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Sea Surface Salinity signatures of tropical instability waves: New evidences from SMOS

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The European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) mission, launched in November 2009, has been providing global maps of sea surface salinity (SSS) since 2010. SSS measurements from the SMOS satellite during June 2010 and December 2012 provide an unprecedented space-borne observation of the salinity structure of tropical instability waves (TIWs) including strong La Niña conditions during recent years.

We use SMOS level 3 SSS maps averaged over 100 x 100 km^2 with a 10-day running window and sampled daily over a 0.25 x 0.25° grid generated at Laboratoire d'Océanographie et du Climat: Expérimentation et Approches Numériques (http://catds.ifremer.fr/Products/Available-products-from-CEC-OS/Locean-v2013) [Boutin et al., 2013; Yin et al., 2012]. We also analyze daily SST from the Operational Sea Surface Temperature and Sea Ice Analysis (OSTIA) produced on an operational basis at the UK Met Office using optimal interpolation [Donlon et al., 2011].

From a time-longitude section in the eastern Pacific ocean, westward propagations of SSS and SST anomalies along 2°N became apparent west of 90°W during June 2010 - March 2011 and June 2011 - March 2012, coincident with negative indexes in the $NINO_3$ and $NINO_3.4$ regions. The 33-day SSS anomaly and SST anomaly appeared together approximately in the same time and regions. The 17-day SSS anomaly is less clear than the 17-day SST anomaly. The SSS anomaly has approximate amplitude of 0.5 practical salinity scale (pss) and the SST anomaly has approximate amplitude of 2 °C.

Then, we focus on analysis of SSS and SST anomalies during June to December 2010. During this period the tropical Pacific was characterized by a strong La Niña, providing favorable conditions for the occurrence of TIWs. The high anomalies and meridional gradients of both SSS and SST appear north of the equator west of 100°W. Near 100W, they straddle the equator where South Pacific water and eastern edge upwelling water with high salinity meets the fresher Inter-tropical Convergence Zone water. SSS anomaly and SST anomaly vary in opposite phase and the amplitude of SSS anomaly is approximately 1/5 of SST anomaly. The westward propagation speed of SSS is approximately between 0.6 m/s and 1.5 m/s depending on latitude and dominant period of TIWs. Poleward propagations of waves are also observed at around 100°W. The results demonstrate the important value of SMOS SSS in studying TIWs.

Reference

Boutin, J., N. Martin, G. Reverdin, X. Yin and F. Gaillard (2013), Sea surface freshening inferred from SMOS and ARGO salinity: Impact of rain, Ocean Sci., 9, 183-192, doi:10.5194/os-9-183-2013.

Donlon, C. J., M. Martin, J. D. Stark, J. Roberts-Jones, E. Fiedler and W. Wimmer (2012), The Operational Sea Surface Temperature and Sea Ice analysis (OSTIA), Remote Sensing of the Environment, 116, 140–158, doi: 10.1016/j.rse.2010.10.017.

Yin, X., J. Boutin, and P. Spurgeon (2012), First assessment of SMOS data over open ocean: part I Pacific Ocean, IEEE Trans. Geosci. Remote Sens. 50(5), 1648-1661.