Geophysical Research Abstracts,
Vol. 11, EGU2009-10050, 2009
EGU General Assembly 2009

Topographical influence on the potential vorticity structure of the extra-tropical lowermost stratosphere

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The lowermost stratosphere is known to host a population of fine-scaled and coherent potential vorticity anomalies. The structure, dynamics and distribution of these anomalies are of interest due to their roles in the vicinity of the tropopause as precursors of low-level cyclogenesis and also as sites of stratosphere-troposphere exchange events.

Isentropic monthly mean PV climatologies constructed from the ERA-40 data set show a seasonal cycle in the distribution of anomalously high PV and the poleward gradient of mean PV, the latter being reversed in spring and very weak in the summer lowermost stratosphere. During these months, the highest values of PV are preferentially located away from the pole over high topography. This has important implications for the usefulness of the equivalent latitude technique applied to stratospheric tracers.

Inspection of the instantaneous fields reveal that the high-PV anomalies are often accompanied by overlying low-PV anomalies in a dipole-like configuration. This study employs a high resolution regional climate model (CHRM) to investigate the origin and evolution of these PV structures which lead to a prominent climatological feature over Greenland.