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Comparative mean and extreme statistics for the TMPA and GPCP 1DD

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The TRMM Multi-satellite Precipitation Analysis (TMPA) provides 0.25˚x0.25˚ 3-hourly estimates of precipitation in the latitude band 50˚N-50˚S for the years 1998-present, while the GEWEX/Global Precipitation Climatology Project (GPCP) One-Degree Daily (1DD) precipitation product provides 1˚x1˚ daily global estimates of precipitation for 1997-present. The TMPA incorporates all available (intercalibrated) microwave estimates of precipitation in addition to microwave-calibrated infrared (IR) estimates, while the 1DD consists of microwave-calibrated IR estimates in the band 40˚N-40˚S and TOVS (or AIRS) sounding-based estimates at higher latitudes. Both datasets are scaled by monthly raingauge analyses, but it should be emphasized that the day-to-day occurrence of precipitation is entirely based on the satellite data.

Although the 1DD is somewhat more approximate than the TMPA, the 1DD can provide an important check on the mean and extreme results computed using the TMPA. In addition, the 1DD can provide results over the entire globe, while the TMPA only covers the tropics and mid-latitudes. Finally, the 1DD captures the entire 1997-1998 El Niño, while the TMPA only captures it from the beginning of 1998. The analysis presented here focuses on basic parameters that are stable and well-suited to comparison with station data or model estimates. These include means, frequency of precipitation, 95th percentile values, and the longest spans of consecutive dry days in a year. Both datasets are compared against a representative sample of stations around the globe for the available overlap period of 1998-2003.

Overall, there is fair consistency between the 1DD and TMPA datasets, even accounting for differences in spatial scale. In addition to enhancing our confidence in the results previously reported, this comparison allows us to examine issues that are inherent in the two datasets. For example, the 1DD typically shows anomalously high fractional coverage in the latitude bands 40-50˚N and 40-50˚S. A review of the algorithm shows that this artifact results from a smoothing operator that is applied at these latitude bands to accommodate the transition from IR-based to sounding-based estimates. As well, the TMPA tends to have drier estimates than the 1DD at higher latitudes, ∼40-50˚, particularly in the winter hemisphere, where the microwave algorithms currently lack sensitivity to the reduced precipitation signals.

The characteristic behavior of precipitation in the additional time/space coverage provided by the 1DD will be examined, considering its performance in the time/space overlap with the TMPA and available gauge data. The 1997 data provide crucial information about the early and middle phases of the significant 1997-1998 El Niño. The high-latitude results could be important for helping assess the conditions that the joint NASA/JAXA Global Precipitation Measurement (GPM) mission will observe.