

The role of Koshu Seamount in generating the Kuroshio large meander south of Japan from data-assimilated HYCOM outputs

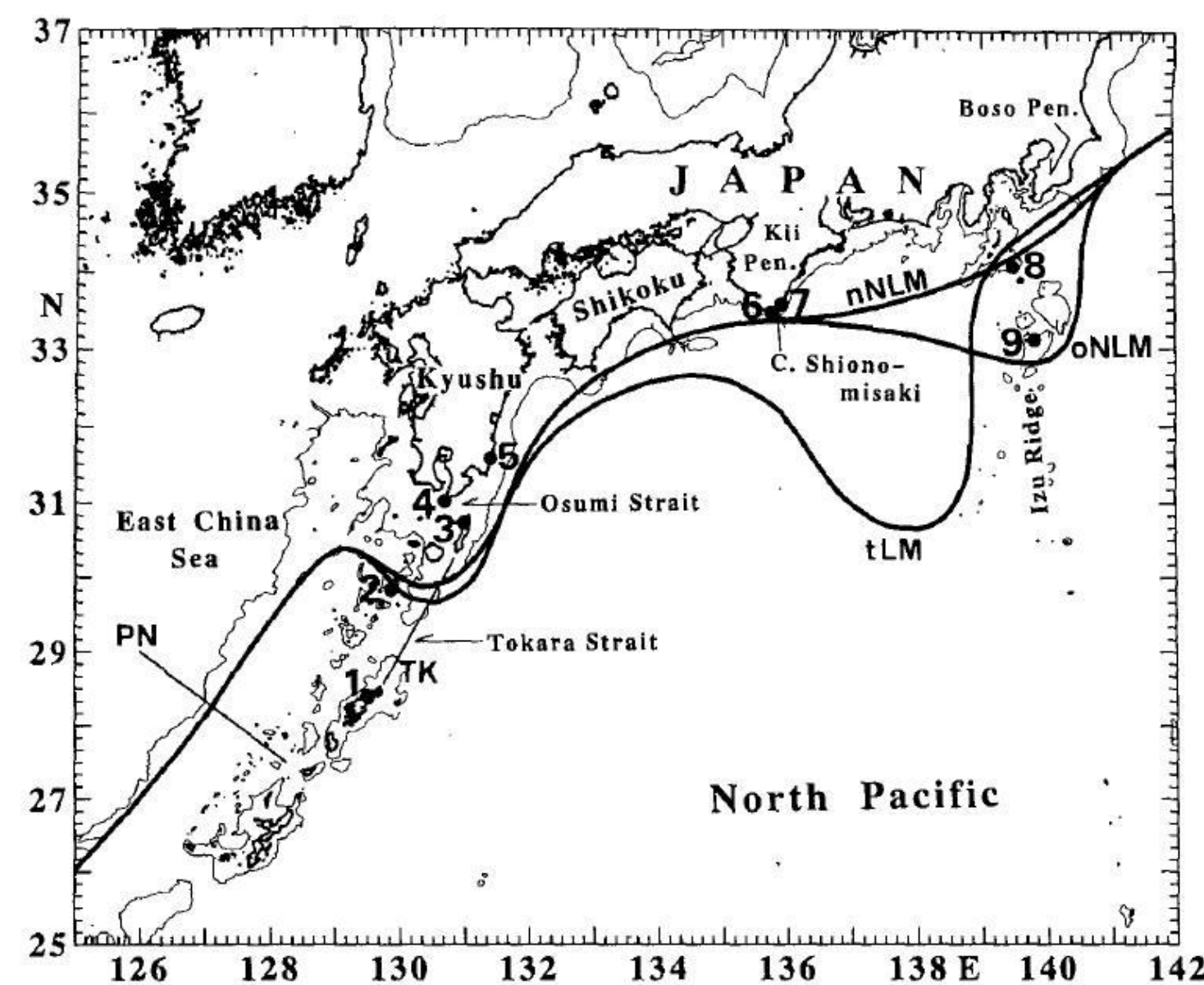
