



## **Isentropic tracking of lower-stratospheric potential vorticity anomalies: A 10-year winter climatology**

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Isentropic charts exhibit many mesoscale potential vorticity (PV) maxima in the weak background PV field of the lowermost stratosphere. Such PV anomalies are known to act as precursors to cyclogenesis when in the vicinity of the tropopause. A feature-tracking tool is developed and applied to ten consecutive winters of the European Centre for Medium-range Weather Forecasts (ECMWF) Reanalysis (ERA-40) to establish the general characteristics and life cycle of these anomalies and thus shed light on an earlier phase of cyclogenesis. The tool identifies the anomalies as local maxima, whose amplitudes are defined with respect to the surrounding local background PV. The isentropic wind field is used to advect structures forward to the next time step, thus predicting their subsequent position and form. A tracking is enabled when there is a satisfactory overlap between the predicted and observed structures. The routine detects the merger and splitting of PV entities as well as their genesis and lysis.

The 10-year climatology reveals that the anomalies are frequently located near high topography in a quasi-annular band at about 70°N, can be long-lived (days to weeks) and their core PV is typically 2 PV units above that of their local surroundings. Clear life cycles in along-track composites of amplitude, PV, shape (isotropy) and velocity indicate that the anomalies have their own distinctive dynamics.

The tracking methodology is being adapted for cyclone tracking to take part in the Intercomparison of Mid-Latitudinal Storm Diagnostics (IMILAST) project.