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# Rapid exchange between the stratosphere and the planetary boundary layer over the Tibetan Plateau

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Stratosphere-troposphere exchange (STE) has an important impact on atmospheric chemistry and the climate system. Of special interest are so-called deep STE events where stratospheric air masses reach the planetary boundary layer (PBL) within a few days, or potentially polluted air masses from the PBL are rapidly transported into the lower stratosphere. Deep STE can, for example, contribute to elevated ozone concentrations at ground level and thus affect plant and human physiology.

Using a Lagrangian methodology and ERA-Interim reanalysis data, we have compiled a global climatology of STE for the years from 1979 to 2011. Because in most regions on this planet, rather large vertical transport is required in order to bring stratospheric air down to the PBL, or vice versa, deep STE events are comparatively rare. Yet, from our climatology, we can clearly identify global 'hot spots' of deep STE, namely the Tibetan Plateau (TP) and the North American Rockies.

The exchange between the stratosphere and the PBL is facilitated in these regions for two reasons: 1) the frequency of tropopause folds, which are features typically associated with intense STE, is globally highest along the subtropical jet stream, and 2) the Great Basin in western North America and the western part of the Tibetan Plateau are semi-arid areas, which together with strong insolation and high orography can lead to elevated PBL heights.

Intrigued by extreme PBL heights measured over the Tibetan Plateau, we investigate case studies of deep STE in this region using a passive stratospheric tracer in the mesoscale numerical weather prediction model COSMO. This tracer allows us to study the transport pathways between the stratosphere and the PBL in great detail and shed light on the role of the PBL dynamics in bringing stratospheric ozone down to the surface.