East China Sea

Overview

The East China Sea is a semi-enclosed sea located in the western Pacific (Figure 1). It is bounded by Mainland China (to the west), Taiwan (to the south), the Ryukyu Island chain (to the east) and the Yellow Se (to the north). The region is influenced by the Tsushima and Kuroshio Currents as well as by a strong upwelling area northeast of Taiwan.



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

Observations

There has been some scientific study on the internal waves in the East China Sea, primarily through the use of satellite imagery. Hsu et al. [2000] have studied rank-ordered packets of nonlinear internal waves often observed in the East China Sea, especially northeast of Taiwan (see Figure 2 and 3). The internal wave field in this region is very complicated, and its generation mechanisms include tidal effects, the interaction of the Kuroshio with the continental shelf, and upwelling induced by the intrusion of the Kuroshio across the continental shelf. Liu et al [1998] noted that mixed layer depth in the East China Sea varies significantly such that either elevation and depression internal waves can be generated.

The satellite imagery reveals that numerous other generation locations exist around the East China Sea. They include the small islands along the east coast of Mainland China (Figure 6-8) and the continental shelf break along the East China Sea's eastern edge (Figures 4 and 9).

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

(Numbers indicate diffete dates in that month when waves have been noted)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
			1	3	1	5	4			1	

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

References

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34°N

Figure 2. ERS-2 (C-Band VV) SAR image over the East China Sea northeast of Taiwan acquired on 10 May 1994 at 0225. The image shows a complex set of internal wave signatures. Internal wave activity in the area is influenced by both the Kuroshio Current (the boundary of which is visible from upper right extending diagonally toward image center) and by upwelling (the oval-shaped area northeast of Taiwan). Imaged area is 100 km x 100 km. ©ESA 1994.



Figure 3. ASTER false-color VNIR image northeast of Taiwan acquired on 25 May 2001 at 0246 UTC. The image shows a complicated set of internal wave signatures (lower right) in addition to more linear wavefronts oriented parallel to the shelf edge (middle center). Imaged area is 60 km x 180 km.





Figure 4. MODIS (Bands 1,3,4) 250-m resolution visible image over the East China Sea acquired on 3 August 2003 at 0235 UTC. The image shows signatures of internal waves propagating roughly west- and northwards. The waves were most likely tidally generated at the continental shelf break Imaged area is 240 km x 130 km.





Figure 5. Distribution map of internal wave occurrence in the East China Sea compiled by Hsu et al. [2000]. The map was generated from ERS1/2 SAR imagery acquired between 1993 and 1997. The orientation of the internal wave patterns northeast of Taiwan points to a complex generation and evolution process.



Figure 6. ASTER false-color VNIR image over the northern section of the Strait of Taiwan acquired on 4 August 2001 at 0252 UTC. The image shows the signature of six internal wave packets propagating east into the East China Sea. The waves are generated among the small islands located along the coast of Mainland China. Imaged area is 60 km x 60 km.





Figure 7. ERS-2 (C-band VV) SAR image over the eastern East China Sea acquired on 26 July 1997 at 0226 UTC. The image shows the signature of fine scale internal wave packets propagating shoreward. Imaged area is approximately 50 km x 130 km. ©ESA 1997. [Image courtesy of Werner Alpers, University of Hamburg, Hamburg, Germany]





Figure 8. ASTER falsecolor VNIR image over the northwest corner of the East China Sea acquired on 16 May 2001 at 0252 UTC. The image shows the signature of several internal wave packets propagating northward. Imaged area is 60 km x 120 km.





Figure 9. MODIS (Bands 1,3,4) 250-m resolution visible image over the northern East China Sea acquired on 3 August 2003 at 0235 UTC. The image shows the signature of well-defined internal wave packets propagating west into the East China Sea near the Korea Strait. Imaged area is 215 km x225 km.

