves in the Sea of Okhotsk. The work is primarily reported in the Russian scientific literature [Nagovitsyn and Pelinovsky, 1988; Nagovitsyn et al., 1991] and appears to be focused on the region east of Sakhalin Island. Ostrovsky and Stepanyants [1989] summarized the solitary internal wave observations reported in Nagovitsyn and Pelinovsky [1988]. In situ measurements collected in 70 meters of water over 10 days during the summers of 1986 recorded a total of 45 solitary waves. The waves were all observed as depression of the thermocline with amplitudes of 5-10 meters; spatial scale 200 to 400 meters; duration 10 – 15 min; and propagation velocity 0.5 m/s (Figure 2).

Table 1 shows the months when internal wave observations have been made.

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
				2	3	4	5	2	5		

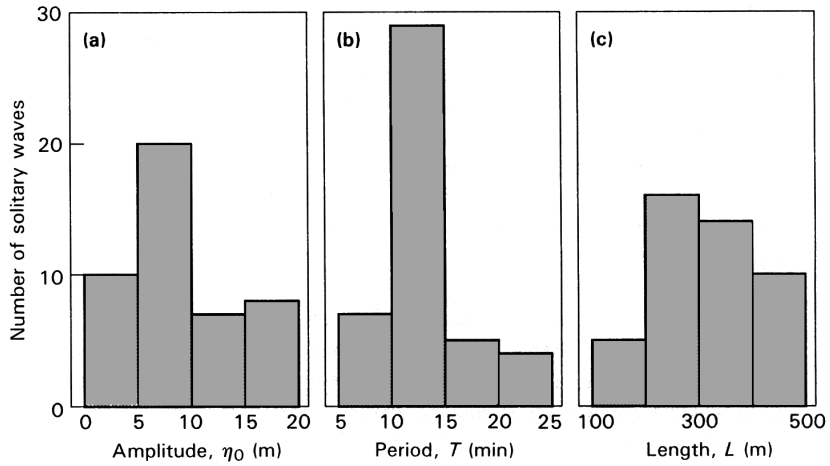


Figure 2. Distribution histograms for internal solitary waves observed in the Sea of Okhotsk near Sakhalin Island. [After Ostrovsky and Stepanyants, 1989; original source Nagovitsyn and Pelinovsky 1988].

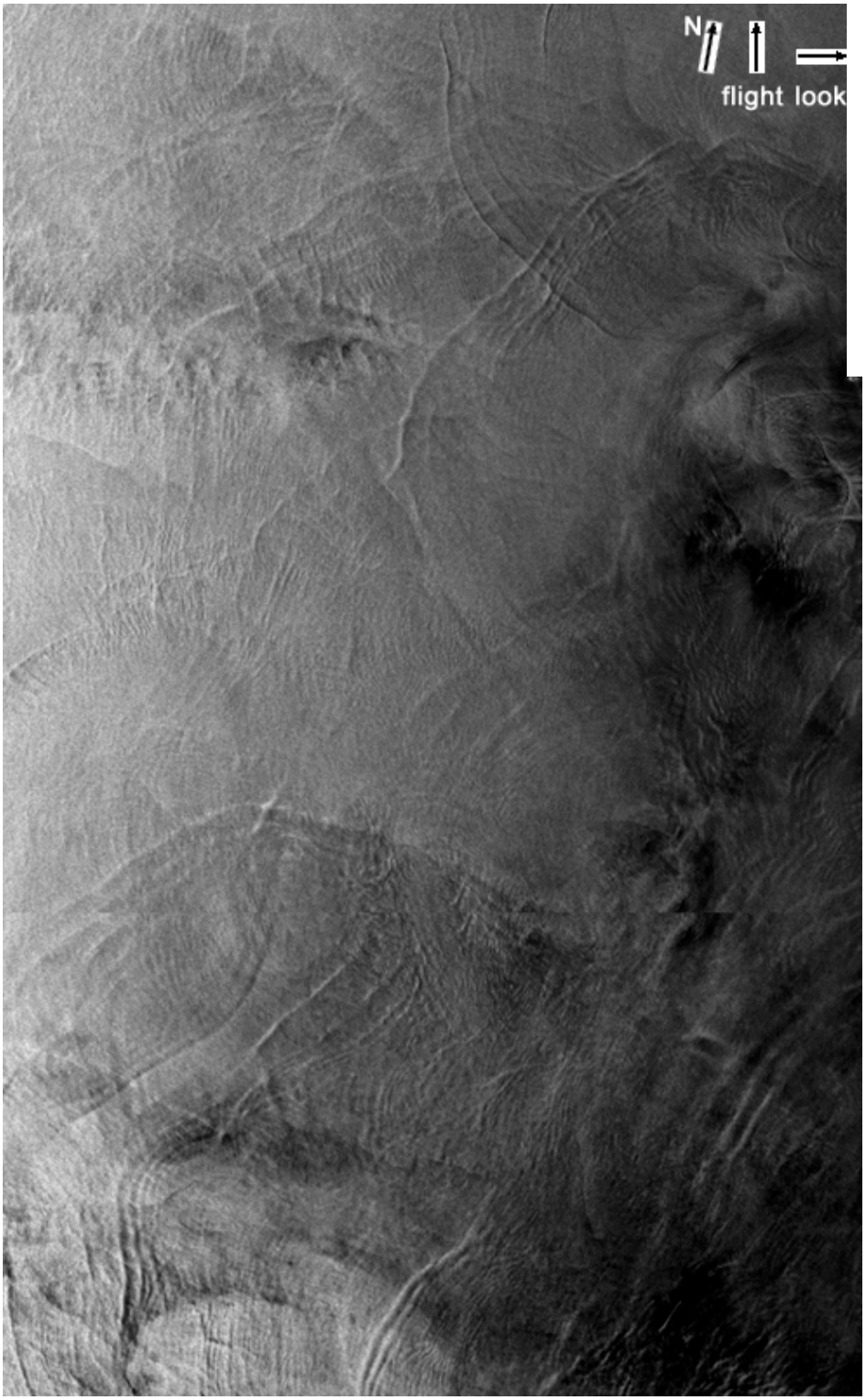
References

Nagovitsyn, A.P., and E.N. Pelinovsky, 1988: Solitary internal wave observation in coastal zone of Okhotsk Sea. *Meteorology i Hydrolog*y, 4, 124-126.

Nagovitsyn, A.P., E.N. Pelinovsky, and Yu. A. Stepanyants, 1991: Observation and analysis of solitary internal waves in the coastal zone of the Sea of Okhotsk, *Sov. J. Phys. Oceanog*r., **2 (1)**, 65-70.

