

Diagnosing long-range propagation of upper tropospheric Rossby wave packets

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Rossby waves packets in the upper troposphere are able to transport information across large horizontal distances, giving rise to interactions between remote locations on both the climate and the weather time scale. In particular, there have been cases in which Rossby wave packets during their final stage were associated with severe weather. This motivates a thorough investigation of Rossby wave packets and their representation in global numerical models.

The talk presents several diagnostic methods to identify and track upper tropospheric Rossby wave packets, including envelope reconstruction of the meridional wind and the wave activity flux. Some previously developed diagnostics assume that the wave must be an almost plane wave and, in addition, small amplitude. Observed waves violate both assumptions. The talk discusses the implications for the detection of Rossby wave packets and suggests alternatives. The semi-geostrophic nature of Rossby waves leads to a tendency for the diagnosed wave packets to fragment into pieces; this problem can at least partly be overcome through the semi-geostrophic coordinate transformation. The large wave amplitudes can be dealt with by use of a recently developed form of a local, finite-amplitude wave activity. The different methods are compared with each other by use of selected examples.

Key words: Rossby wave packets, envelope reconstruction, wave activity flux, finite amplitude wave activity, semi-geostrophic theory