

The Celtic Sea

Overview

The Celtic Sea is located in the North Atlantic Ocean between southern Ireland and southwest England (between approximately 48° and 51.5° N. latitude and 5° and 12° W. longitude) (Figure 1). Its western edge covers the continental shelf where both upwelling and internal wave activity has been observed.

On July 5, 1991, a coincident data collection was performed over the continental shelf break by the Russian Almaz S-Band SAR and the multifrequency NASA JPL AirSAR aircraft. Figure 2 is the Almaz image [Apel 1995, Evans 1995]. Internal wave signatures are visible and extend from the lower left to the upper right hand portion of the image. The dark regions in the right hand side of the image are believed to be a cool stable area of upwelled water. Upwelling may serve to excite internal waves in areas of high bathymetric relief. [Apel 1995]. Figure 3 shows the Almaz image overlaid with the local bathymetry. The internal waves appear inside the 500-m isobath and its overall pattern is roughly aligned with the bathymetry.

Figure 4 [Evans 1995] shows the NASA JPL AirSAR data that correspond to Almaz image. The AirSAR data were collected simultaneously at three frequencies (P, L and C-Band, 68, 24, 5.7 cm wavelength respectively). Variations in backscatter from both the internal waves and the upwelling region can be seen across the three frequencies.

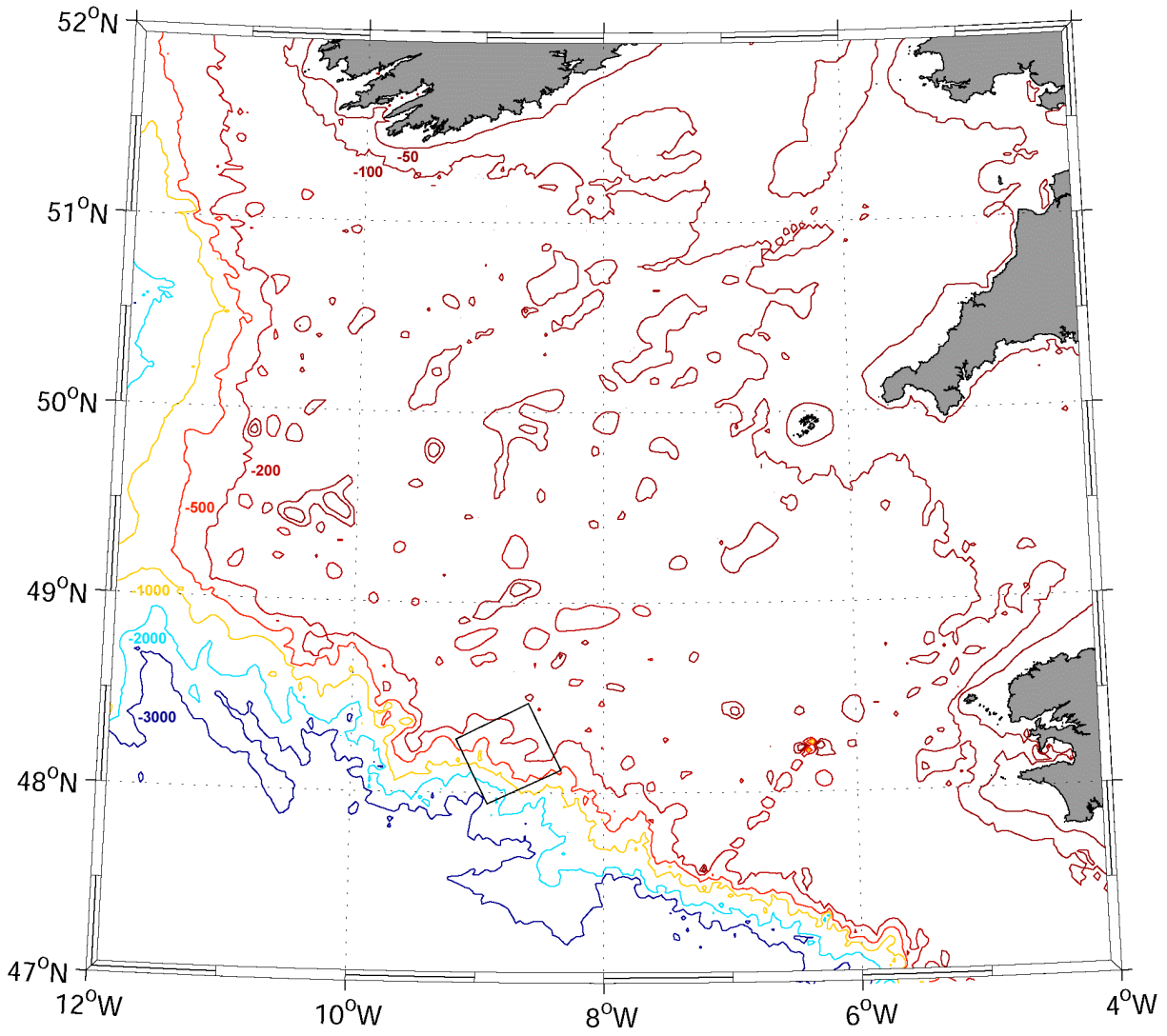


Figure 1. Bathymetry map of the Celtic Sea showing the continental shelf break. (Bathymetry derived from Smith and Sandwell version 8.2). The black box denotes the Almaz image location.

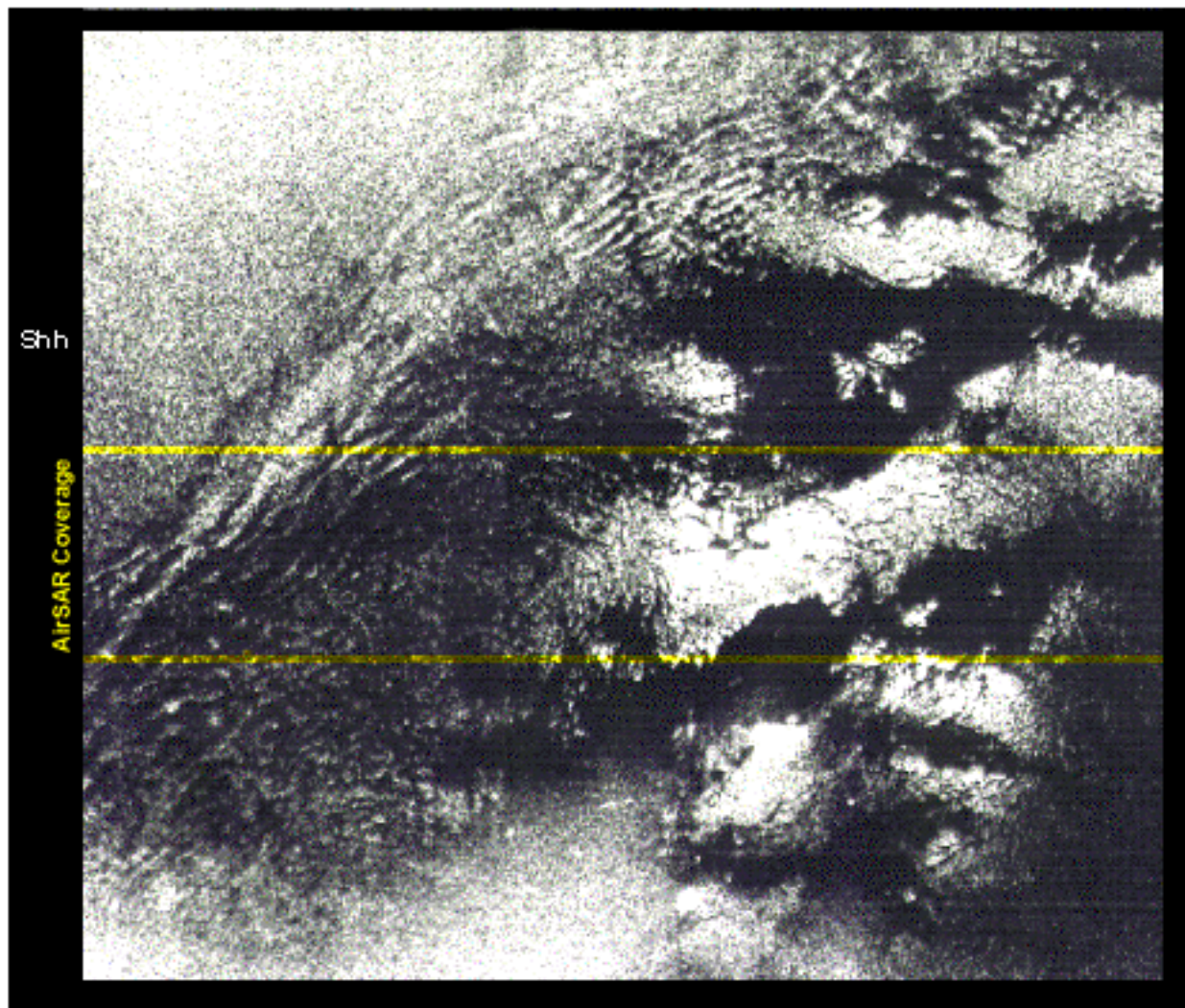


Figure 2. Russian Almaz S-Band HH SAR image of the Celtic Sea, July 5, 1991. The image shows a region of tidally induced upwelling and internal wave generation at the edge of the continental shelf. Dimensions are approximately 40 x 35 km centered near 48°10'N Latitude 8°48'W Longitude. (Data courtesy V. S. Etkin and A. L. Smirnov) [From Apel 1995, Evans 1995]. Horizontal strip shows the area of the AirSAR collection

