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On the temporal structure of the extratropical UTLS

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The extratropical UTLS has been identified as a transition region between the troposphere and stratosphere. It's composition is therefore affected by the large scale Brewer-Dobson circulation and rapid and frequent exchange across the extratropcal tropopause. A third important pathway constitutes quasi horizontal transport from the tropics to high latitudes in the tropical controlled layer above the tropical tropopause. These processes have different time scales and seasonalities affecting tracers with different properties in a different way.

We will present results of comprehensive backward trajectory calculations of 90 days and 270 days, respectively, to investigate the temporal structure of the lower stratosphere. We will demonstrate, that the key quantity, which determines the tracer abundance in the stratosphere is time since tropopause crossing. We will show, that the distribution of CO relative to the tropopause and it's correlation with ozone can be used to define different transport regimes close to the tropopause. These correspond to different probability for time scales of tropopause crossing and as well as transport times from the tropopause.

We will also show, that CO can be used to identify the bottom of the tropical pipe and it's effect on transport to high latitudes. The transition is located around Θ=460K in summer and 440K in winter.