Ostrovsky, L.A., and Y.A. Stepanyants, 1989, "Do internal solitons exist in the ocean?" Rev. of Geophys., 27(3), 293-310.

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



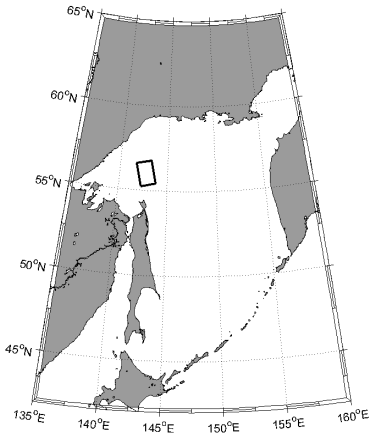


Figure 2. ERS-2 (C-Band, VV) SAR image acquired on 1 October 1998 at 1227 UTC (orbit 18028, frames 1107, 1125). The image shows an area north of Sakhalin Island with a number of internal wave signatures having a variety of propagation directions, an indication of a number of source locations. Imaged area is 100 km x 140 km. ©ESA 1998. [Image courtesy of ADI'DAS Radar Image Preview Database. http://adidas.iki.rssi.ru]

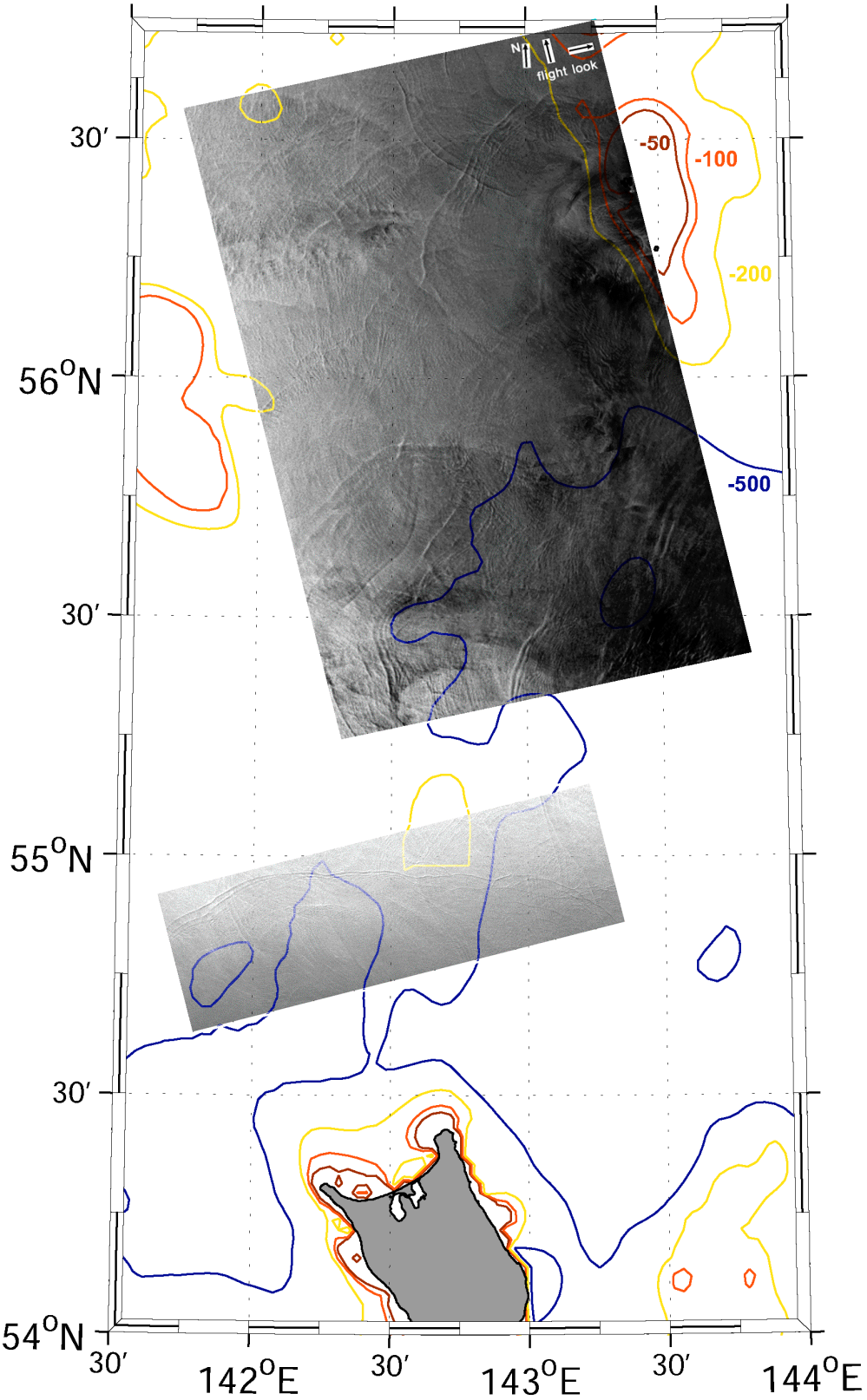


Figure 3. ERS-2 SAR image from 1 October 1998 (Figure 2) and the SIR-C data from 10 October 1994 (Figure 4) shown with the local bathymetry [Smith and Sandwell, 1997]

