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Scaling Characteristics of Global Tropical Rainfall

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We examine the presence of dominant scales of rainfall variability using 3-hourly, 0.25-degree TRMM 3B42 satellite observations by a combination of EOF and traditional spectral analysis. In the temporal domain, we find that apart from the two externally forced modes (seasonal and diurnal cycles), the variance of anomalies follows a power-law. Specifically, depending on the construction of anomalies, the slope varies between -1.34 and approximately -5/3. The spatial spectrum also shows an uninterrupted distribution of variance between 200 to 5000 km (synoptic to planetary scales), complementing the results obtained in temporal spectra. These slopes are shallower than red noise spectra, suggesting that the variability observed in the anomalies cannot be ignored as background noise. These scaling relations also suggest that, when trying to understand the variability of tropical rainfall, all scales are important, and it is difficult to justify a focus on isolated space and time scales.