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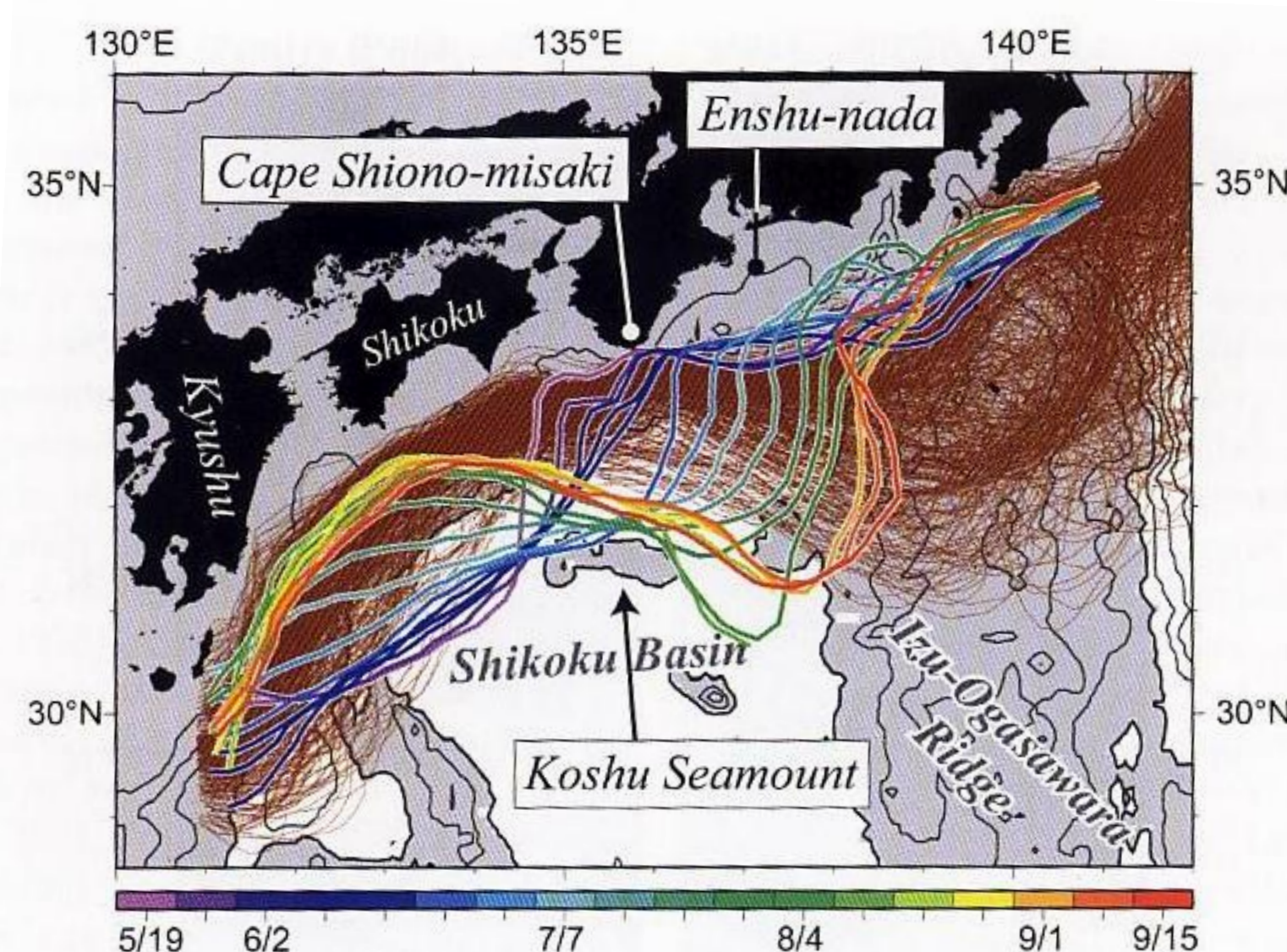
1. Kuroshio Large Meander (LM)