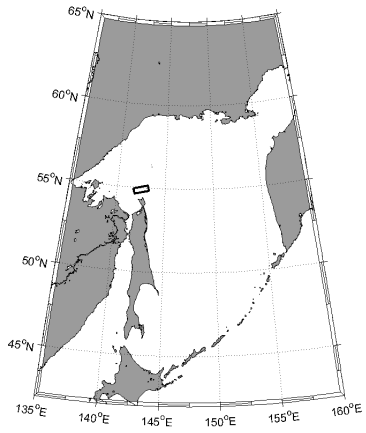
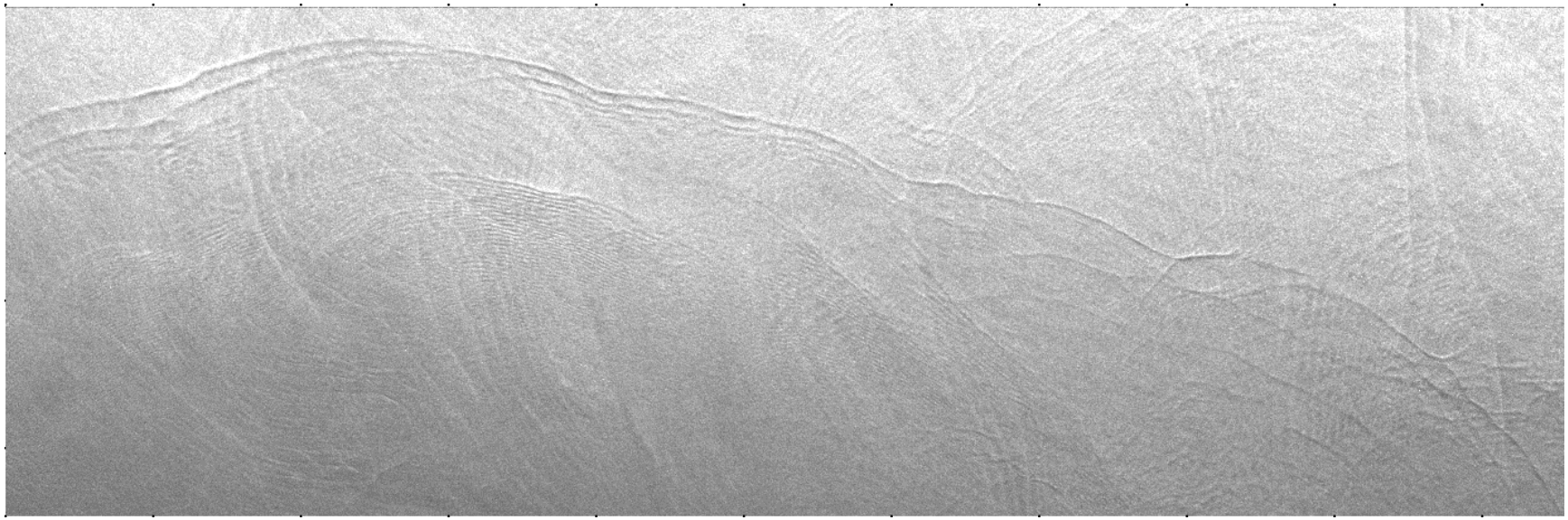


Figure 4. SIR-C (L-Band) SAR image of internal waves signatures north of Sakhalin Island in the Sea of Okhotsk. Image was acquired on 10 October 1994 at 1958 UTC (DT169.2, Seg. 67). Internal wave signatures show several propagation directions indicating multiple sources. Image dimensions are 34.4 x 106.9 km.



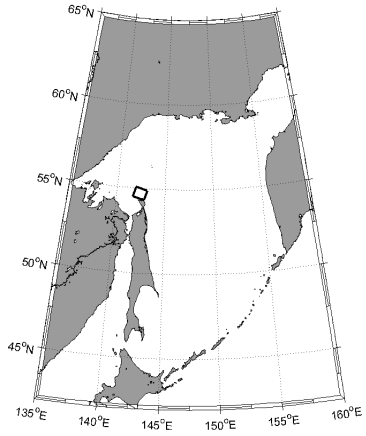
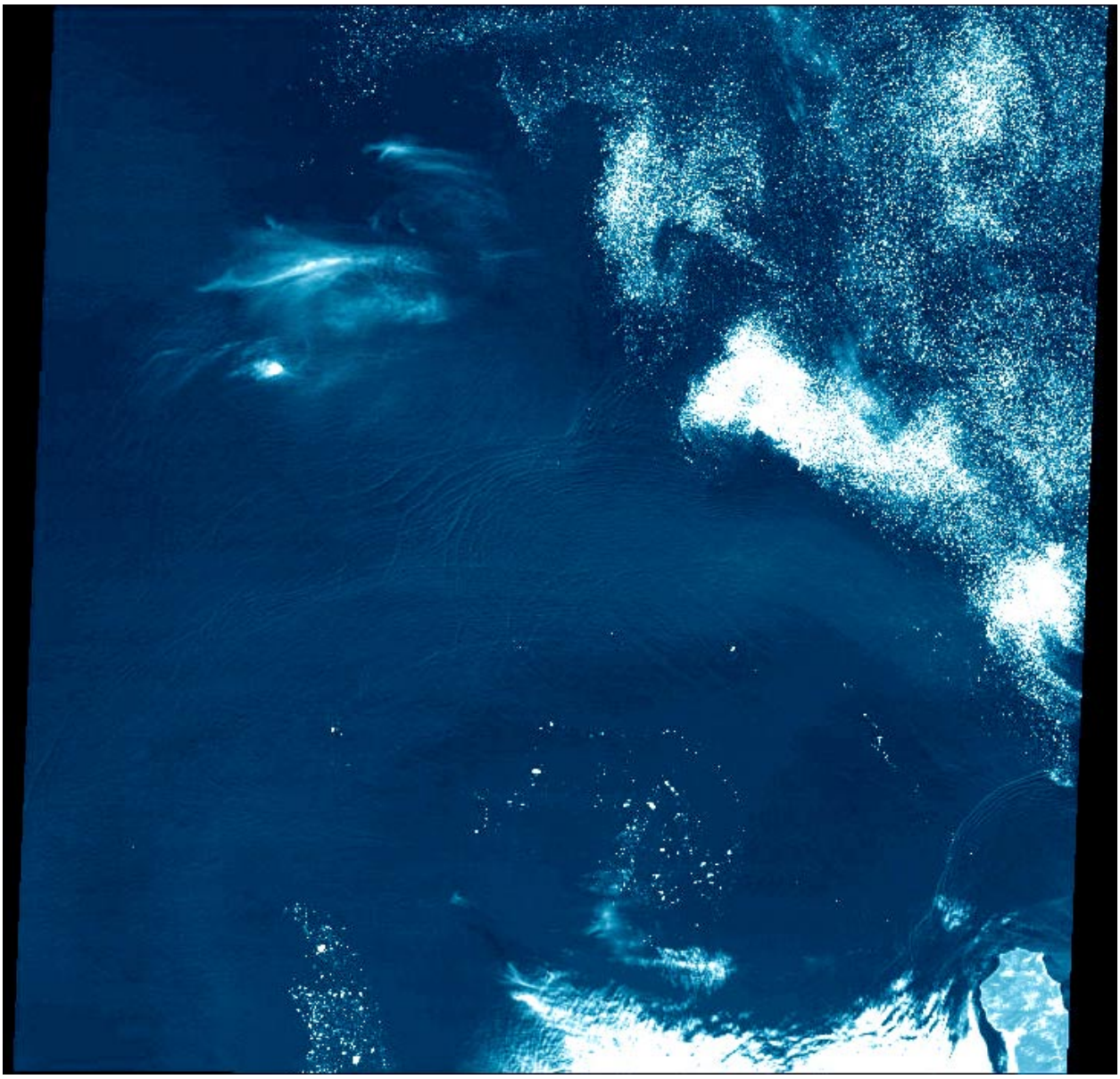


Figure 5. ASTER false color VNIR image over the Sea of Okhotsk immediately north of Sakhalin Island acquired on 15 June 2003 at 0147 UTC. The image shows internal waves propagating northward next to sea ice. Imaged area is 60 km x 60 km.



