Tropical wave analyses: variability, trends and uncertainties in ERA-Interim, JRA-55, MERRA and ERA5 reanalyses

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Abstract

We discuss uncertainties in tropical wave circulation using ERA-Interim, JRA-55, MERRA and ERA5 reanalyses. The equatorial Rossby and inertia-gravity waves are filtered using the three-dimensional linear wave theory. The results quantify amplitudes and trends in the equatorial wave activity across scales. We show that the four reanalyses agree regarding recently increased subseasonal variability in the large-scale Kelvin waves, mixed Rossby-gravity waves and westward-propagating inertio-gravity waves with the lowest meridional mode. The amplitude and sign of trends at smaller zonal scales with greater meridional modes differ between the ERA-Interim and JRA-55 datasets on one hand, and the ERA5 and MERRA data on the other. Increased variability in the ERA-Interim and JRA-55 accounts for positive trends in their global subseasonal variability.

Keywords: tropical analyses, uncertainties, equatorial waves, circulation trends

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