- Kawabe (1995) shows three typical Kuroshio patterns:
 - nNLM: nearshore non-large meander
 - oNLM: offshore NLM
 - tLM: typical large meander

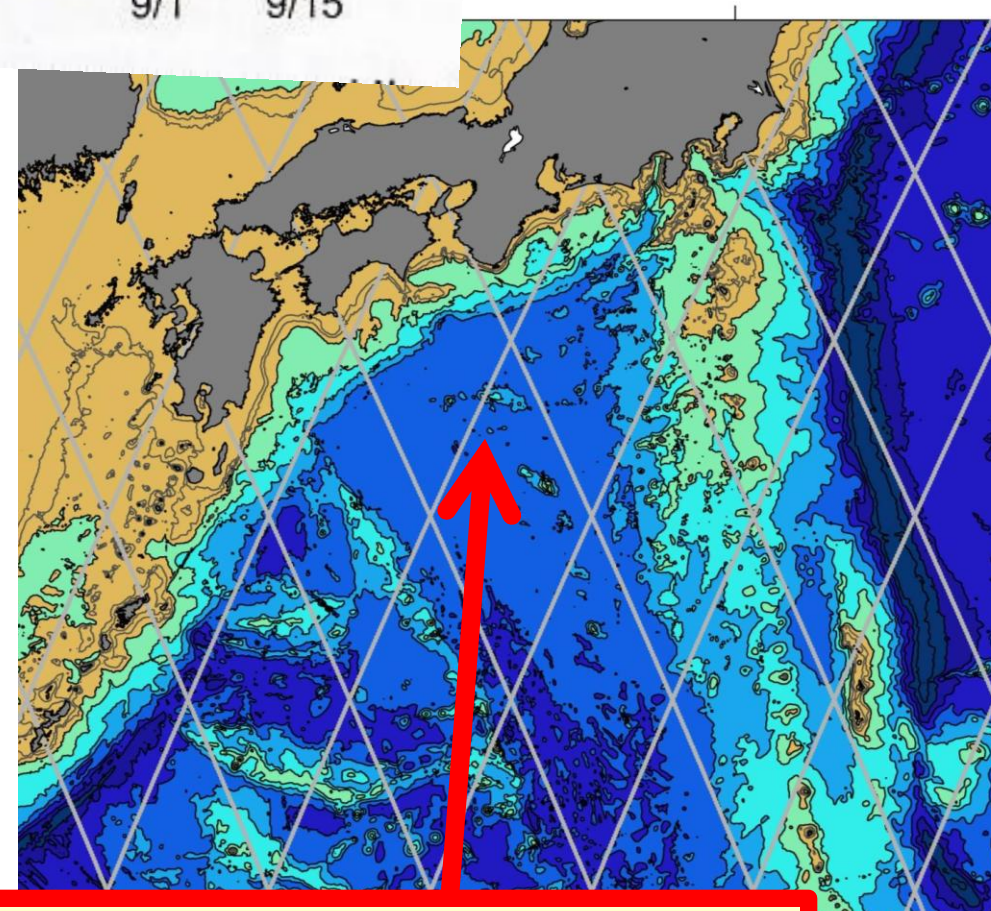


2. Recently, the role of Koshu Seamount in triggering the Kuroshio larger meander draws attentions

- Ambe et al. (La Mer, 2009)
- Endo and Hibiya (GRL, 2009)
- Endo et al. (JPO, 2011)

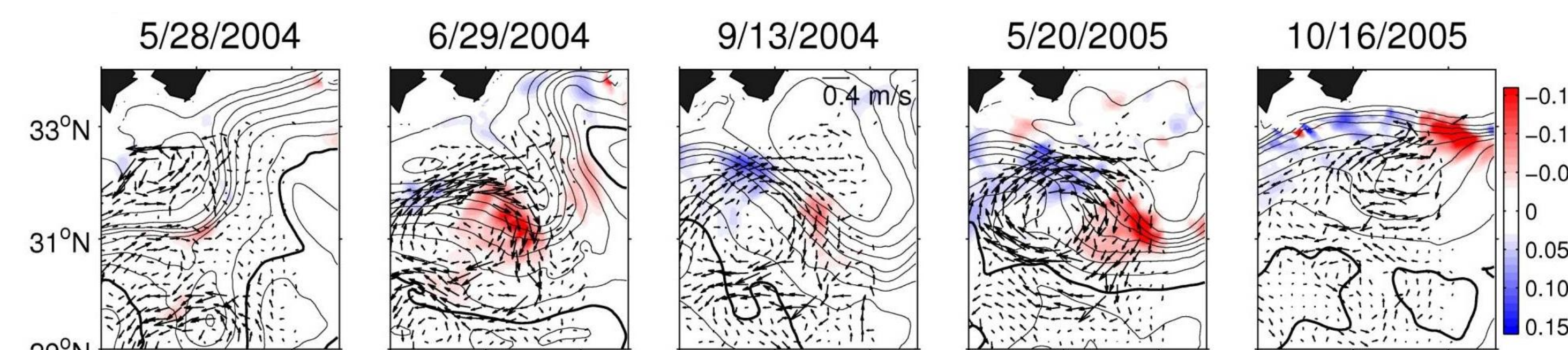


- During the last 20 years of satellite altimeter measurement period, the Kuroshio has passed over the Koshu Seamount once just before the LM event in 2004 (Ambe et al., 2009)