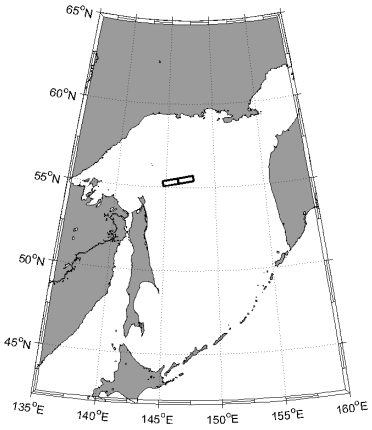
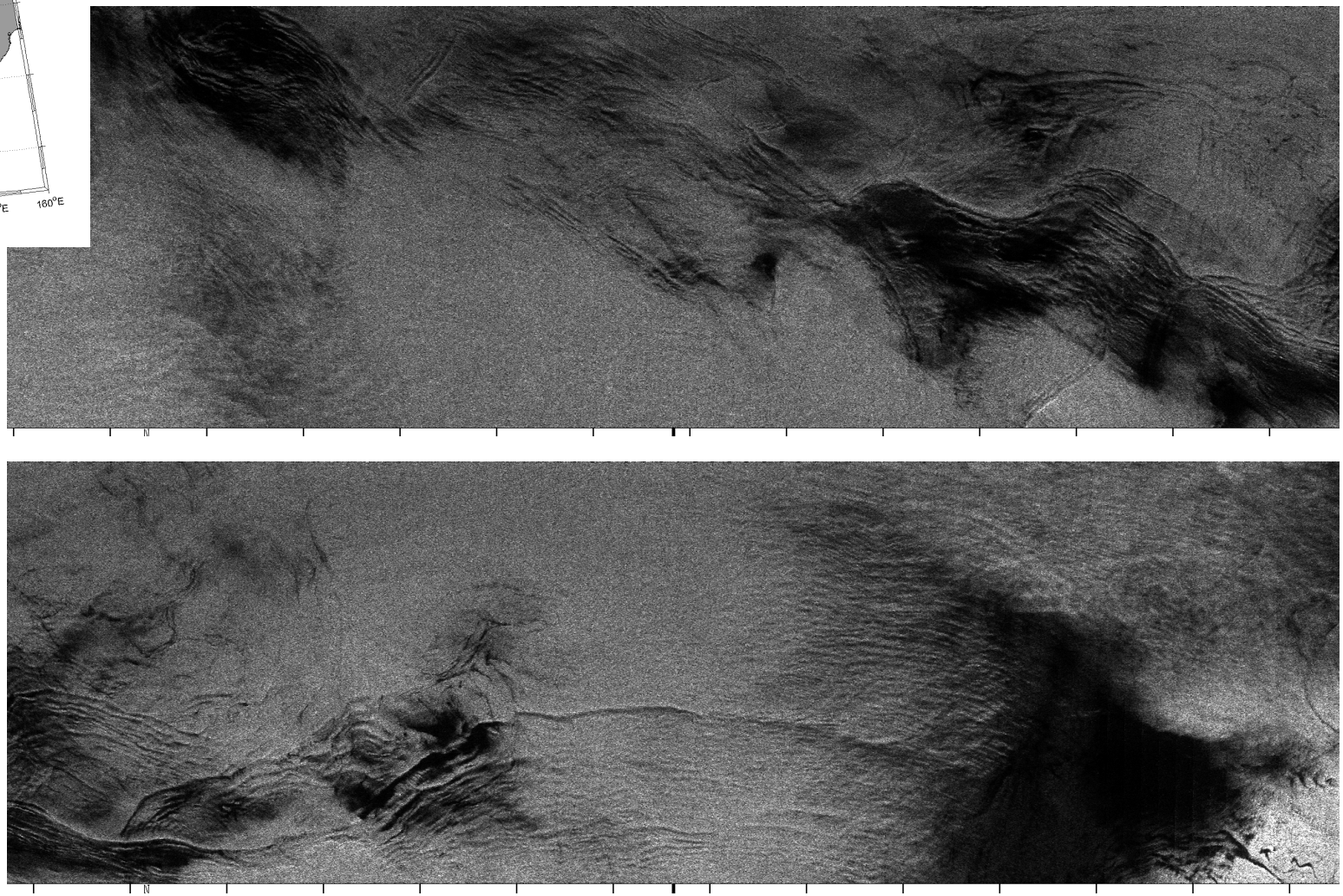
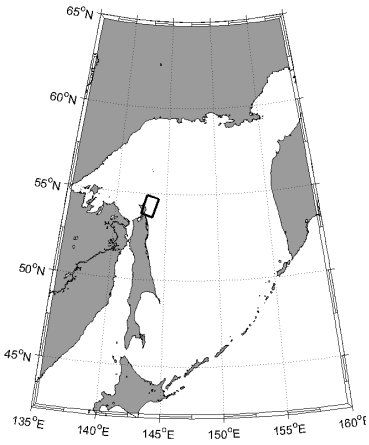


Figure 6. SIRC SAR images northeast of Sakhalin Island acquired on 7 October 1994 at 2107 UTC (DT121.1, Seg. 69, 70). The image shows the signature of internal waves generated at the shelf break propagating north. Imaged area of each segment is 100 km x 32.8 km





