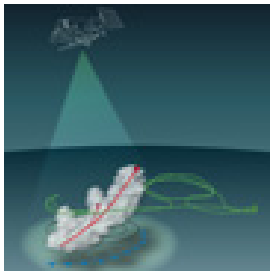

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An overview on the concept of warm conveyor belts

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Warm conveyor belts (WCBs) are coherent moist airstreams in extratropical cyclones that ascend from the (oceanic) boundary layer to the upper troposphere. The ascent of typically more than 600 hPa within 1-2 days is accompanied by a strong poleward motion of more than 2000 km, intense cloud formation, latent heating and precipitation. From a dynamical perspective, WCBs are also important because their associated latent heating leads to a production of potential vorticity (PV) in the lower troposphere and the creation of a negative anomaly of PV in the upper-tropospheric outflow of the WCBs. From a climate perspective one of their key aspects is the complex cloud evolution, which involves warm clouds at low levels, mixed-phase clouds in the mid-troposphere and ice clouds in the upper-tropospheric outflow regions. In this introductory overview presentation, after a brief history of the concept of WCBs, the following key aspects of WCBs will be discussed: (i) WCBs are frequent flow features in mid-latitudes, in particular over the North Atlantic and North Pacific storm tracks, (ii) WCBs produce a large fraction of extratropical precipitation and are involved in many extreme precipitation events, (iii) WCBs are associated with high values of midlatitude ice water content and lead to a strong cloud radiative forcing, (iv) WCBs are dynamically important because they can influence the intensity of the cyclone and of the upper-level ridge building, (v) the slantwise ascent within WCBs can be intercepted by embedded convection, and (vi) WCB are often involved in situations with increased forecast uncertainty.

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