

New insight into ENSO from GPS RO and related observations

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The El-Nino-Southern Oscillation (ENSO) dominates low latitude climate variability. The ENSO cycle is tied to changes in the patterns and intensity of moist convection and precipitation. As such, water vapor observations across the tropics are critical to understanding and forecasting ENSO. We will summarize some of the relationships we have found between free tropospheric water vapor derived from CHAMP and COSMIC GPS RO data and other variables such as SST and rainfall as well as evidence of a strong negative feedback over the ENSO cycle derived from these relationships. Combining GPS RO water vapor, rainfall and SST in the SPCZ region in April-May has yielded a pattern that predicted a shift into the El Nino phase this year as has indeed been happening.

We have developed a method to grid the COSMIC water vapor data analogous to the gridding of other variables such as SST and OLR to study ENSO. This has revealed patterns in water vapor that shift with the ENSO cycle and large month-to-month variability that may be a signature of the Madden Julian Oscillation. Regarding the COSMIC follow-on mission, a key question is the number of satellites that are needed. In this context we will discuss the sampling density needed to adequately reproduce grid patterns tied to ENSO and low latitude variability such as those that have emerged from the COSMIC data.