

Unusual Path of the Kuroshio in Spring 1997 as Revealed by OCTS Images

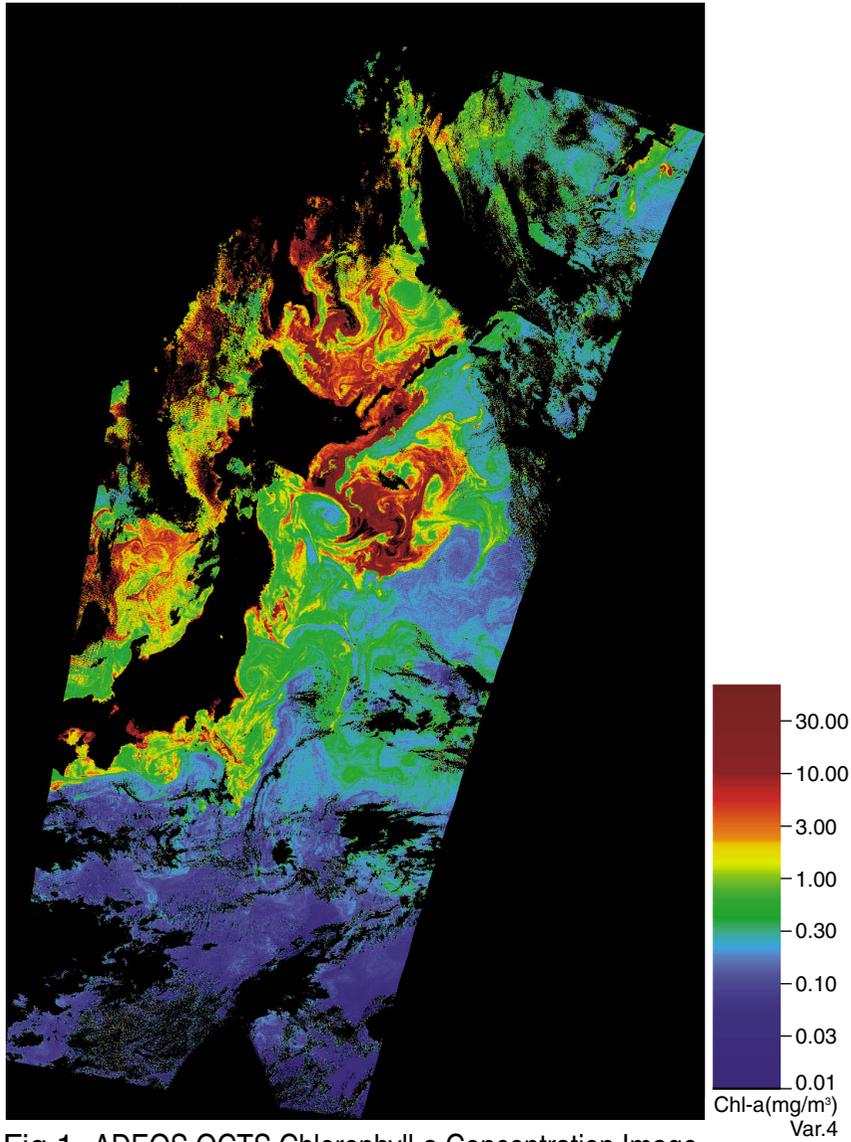


Fig.1 ADEOS OCTS Chlorophyll-a Concentration Image
(26 April 1997 01:37 UT / Japan)

