Dean
Roemmich
Scripps Institution of Oceanography, UCSD
Oral
The close relationship of Argo steric height (SH) and altimetric sea surface height (SSH) is revisited in the equatorial Pacific, focusing on the annual cycle because of its large contribution to the total variance, its relationship to interannual ENSO variability, and its unique equatorial wave phenomena. Using either 9-year (2004-2012, SH and SSH) or 20-year (1993-2012, SSH) time-series for averaging, the westward propagating annual Rossby wave described by Kessler and McCreary (JPO,1993) stands out clearly. Eastward intraseasonal Kelvin wave propagation along the equator is strong enough in individual years to leave residuals in the 9-year or 20-year averages, particularly in October/November at around 160°W. In the eastern and central equatorial Pacific, the amplitude of annual variability is much greater at 5°N than at 5°S, as noted by Kessler and McCreary (1993). West of the dateline the variability is nearly symmetric about the equator with strong maxima at 5°N and 6°S. Gridded SH and SSH are well correlated throughout the domain with SSH anomalies approximately 1.1 times SH. The Argo profile data reveal the vertical structure and vertical phase propagation corresponding to the SH annual cycle. Argo trajectories at 1000 m show large annual zonal displacements along the equator of 1000 -2000 km. Annual steric variability extends below 2000 m, where the deep steric signal is significant but weaker due to decreased vertical property gradients. The spatial pattern of the SSH-minus-SH annual cycle is noisy but resembles that of mass variability from GRACE.

This report anticipates a field experiment beginning in late 2013 in which Argo resolution will be doubled in the equatorial Pacific. Using high bandwidth 2-way communications, Argo floats can now leave the sea surface in about 20 minutes, minimizing the sea surface equatorial divergence caused by much longer surface times in earlier floats. Information content in Argo and altimetry will first be investigated separately for comparison. In subsequent work we will consider them in combination, and together with wind stress, using multivariate optimal interpolation and then ocean state estimation to add dynamical constraints. The equatorial Pacific is a favorable test-bed because of the importance of optimizing the ENSO observing system and because the scales of variability are longer there than at higher latitudes, providing more robust statistical results.
OSTS session
Science Results from Satellite Altimetry