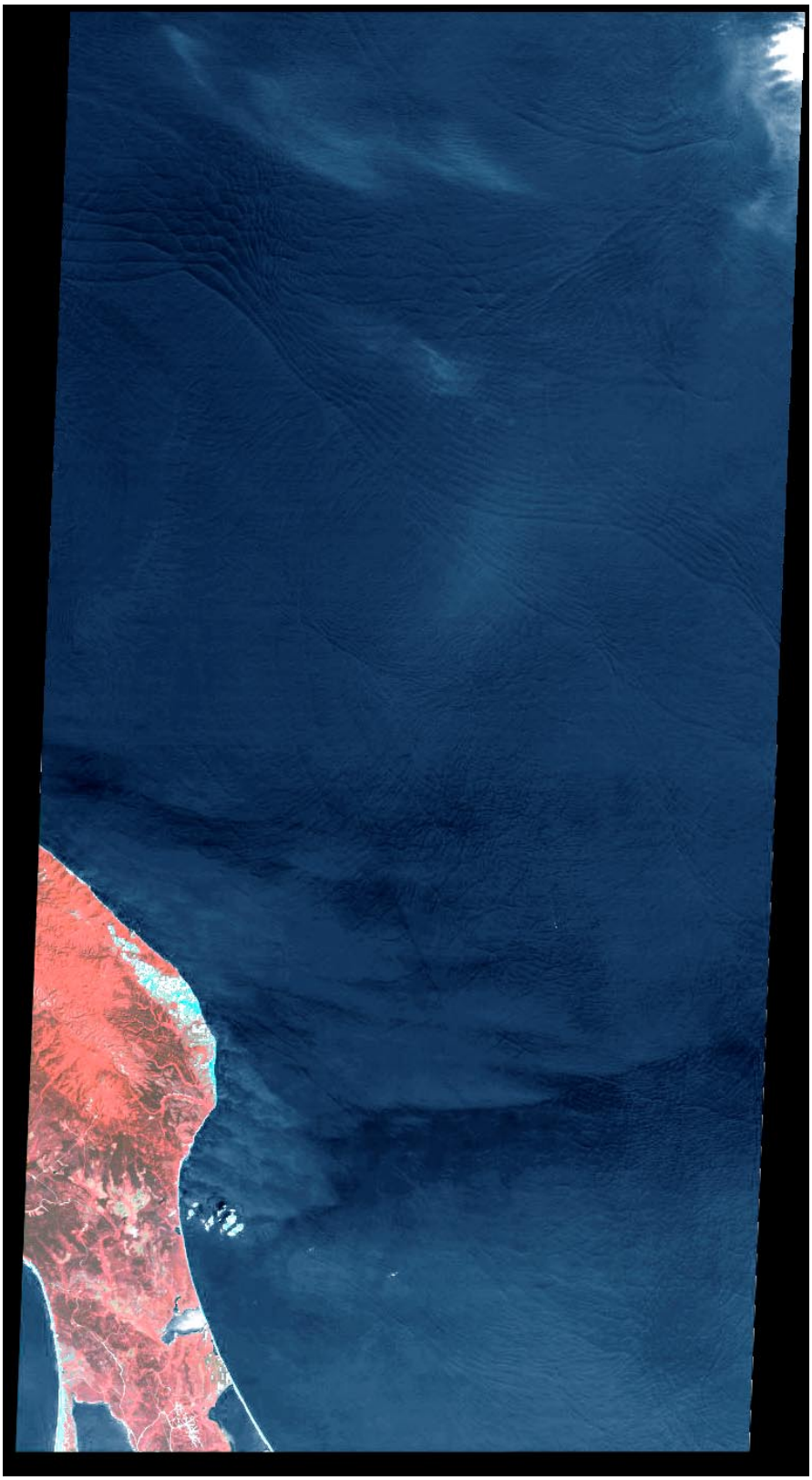
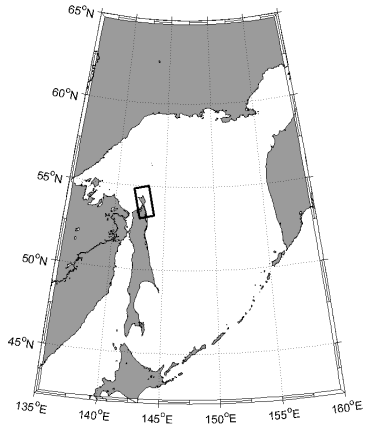


Figure 7. ASTER false color VNIR image along the northeast coast of Sakhalin Island acquired on 30 July 2002 at 0148 UTC. The image shows the signature of several internal wave packets propagating shoreward. Imaged area is 60 km x 120 km.



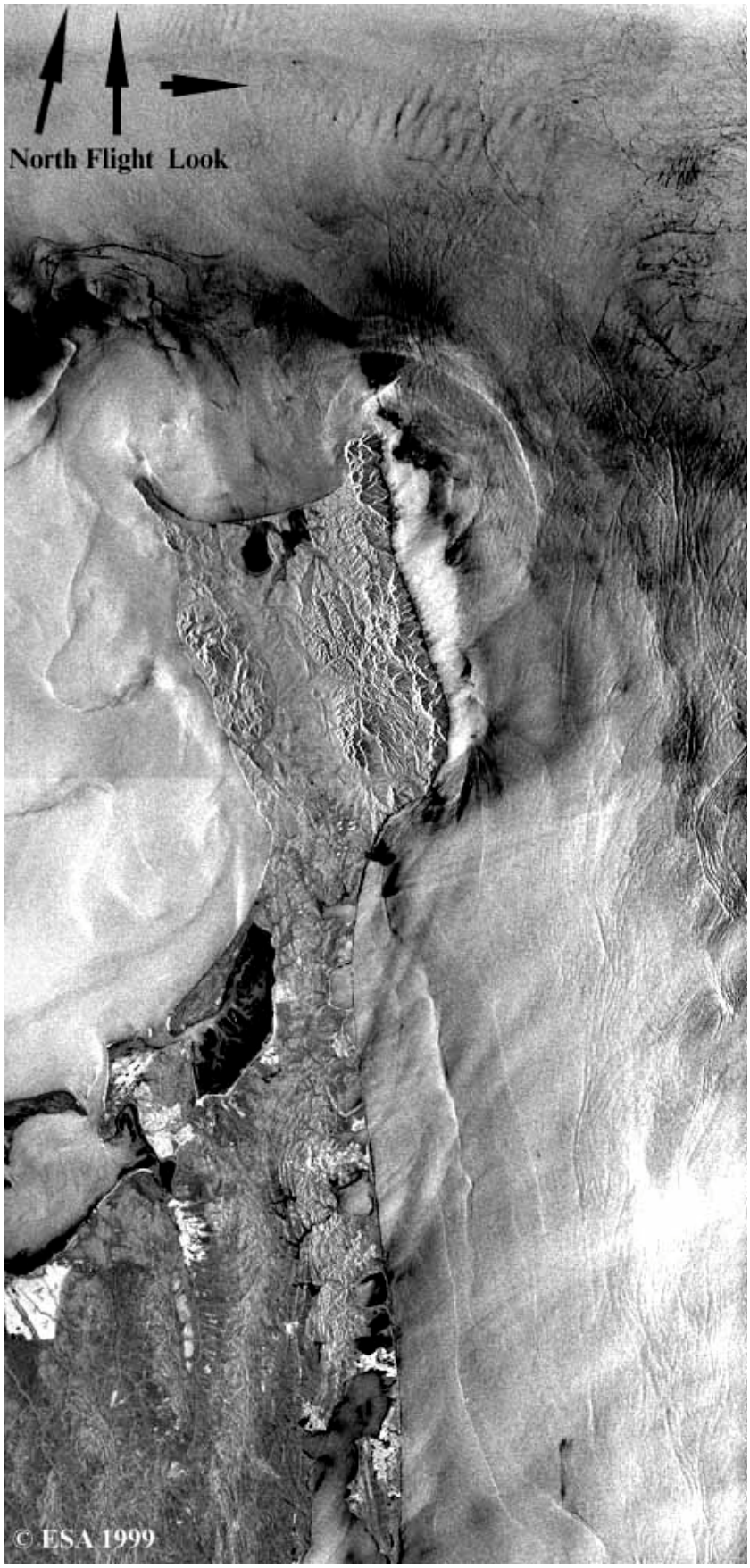
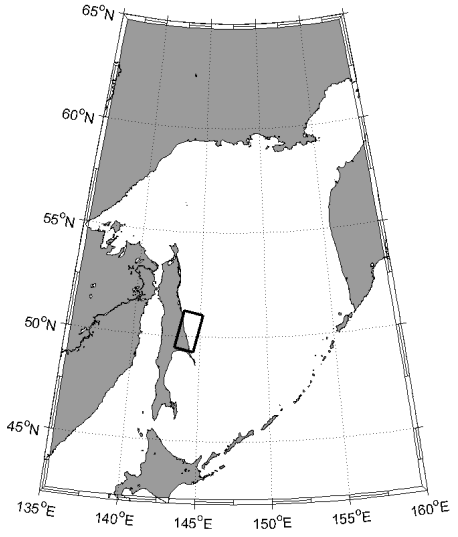