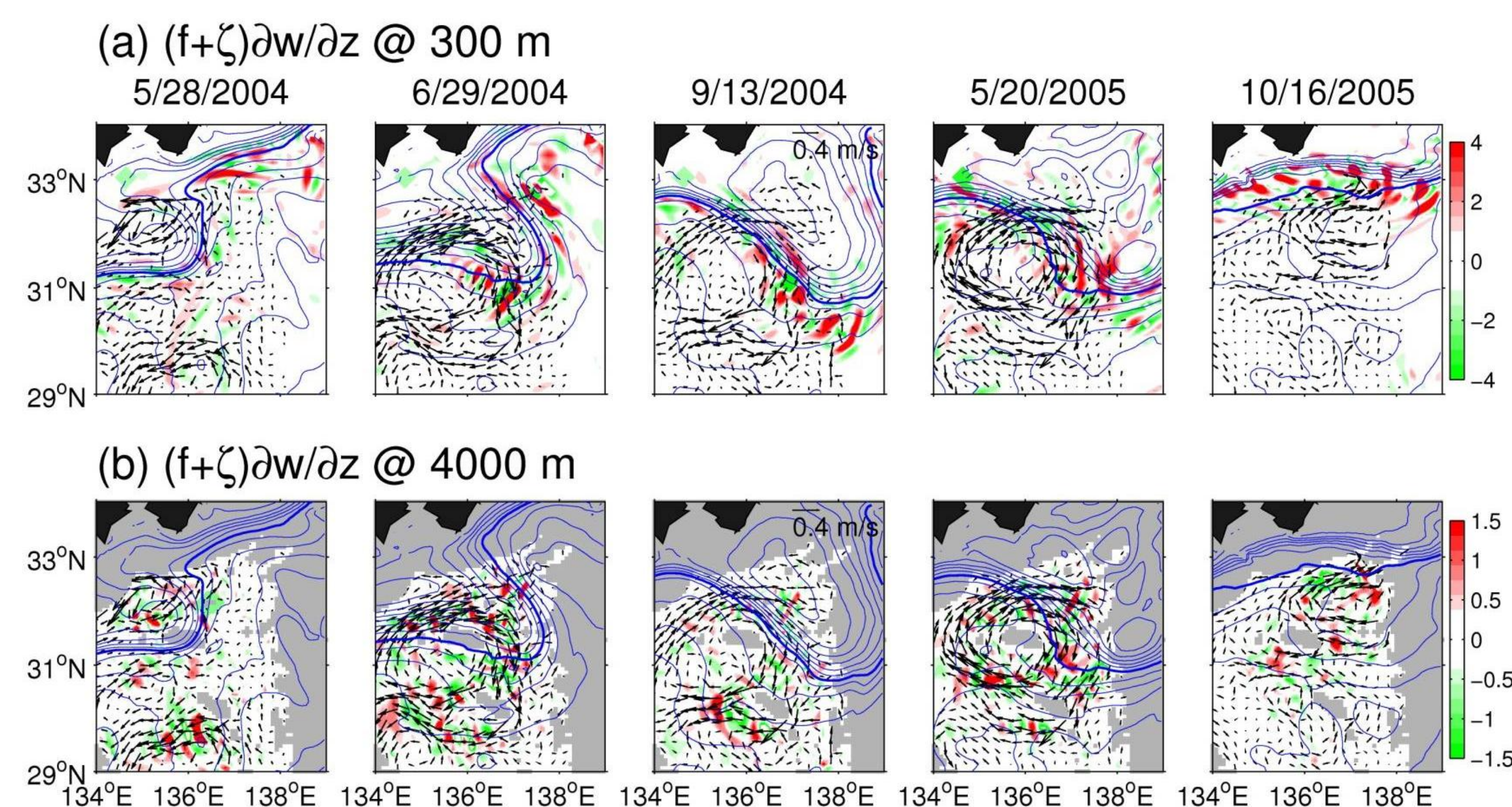


Koshu Seamount

3. The distribution of w at 500 m from HYCOM analysis shows upwelling and downwelling due to a deep anti-cyclonic eddy around the Koshu Seamount. This eddy is generated by the meandering Kuroshio passing over the Koshu Seamount.

