

Variability in Inter-hemispheric Exchange Inferred from Tropospheric Measurements of SF₆

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With a long atmospheric lifetime (~850 yr) and no known tropospheric or stratospheric loss processes, sulfur hexafluoride (SF₆) is useful as a tracer of large-scale atmospheric transport. The latitudinal gradient has been used to assess model transport, in terms of both inter-hemispheric exchange, as well as mean transport time, or tropospheric “age of air”. We derive an inter-hemispheric exchange time, τ_{ex} , from global surface measurements of SF₆. We find an annual cycle with a minimum in late Northern Hemisphere summer and maximum in spring. Some years show a bi-modal cycle, as depicted in some atmospheric models, with a second maximum occurring in fall/winter. We also see inter-annual variability, with some years showing relatively slower exchange than others. Climate drivers, such as El Niño Southern Oscillation (ENSO), and their possible affect on τ_{ex} inter-annual variability and associated impacts on trace gas distributions are examined.

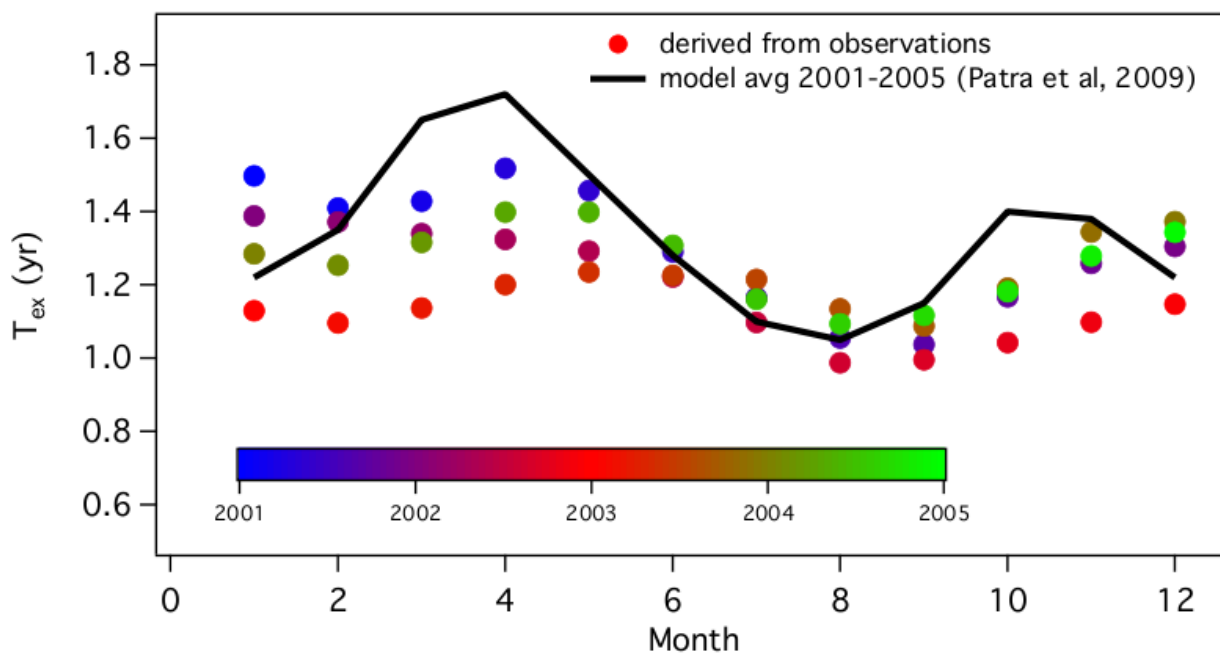


Figure 1. Annual cycle of inter-hemispheric exchange time derived from surface measurements of SF₆ (symbols) and a mean model result over the same period from Patra et. al, 2009 [Atmos. Chem. Phys., 9, 1209–1225, 2009].