Figure 8. ERS-2 (C-Band, VV) SAR image acquired on 5 October 1999 at 1229 UTC (orbit 23310, frames 1071, 1089). The image shows the signature of internal waves along the east coast of Sakhalin Island. The complexity of the signatures indicates that there are a large number of internal wave sources on the adjacent shelf. Imaged area is 100 km x 200 km. ©ESA 1999. [Image courtesy of ADI'DAS Radar Image Preview Database. http://adidas.iki.rssi.ru]



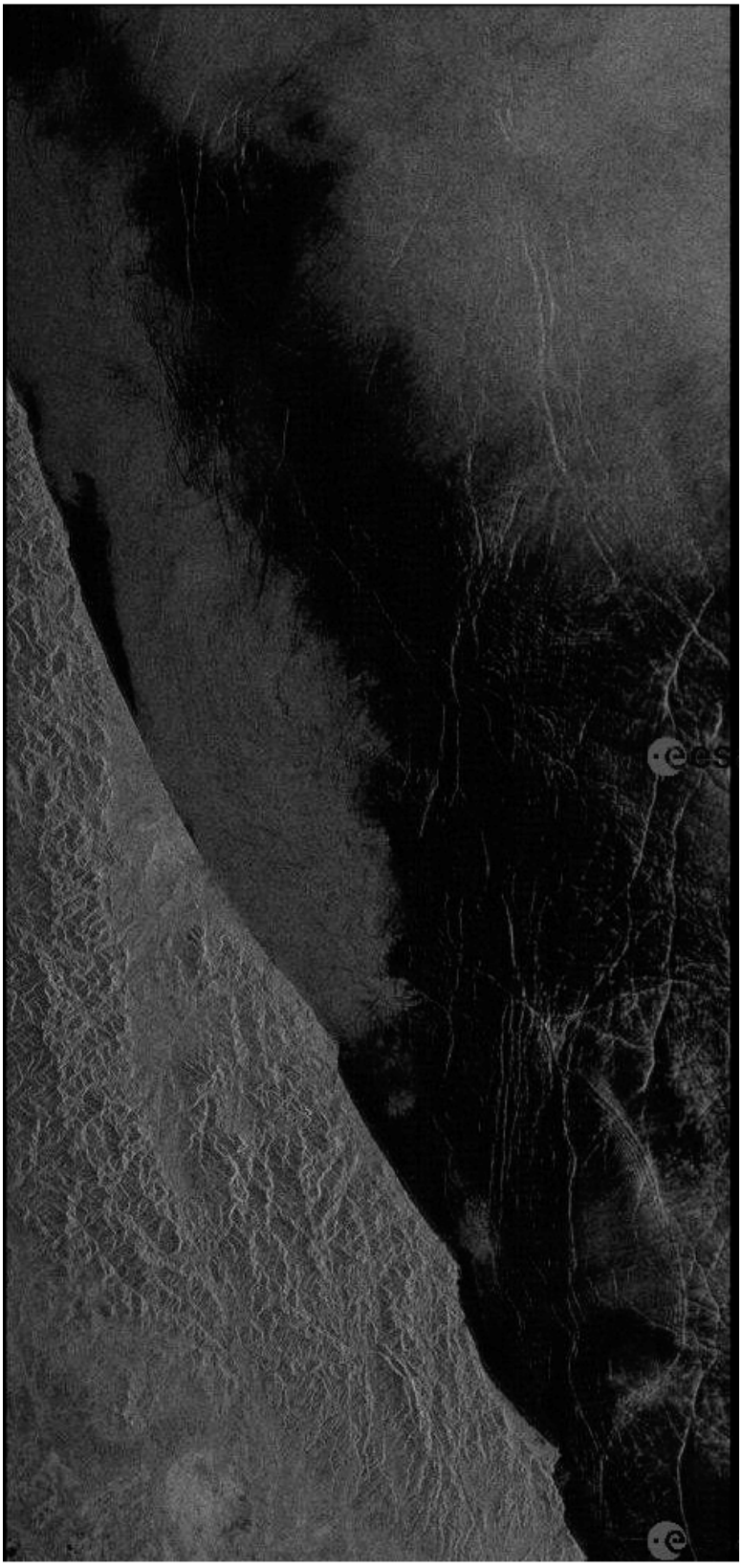


Figure 9. ERS-2 (C-Band, VV) SAR survey image acquired on 6 September 1999 at 1229 UTC (orbit 22888, frames 2583, 2601). The image shows the signature of internal waves along the central east coast of Sakhalin Island. Imaged area is 100 km x 200 km. ©ESA 1999.

