

Convective transport of NMHCs and VSLS from the surface to the upper troposphere and lower stratosphere

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Deep convection is the primary mechanism that delivers important chemical constituents, e.g. nonmethane hydrocarbons (NMHCs) and very-short-lived halogen species (VSLS), into the upper troposphere and the lower stratosphere (UT/LS), where they exert significant impact on atmospheric O₃ and OH. Western Pacific has traditionally been viewed as the primary convective lofting region for air to enter the tropical tropopause layer (TTL). We will analyze aircraft measurements of CO₂, NMHCs (CO, ethyne, ethane, HCHO), and very-short-lived bromocarbons from both the ATTREX and CONTRAST missions to examine the transport timescale and transport efficiency of these chemical compounds from the surface to the UT/LS in the western Pacific. Using a newly developed model CO₂ capability as an accurate transport clock tracer, we will compare modeled CO₂, NMHCs and VSLS from the NASA Goddard GEOS-5 simulations with these observations to assess model transport and to diagnose potential model biases in these trace constituents, whether it is due to biases associated with photochemistry and emissions or due to transport errors. The results from the CONTRAST/ATTREX missions will be compared with our earlier results from the NASA SEAC⁴RS mission to address regional differences in convective lofting into the TTL and the impacts on UT/LS atmospheric composition.