Intraseasonal signals in the daily high resolution blended Reynolds sea surface temperature product and their validation over the Tropical Indian Ocean

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Sea surface temperature (SST) is an important parameter in many operational and research activities, ranging from weather forecasting to climate research. In this study the new available daily SST product produced at the National Oceanic and Atmospheric Administration (NOAA) as described by Reynolds et al. (2007) has been examined. The weekly Reynolds (REY) SST product (Reynolds et al. 1994) has been widely used by various researchers though they had some drawbacks. One drawback is its inability to capture the intraseasonal variability. In this study the daily SST product is validated using the TMI and available buoy observations. Its capability to capture the intraseasonal signals has been highlighted.

The credibility of daily REY SST is quantified by computing the correlation coefficient, Root Mean Square (RMS) error and standard deviation (STD) between TMI and REY SST. The correlation between TMI and REY SST shows values above 0.8 (above 99% confidence level) over most of the tropical Indian Ocean basin. The RMS difference is observed to be less than 0.7°C over the tropical Indian Ocean between 10°S to 10°N, most of the Arabian Sea and southern Bay of Bengal. RMS differences of the order of 0.8°C are seen in the coastal regions (especially Sumatra), where the correlation is also less. STD of TMI and REY SST shows similar pattern with almost similar amplitude. To validate the daily REY SST product the continuous mooring observations at DS1 (69.3E, 15.3N), DS2 (72.5E, 10.8N), DS3 (87E, 13N), DS4 (89E, 19N) and DS5 (82E, 16N) buoys are utilized for this purpose. Figure 1 shows a comparison of SST from TMI, buoy and REY at viz five buoy locations DS1, DS2, DS3, DS4 and DS5 for the year 1998. The REY SST is comparable with the TMI and DS SST at all the five locations. At DS5, a possible warm bias in the buoy SST during the end of May was observed based on the comparison with the TMI and Reynolds data. This perhaps is due to the horizontal and temporal resolution of these products REY and TMI SST and due to their inefficiency in incorporating the rains in the algorithm. To further check the reliability of the product, Complex Empirical Orthogonal Function (CEOF) analysis has also been carried out and compared with that of TMI. The first CEOF mode of TMI and REY explains respectively 46.49% and 46.19% of the total variance. The second CEOF mode of TMI and REY explains respectively 23.19% and 18.94% of the total SST variance in the IO. So the variability (both spatial and temporal) in both REY and TMI SST showed similar pattern.

To check out the intraseasonal signals presented in the daily REY SST and TMI SST data from both the products are filtered into 10–90 day using Lanczoc band-pass filter. Figure 2 shows time series of 10–90 day SST averaged over (a) BOX1 (65E:85E,10S:3S), (b) BOX2 (80E:90E,Equator:5N) and (c) BOX3 (85E:90E,10N:14N). Intraseasonal signals of 10 – 90 days are observed to be well captured by REY and TMI SST. Saji et al. (2006) observed the cooling event in BOX1 on 27 Jan 1999, 24 Mar 1999, 25 Feb 2000, 23 Jan 2001, 29 Nov 2001, 27 Jan 2002, 07 Feb 2003, which can be seen in the intraseasonal signal of 10 – 90 days in both the products. Intraseasonal signals in TMI and REY SST in BOX2 and BOX3 are also found to be comparable.

SUMMARY

The new high resolution REY SST products is validated using TMI SST and observations from moored buoys in the tropical Indian Ocean. The most encouraging result is that, for the first time a REY SST product has become available that captures the intraseasonal signals.

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REFERENCES

Reynolds, R. W. and T. M. Smith, (1994), Improved global sea surface temperature analyses using optimum interpolation. ***J. Clim.***, **7**, 929-948.

Reynolds, R. W., T. M. Smith, C. Liu, D. B. Chelton, K. S. Casey and M. G. Schlax, (2007), Daily High-Resolution Blended Analyses for Sea Surface Temperature, ***J. Clim., 20***, 5473-5496.

Saji, N. H., S. P. Xie, and C. Y. Tam (2006), Satellite observations of intense intraseasonal cooling events in the tropical south Indian Ocean, ***Geophys. Res. Lett., 33***, L14704, doi:10.1029/2006GL026525.

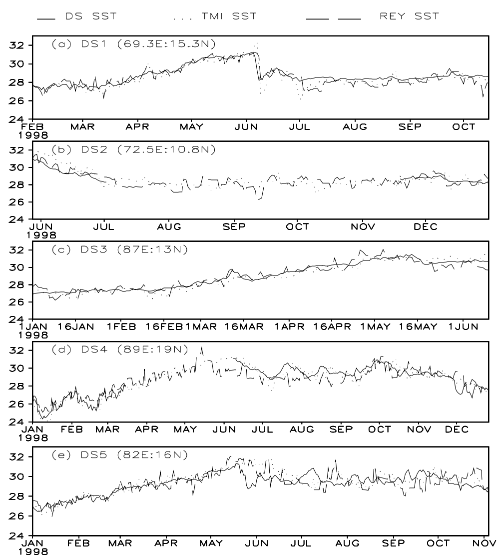

Figure 1: The comparison of TMI SST (dotted line), REY SST (dashed line) and DS SST (solid line).

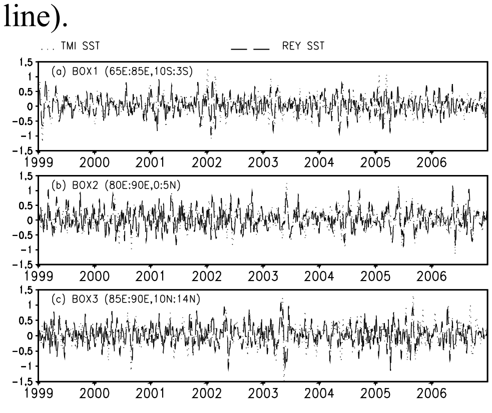

Figure 2: Time series of 10–90 days timescales intraseasonal TMI (dotted line) and REY SST (dashed line) averaged over (a) BOX1 (b) BOX2 (c) BOX3.