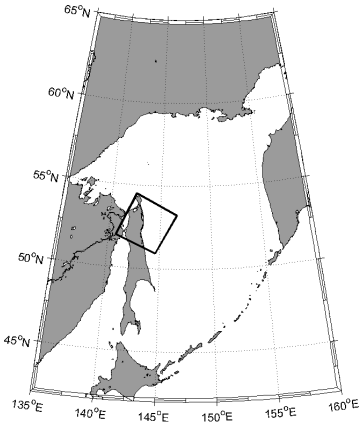
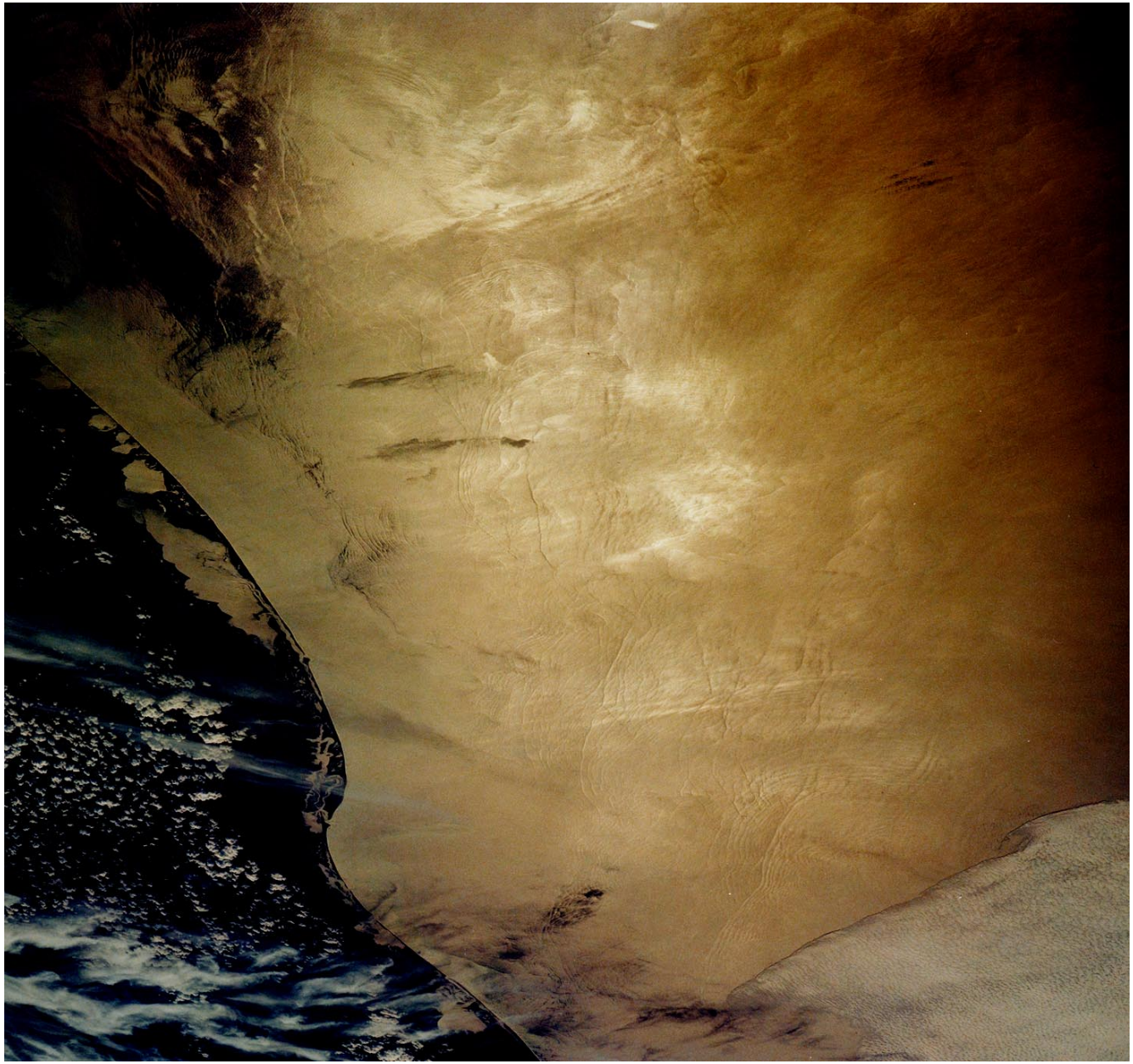


Figure 10. Astronaut photograph (STS047-151-229) over northeast Sakhalin Island acquired on 14 September 1992 at 0254 UTC. Imaged area is approximately 200 km x 200 km. [Image Courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (http://eol.jsc.nasa.gov]



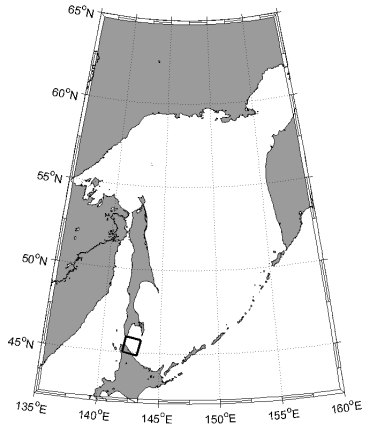
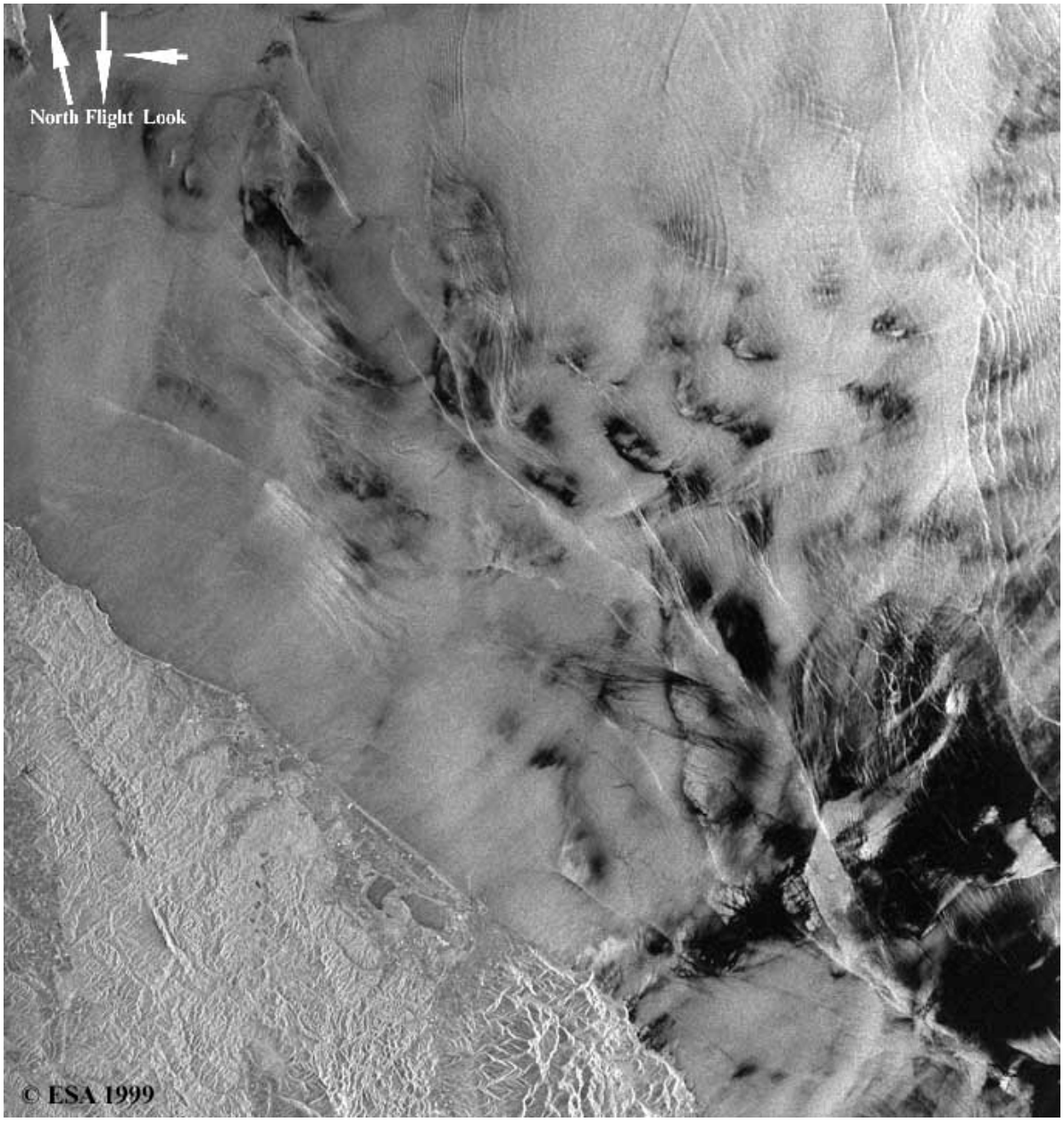
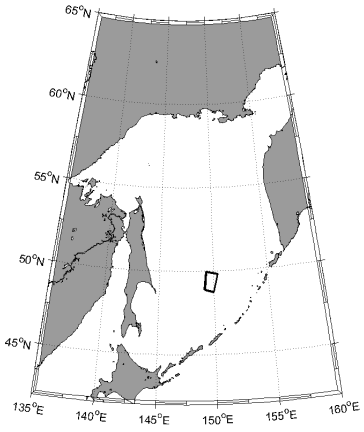


