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合成開口レーダと光学センサによる海洋メソ・サブメソスケールフロントの検出
Detection of meso- and submeso-scale ocean fronts using Synthetic Aperture Radar (SAR) and Optical data

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Synthetic aperture radar (SAR) can image ocean surface roughness with high spatial resolution (˜10m) and operationally detect information on wind speed and wave, which are related to ocean surface roughness. One of main factors by which surface roughness is modulated is convergence and divergence of surface currents and it has been reported that a large current shear is imaged as line-shaped high NRCS on a SAR image. With a combination of c-band SAR and optical images, a study on upper ocean dynamics has been reported. In the present study, information of ocean fronts with meso- and submeso-scales are detected using L-band SAR (PALSAR-2) and MODIS SST/Chl-a images. The MODIS data we used, which are processed and provided in near-real-time by JAXA/EORC, are observed in the Northwestern Pacific at October 25, 2014 01:11(UT), while PALSAR-2 data that are provided by JAXA within the framework of the 4th ALOS Research Announcement are acquired at October 25, 2014 14:17(UT), about 13 hours time gap for the MODIS acquisition.

In order to make fine structure visible, an about 20-km high-pass filtering is applied for the PALSAR-2 NRCS image after eliminating incidence angle-dependent average signals. This PALSAR-2 contrast image is then compared with the MODIS SST and Chl-a images. The comparison shows that the positions of line-shaped bright and dark patterns in the contrast images correspond with large SST gradients, i.e., SST fronts. This feature is consistent with a general theory that divergence and convergence areas induced by large current shear are imaged dark and bright, respectively, through the modulation of ocean surface roughness. Moreover, the comparison with the Chl-a image represents some local Chl-a maximum along the line-shaped patterns in the PALSAR-2 contrast image. It is suggested that the local increase of Chl-a is induced by upwelling caused by submeso-scale front phenomena. The PALSAR-2 contrast image is thus expected to give useful information on the upper ocean dynamics. In addition to that, since the detected line-shaped patterns might represent ”Shiome” and are related to Chl-a concentration, it is interesting to investigate their relationship with fishing grounds.

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