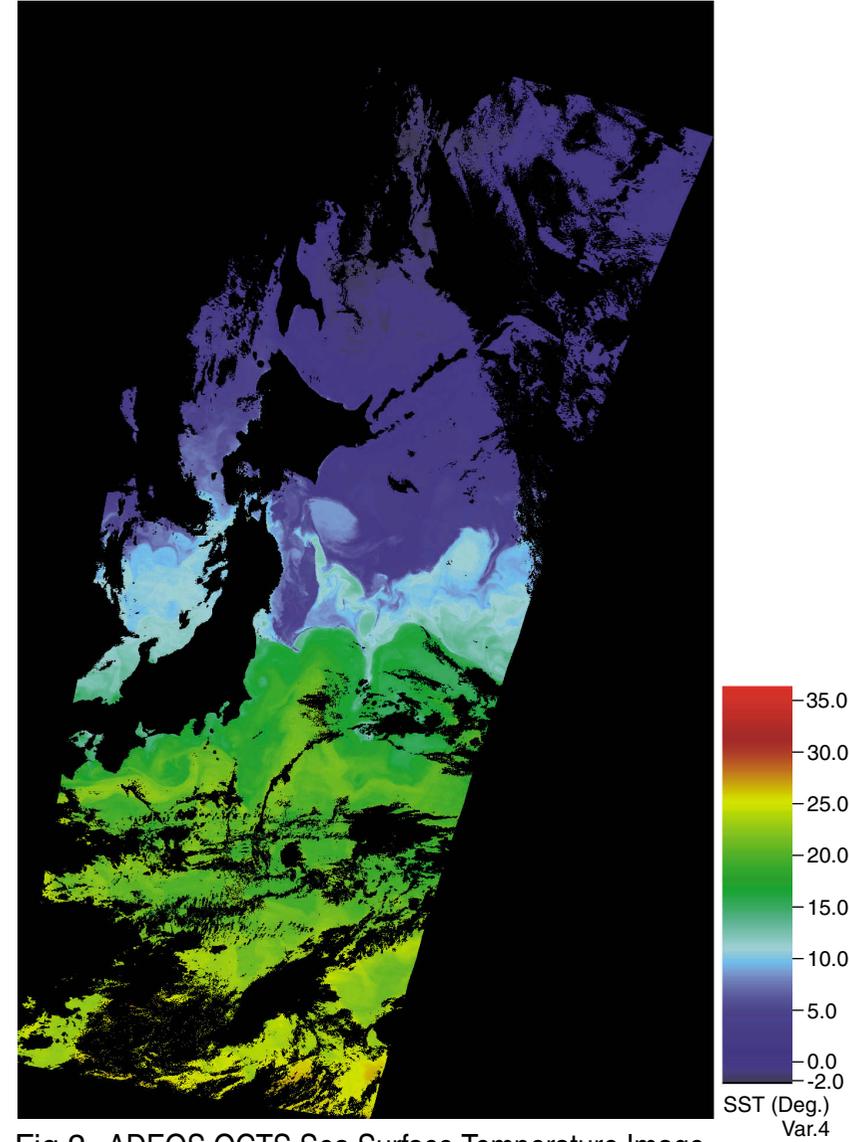


Fig.2 ADEOS OCTS Sea Surface Temperature Image
(26 April 1997 01:37 UT / Japan)

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A combination of simultaneous images of ocean color and sea surface temperature (SST) by OCTS can reveal oceanic conditions more clearly than the use of SST images alone. A good example is the finding of unusual paths of the Kuroshio in the spring of 1997.

The Kuroshio, the western boundary current of the North Pacific Ocean, has two major groups of paths: those with a large meander and those without a large meander. These two groups do not switch periodically but with time scales of a few years. When there is no large meander, the Kuroshio flows along Honshu. When there is a large meander, the Kuroshio flows off Honshu usually south of Kii Peninsula to the southeast then turns to the north, usually along the west slope of the Izu-Ogasawara Ridge, to flow over the Ridge around 34-32°N to the east. There is a cold water mass off Kii Peninsula or Enshunada, surrounded by the large meander.

Since December 1996, the Kuroshio was observed to take a very southerly path. In particular, the OCTS ocean color and SST images of 26 April revealed that the Kuroshio path reached 31°N on the Izu-Ogasawara Ridge. At the same time, the northern cold water mass reached down to 32°N to the east of the Izu-Ogasawara Ridge, the Kuroshio flowed south of this cold water, then flowed straight to the north at 142°E along the east slope of the Japan Trench, reaching 37°N. From that point, the Kuroshio Extension did not flow eastward immediately, but flowed like a pin curl south down to 34°N then eastward. Further to the east, at 146°E, a cold water mass was seen flowing straight south.

It is very unusual for the Kuroshio to take such a southerly path around the Izu-Ogasawara Ridge, with many meridional flow patterns. Also, it is unusual that the Kuroshio Extension flowed south of 35°N for such a long period (since December 1996). The cause of these rather unusual flow patterns is to be investigated oceanographically. However, it might be related to the recent global warming.

The OCTS data of 25-27 May 1997 revealed that the Kuroshio isolated a large cold water mass south of the Kuroshio Extension and east of the Izu-Ogasawara Ridge. A similar phenomenon also occurred from February to March.

The SST pattern observed by satellite is the temperature at the very surface layer of the oceans (about 20 micrometers thick). This is affected by the short time-scale variability of the SST due to air-sea boundary processes including solar radiation, evaporation and other factors, so the pattern does not necessarily correspond to the current pattern. The ocean color data, however, represents the average phytoplankton concentration of the upper ocean on the order of a few tens of meters in thickness. Consequently, the combination of the SST and ocean color images is very useful for studying the oceanic conditions, though the phytoplankton concentration is not a conservative quantity since it includes chemical and biological processes of some time scales.

It is also noted in the ocean color image of 25 May 1997 that the isolated cold water mass to the southeast of the Boso Peninsula corresponds to a very good fishing area of bonitos. OCTS data is thus very useful for fisheries purposes also.