# MJO Signals in Latent Heating: Results from TRMM Retrievals

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Popular Summary

The Madden-Julian Oscillation (MJO) is the dominant intraseasonal signal
in the global tropical atmosphere. Almost all numerical climate models
have difficulty to simulate realistic MJO. Four TRMM datasets of latent
heating were diagnosed for signals in the MJO. In all four datasets,
vertical structures of latent heating are dominated by two components,
one deep with its peak above the melting level and one shallow with its
peak below. Profiles of the two components are nearly ubiquitous in
longitude, allowing a separation of the vertical and zonal/temporal
variations when the latitudinal dependence is not considered. All four
datasets exhibit robust MJO spectral signals in the deep component as
eastward propagating spectral peaks centered at period of 50 days and
zonal wavenumber 1, well distinguished from lower- and higher-
frequency
power and much stronger than the corresponding westward power.

The shallow component shows similar but slightly less robust MJO
spectral peaks. MJO signals were further extracted from a combination of
band-pass (30 – 90 day) filtered deep and shallow components. Largest
amplitudes of both deep and shallow components of the MJO are
confined
to the Indian and western Pacific Oceans. There is a local minimum in
the deep components over the Maritime Continent. The shallow
components
of the MJO differ substantially among the four TRMM datasets in their
detailed zonal distributions in the eastern hemisphere. In composites of
the heating evolution through the life cycle of the MJO, the shallow
components lead the deep ones in some datasets and at certain
longitudes.

In many respects, the four TRMM datasets agree well in their deep
components, but not in their shallow components and the phase relations
between the deep and shallow components. These results indicate that
caution must be exercised in applications of these latent heating data.