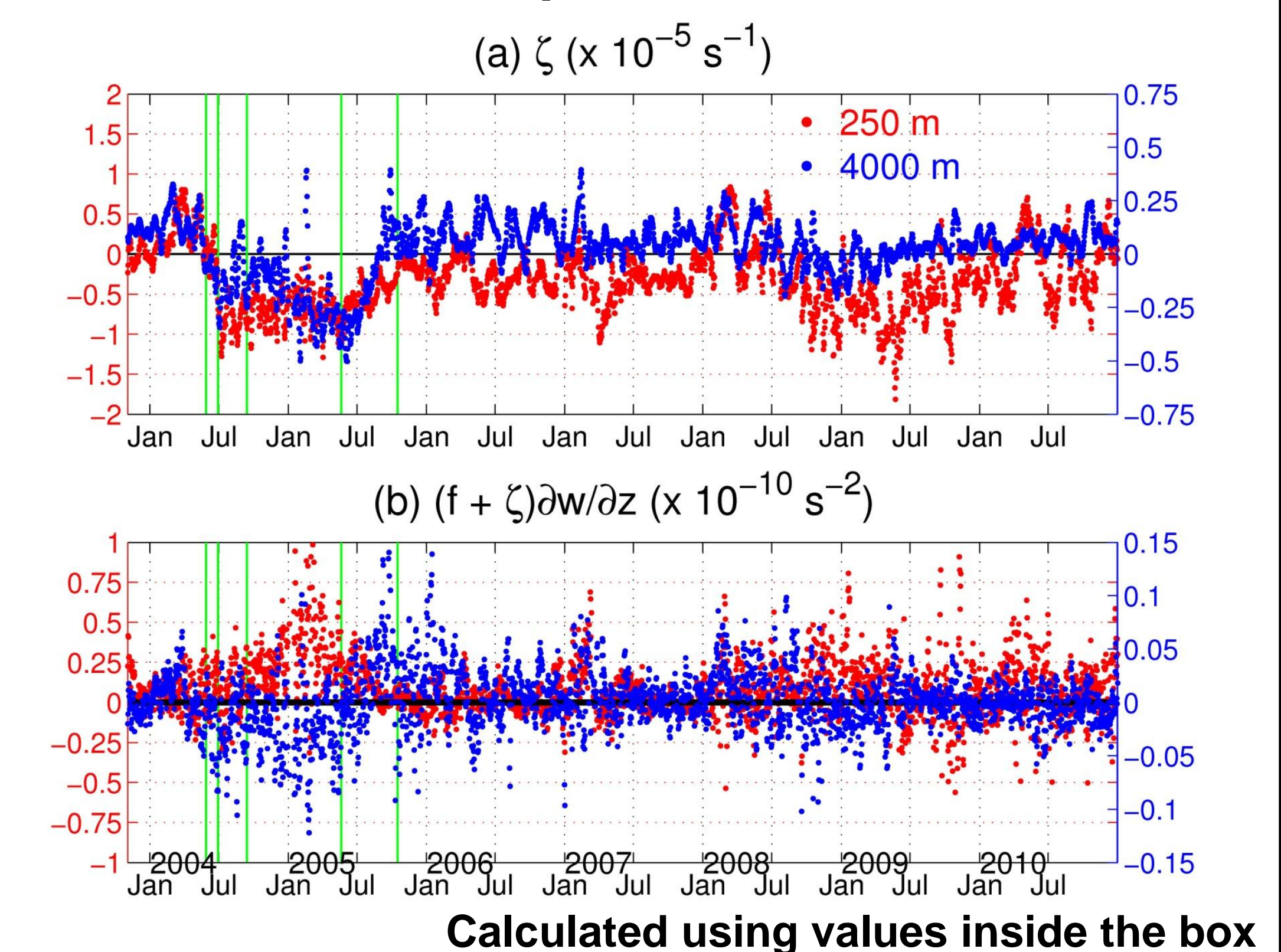


4. Stretching term of vorticity shows positive and negative values in the upper and deep layers, respectively.

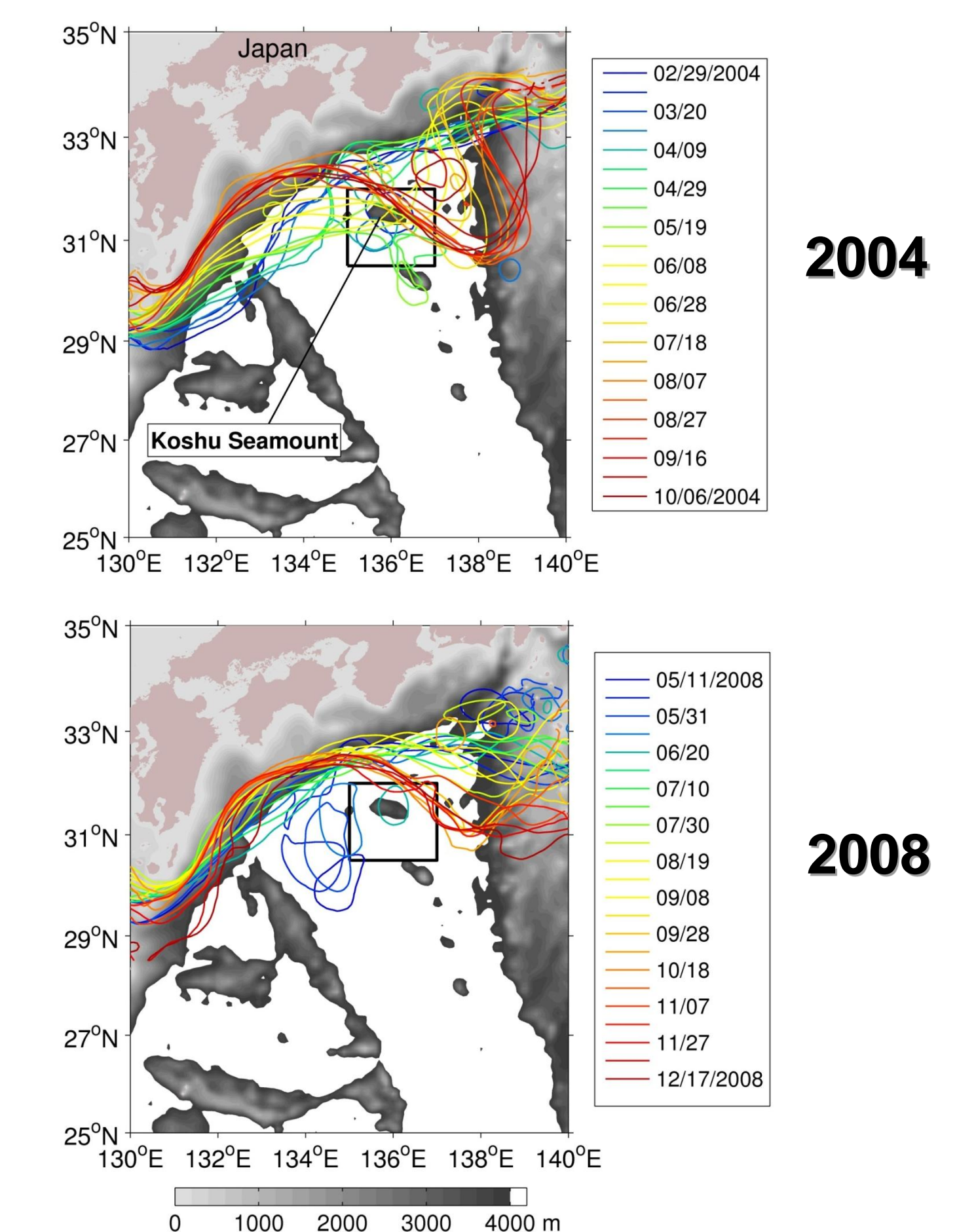


Several mechanisms have been suggested to explain the transition of Kuroshio path from non-large to large meander south of Japan. Recently, a series of studies using satellite altimetry measurements, reanalysis data, and simplified numerical simulations demonstrates an essential role of Koshu Seamount located south of Cape Shiono-misaki, Japan, in generating the Kuroshio large meander. This study confirms the role of Koshu Seamount using data-assimilated HYbrid Coordinate Ocean Model (HYCOM) outputs. Analyses of model outputs reveal the interaction between deep abyssal anticyclonic circulation around Koshu Seamount and the Kuroshio, which amplifies the trigger meander to create the large meander in 2004. The Kuroshio takes offshore non-large meander paths for about a year from fall 2008. During this period deep anticyclone around Koshu Seamount was not developed enough to create the Kuroshio large meander since its path doesn't pass over Koshu Seamount. Scatter plot of upper stretching term versus deep one computed in a box surrounding Koshu Seamount shows negatively-correlated tight relationship between them when the large meander happens, suggesting that baroclinic instability is an important process to create the large meander.

5. Time series of ζ reveal negative values in both upper and deep layers during 2004-2005 when the Kuroshio LM event occurred. Correspondingly, Positive and negative stretching occurred in the upper and lower layers, respectively. Another negative ζ event in the upper layer occurred in 2008, but it didn't develop to the LM.



6. The Kuroshio didn't pass over the Koshu Seamount during 2008



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