

EGU2020-609, updated on 22 Apr 2021

<https://doi.org/10.5194/egusphere-egu2020-609>

EGU General Assembly 2020

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Transport into the upper troposphere-lower stratosphere over North America

Xinyue Wang¹, William Randel², and Yutian Wu³

¹Purdue University, Earth, Atmospheric, and Planetary Sciences, West Lafayette, IN, United States of America

(wang2807@purdue.edu)

²National Center for Atmospheric Research, Atmospheric Chemistry Observations and Modeling Laboratory, Boulder, Colorado, USA

³Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY, USA

We study fast transport of air from the surface into the North American upper troposphere-lower stratosphere (UTLS) during northern summer with a large ensemble of Boundary Impulse Response (BIR) idealized tracers. Specifically, we implement 90 pulse tracers at the Northern Hemisphere surface and release them during July and August months in the fully coupled Whole Atmosphere Community Climate Model (WACCM) version 5. We focus on the most efficient transport cases above southern U.S. (10°-40°N, 60°-140°W) at 100 hPa with modal ages fall below 10th percentile. We examine transport-related terms, including resolved dynamics computed inside model transport scheme and parameterized processes (vertical diffusion and convective parameterization), to pin down the dominant dynamical mechanism. Our results show during the fastest transport, air parcels enter ULTS directly above the Gulf of Mexico. The budget analysis indicates that strong deep convection over the Gulf of Mexico fast uplift the tracer into 200 hPa, and then is vertically advected into 100 hPa and circulated by the enhanced large-scale anticyclone.