

## **East and South China Seas**

Figure 1 ERS-1 C-band VV SAR image of internal wave signatures northeast of Taiwan on May 10, 1994 at 2:25 GMT. The Kuroshio Current boundary is visible inside the 1000m isobath. Image dimensions are 100 km x 100 km centered at  $25^{0}12'$  N Latitude,  $121^{0}11'$  E. Longitude. [Hsu et. al, 2000]

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Figure 2. (Left) ERS-1 C-band VV SAR image of the Luzon Strait collected on June 16, 1995. The image shows the signature of a huge soliton packet. Image dimensions are 100 km x 400 km [Hsu and Liu, 2000]. (Below) An enlargement showing the details of the internal waves [Apel 1999].





Figure 3. ERS-1 image from figure 2 shown over the bathymetry of the Luzon Strait. Bathymetry derived from GEBCO Digital Atlas 97.





Figure 4. Radarsat ScanSAR image of the South China Sea collected on April 26, 1998. Image dimensions are 450 km x 450 km. A variety of internal wave signatures are visible. The internal waves are refracted as they pass Dongsha coral reef (near image center) and then recombine [Hsu and Liu, 2000]

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Figure 5: SIR-C C-Band Survey image (DT174.2 20 April 1994 3:31 GMT) of the South China Sea off the coast of Hong Kong showing internal wave activity. Bathymetry map derived from Smith and Sandwell version 8.2



Figure 6. Space Shuttle Photograph (STS007-05-245) taken in June 1983 showing internal wave signatures off the southeast coast of Hainan Island in the South China Sea. Image is centered near 18.5° N, 110.5° E. Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center (http://eol.jsc.nasa.gov).

## References

- Apel, J.R., 1999, "Are Strongly Sheared Baroclinic Currents Sources for Internal Solitons?" IOS/WHOI/ONR, 1998: Internal Solitary Wave Workshop Papers. *Woods Hole Oceanographic Institution Technical Report* WHOI-99-07, Edited by T. Duda and D. Farmer. http://www.whoi.edu/science/AOPE/people/tduda/isww/text/index.html.
- Hsu, M.-K., A.K. Liu, and C. Liu, 2000: A study of internal waves in the China Seas and Yellow Sea using SAR. *Continental Shelf Res.*, **2**0, 389-410.
- Hsu, M.-K., and A.K. Liu, 2000: Nonlinear internal waves in the South China Sea. *Canadian J. Rem. Sens.*, **26** (**2**), 72-81.
- Liu, A.K., S.Y. Chang, M.-K. Hsu, and N.K. Liang, 1998: Evolution of nonlinear internal waves in East and South China Seas. *J. Geophys. Res.*, **10**3, 7995-8008.

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