A Real-time Ocean Reanalyses Intercomparison Project in the Context of Tropical Pacific Observing System and ENSO Monitoring

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An ensemble of nine operational ocean reanalyses (ORAs) is now routinely collected, and is used to monitor the consistency across the tropical Pacific temperature analyses in real-time in support of ENSO monitoring, diagnostics, and prediction. The ensemble approach allows a more reliable estimate of the signal as well as an estimation of the noise among analyses. The real-time estimation of signal-to-noise ratio assists the prediction of ENSO.

The ensemble spread, as a measure of uncertainties in ORAs, is shown to partially link to the Tropical Pacific Observing System (TPOS). The full deployment of the TAO array significantly reduced the uncertainties among temperature analyses in the equatorial Pacific, thus clearly highlighting the positive influence of the TAO data on constraining ocean analyses. The availability of the Argo data helped to reduce the analysis uncertainty north of 8^oN and south of 8^oS significantly. The uncertainties in total temperature reduced significantly in 2015 due to the recovery of the TAO/TRITON array to approach the value before the TAO crisis in 2012. However, the uncertainties in anomalous temperature still remained much higher than the pre-2012 value, probably due to uncertainties in the reference climatology. This highlights the importance of the long- term stability of the observing system for anomaly monitoring.

The influences of the TAO data loss on the estimation of D20 anomalies during 2012-2015 were assessed. In 2012 and 2013, the signal was weak, while the noise was comparable to the signal in the eastern equatorial Pacific where many TAO moorings were down. The 2015/16 El Nin∼o was very well observed due to the recovery of the TAO moorings by the end of 2014, and the signal-to-noise ratio in D20 anomalies was relatively high. The ensemble ORAs have been used to study the characteristics of the evolution of the 2015/16 El Niño and place it in the context of historical ENSO events since 1979.