Tropical Stratospheric Cloud climatology from the PATMOS-x dataset - an assessment of convective contributions to stratospheric water

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The PATMOS-x level 2b climatology, generated using three decades of AVHRR measurements, contains valuable information about the past global cloud record. We extract climatologies of tropical deep convective clouds from the PATMOS-x data set, based on the 10.30-11.30 micro meter brightness temperature. A comparison of the cross ropopause convective cloud frequency between ISCCP and PATMOS-x shows that PATMOS-x has a greater frequency of occurrence than does the ISCCP, and this enhanced frequency is attributed to greater horizontal resolution (2 km) in the PATMOS-x data. The high resolution makes this dataset suitable for a search for cross tropopause convection, which happens on length scales down to 1 km. We find there have been several changes in deep convective activity over land during the period 1982 to 2009. We explore specifically the epoch of the HALOE satellite, and find a correlation between land deep convective activity and anomalies in the HALOE stratospheric water retrievals. A simple model is able to predict stratospheric water vapor concentrations highly correlated to that observed using only frequency of deep convection. From this we conclude that deep convection over land contributes to moistening of the lowest tropical stratosphere on seasonal, annual and decadal timescales[1].

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