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Stratosphere-troposphere mass exchange (STE) in midlatitude convection: A numerical study

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This study examines the dynamics of cross-tropopause transport in the vicinity of midlatitude convection. The transport of mass across the tropopause is of basic relevance to problems in atmospheric chemistry: the stratosphere and upper tropopshere have very different chemical compositions, the former being dry and rich in ozone. Determining the dynamical mechanisms by which the transport takes place is a critical step towards understanding the evolving distribution of these atmospheric constituents. The context for this analysis is a numerical model simulation of a convective event that developed over Southern England on 27th June 2004 on the periphery of a tropopause fold and upper-level potential vorticity anomaly. The nonhydrostatic mesoscale version of the UK Met Office Unified Model is run with horizontal resolutions of 12km and 4km in order to contrast the role of explicitly-resolved and parameterized convection in accomplishing transport. Transport is diagnosed via an online passive tracer that may either be processed by or withheld from the model's convective and boundary-layer parameterizations. Preliminary results indicate that the parameterized convection accomplishes larger and deeper tropospheric transport of stratospheric tracer than does the explicitly-resolved convective circulations.