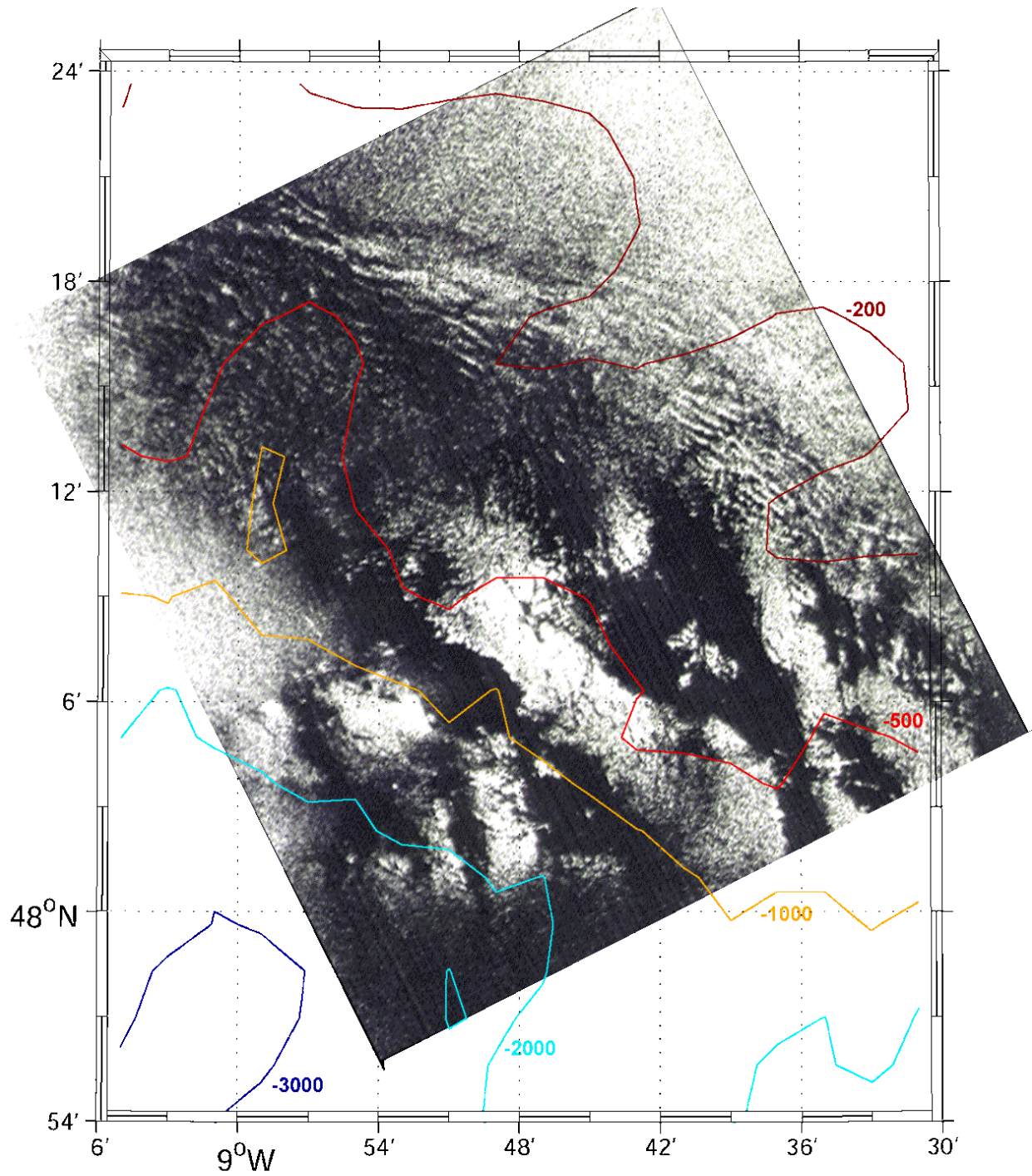


Figure 3. Almaz data overlaid with local bathymetry map.
(Bathymetry derived from Smith and Sandwell version 8.2)

