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A climatology of Rossby Waves - propagation aspects and linkage to heavy precipitation

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Rossby Waves (RWs) are a key meteorological feature closely associated with surface baroclinic development and energy transport in the atmosphere. From the PV perspective, these waves exist and travel on the band/region of maximum PV gradient at the tropopause break. Indeed, the wave propagation properties are in good agreement with results determined from linear theory.

We present results from a climatology of RWs derived from the ERA40 data set on a 6-hourly basis. Their propagation is depicted in a novel form of Hovmoller diagram that accounts for the instantaneous shape of the PV waveguide. This eliminates the effect of meridional averaging and non-zonal wave propagation and precludes attentuation of the amplitude by spurious cancelling of wave peaks, inaccurately determined wave numbers and hence propagation velocities.

The RW climatology provides information on the phase and group velocities and their spatial and temporal distribution. It can be used for instance to enhance our dynamical understanding of the origin and development of severe weather. This is exemplified for a climatology of severe precipitation events on the Alpine south-side that are triggered by wave breaking events. These events exhibit interesting seasonal variations in both the mean flow and the wave propagation.