Extratropical Influence of Upper Tropospheric Equatorial Zonal Wind

What is \([U150]_E\)?

- The Madden-Julian Oscillation (MJO) has been shown to have influence on the extratropics by many previous studies – but measuring the MJO is not trivial.

- The upper tropospheric zonal mean zonal wind over the equator is mainly influenced by the MJO - during boreal winter also by shifts of the ITCZ (see the two figures in this section).

- Our simple index \([U150]_E\) is defined as the monthly mean zonal mean zonal wind at 150 hPa during DJF, with the monthly seasonal cycle removed. ENSO effects are also linearly removed from \([U150]_E\), using the NINO3.4 index from NOAA Version3-SST. The standard deviation of \([U150]_E\) is \(\sim 1.7 \text{ m/s}\).

- \([U150]_E\) is...
  - **Westerly** during and after strong late MJO phases
  - **Easterly** during active early MJO phases or when ITCZ is anomalously south

\([U150]_E\) affects...

- Aleutian trough
- Rossby waveguide from Pacific towards Atlantic
- Rossby wave-breaking over Europe (~ blockings)

What’s next?

- investigate impact on mid- and high-latitude blocking

Conclusions

\([U150]_E\) is an “easy to use” index for tropical variability that is important for northern extratropics, especially North Pacific
- is related to late MJO phases and shifts of the ITCZ
- simplifies monitoring interannual changes or long-term trends of late MJO phases

Extratropical response to \([U150]_E\)

During anomalously westerly

\([U150]_E\) ...

- Aleutian trough is strengthened
- Cyclonic anomalies to both sides of the Equator near Peru
- A Rossby Wave-train emerges from Pacific towards Atlantic

Stronger and more continuous waveguide between North Pacific and North Atlantic during easterly \([U150]_E\) ...

References

Wheeler and Hendon, 2004: An All-Season Real-Time Multivariate MJO Index: Development of an Index for Monitoring and Prediction. MWR.

Index downloaded from http://cawcr.gov.au/staff/mwheeler/maproom/RMM/RMM1RMM2.74toRealtime.txt