Figure 11. ERS-2 (C-Band, VV) SAR image acquired on 2 August 1999 at 1924 UTC (orbit22387, frame 2691). The image shows internal wave signatures off the northeast coast of Hokkaido Island, Japan, in the southern Sea of Okhotsk. Imaged area is 100 km x 100 km. ©ESA 1999. [+Image courtesy of the ADI'DAS Radar Image Preview Database. http://adidas.iki.rssi.ru]





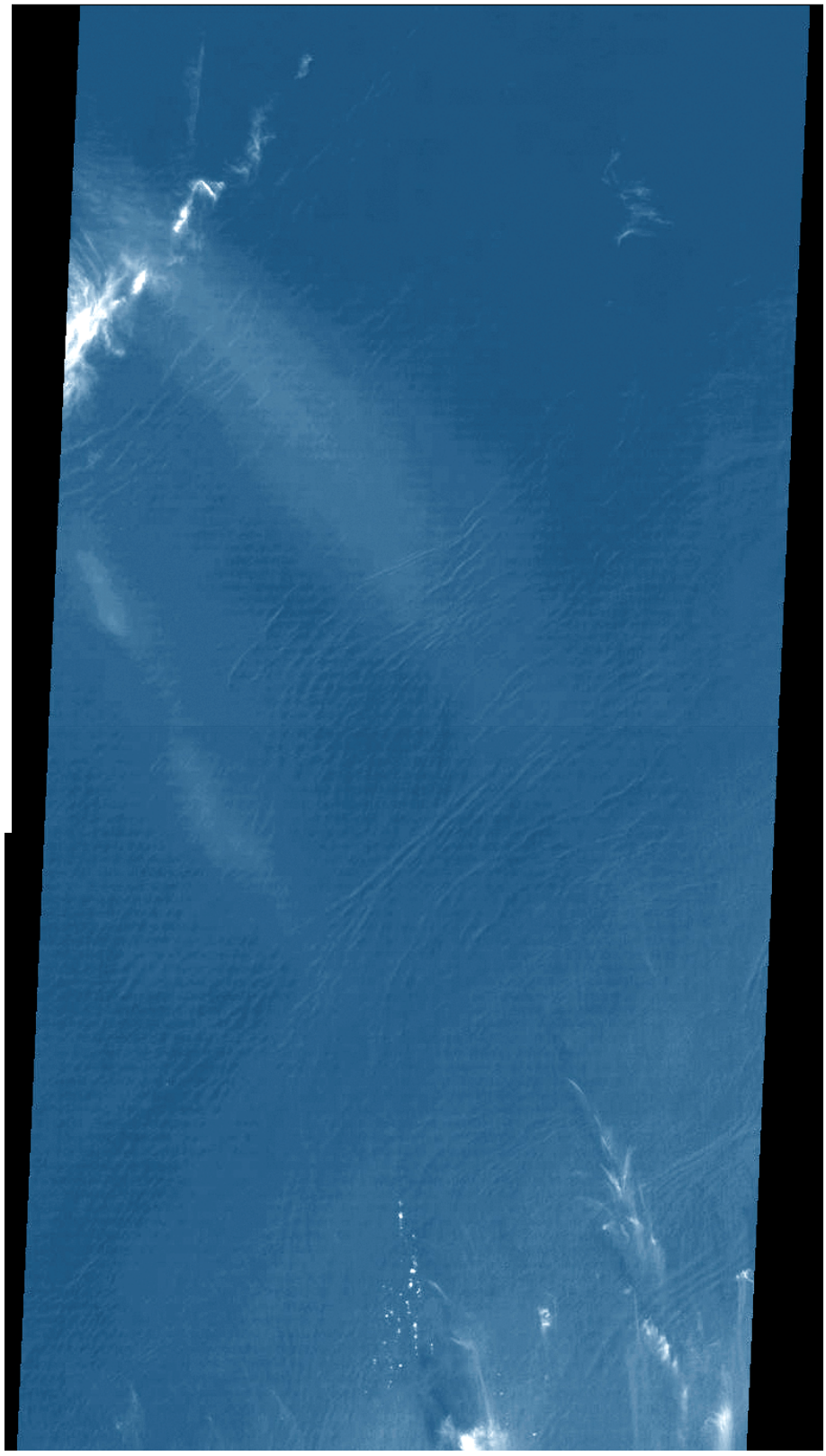


Figure 12. ASTER false color VNIR image over the south central Sea of Okhotsk acquired on 27 August 2001 at 0112 UTC. The image shows the signature of several internal wave packets propagating northward. The location of the waves indicated they were not generated at the shelf break. Imaged area is 60 km x 120 km.

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