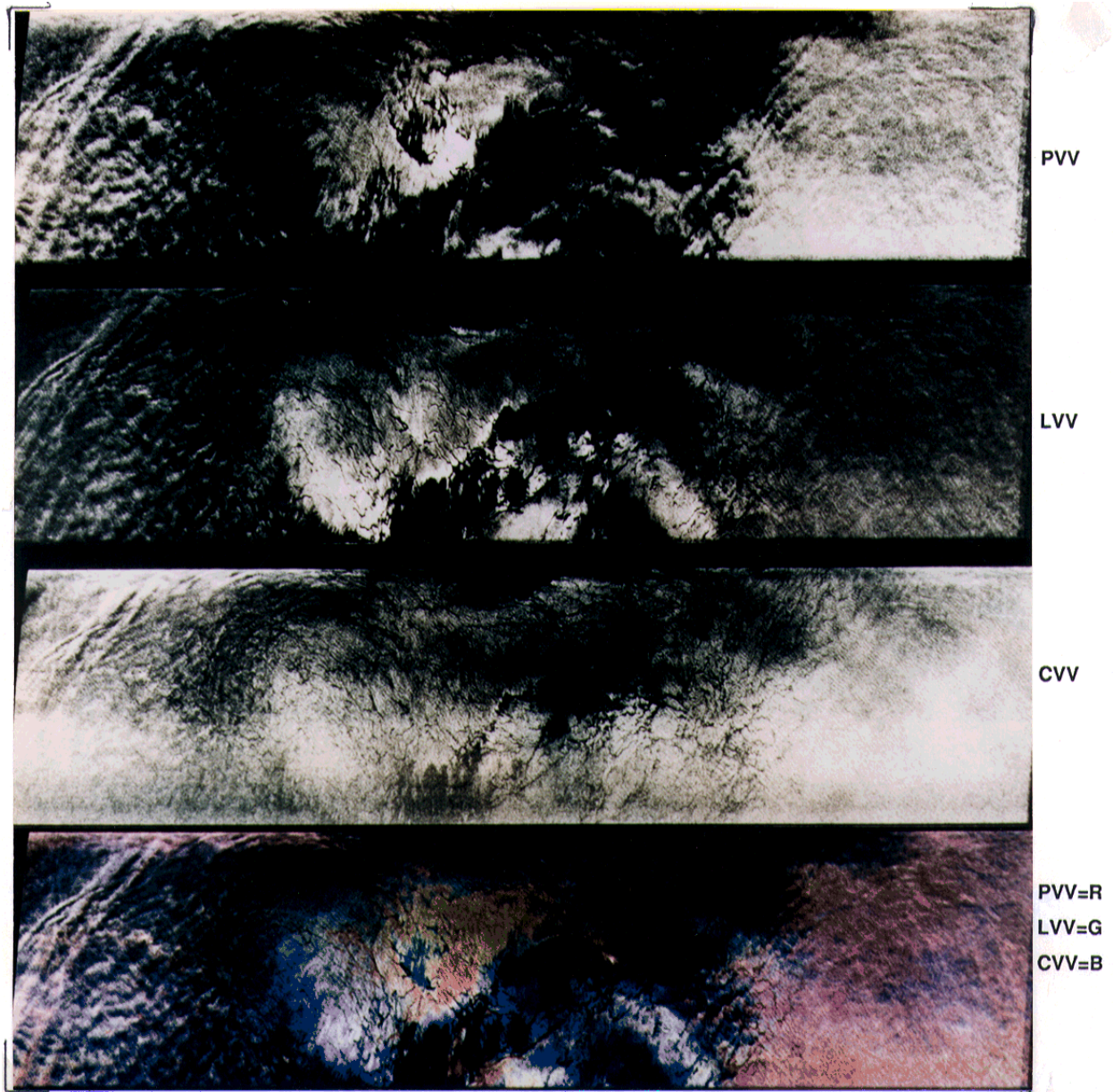


Figure 4. NASA JPL AirSAR images at P, L, and C-Band (VV polarization) of the area within the yellow strip on figure 2. Significant differences exist between the AirSAR images that relate to surface roughness (backscatter intensity) due to different sensitivities at the various wavelengths. [From Evan 1995]

References

- Apel, J.R., 1995: Linear and nonlinear internal waves in coastal and marginal seas. *Oceanographic Application of Remote Sensing*, ed. by M. Ikeda and F. Dobson, CRC Press, Boca Raton, FL, 512pp.
- Evans, D. L. (Editor), 1995, Spaceborne Synthetic Aperture Radar: Current Status and Future Directions, NASA Technical Memorandum 4679
- Pingree, R.D., and G.T. Mardell, 1985: Solitary internal waves in the Celtic Sea. In essays on oceanography: a tribute to John Swallow, ed. by J. Crease, W.J. Gould, and P.M. Saunders, *Progress in Oceanography*, 14, 431-441