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Abstract: High ozone (O3) concentrations at low altitudes (1.5e4 km) were detected from airborne Alpha Jet Atmospheric eXperiment (AJAX) measurements on 30 May 2012 off the coast of California (CA). We
investigate the causes of those elevated O3 concentrations using airborne measurements and various
models. GEOS-Chem simulation shows that the contribution
>from local sources is likely small. A backtrajectory
model was used to determine the air mass origins and how much they contributed to the
O3 over CA. Low-level potential vorticity (PV) from Modern Era Retrospective analysis for Research and
Applications 2 (MERRA-2) reanalysis data appears to be a result of the diabatic heating and mixing of airs
in the lower altitudes, rather than be a result of direct transport from stratospheric intrusion. The Q

diagnostic, which is a measure of the mixing of the air masses, indicates that there is sufficient mixing along the trajectory to indicate that O3 from the different origins is mixed and transported to the western U.S.

The back-trajectory model simulation demonstrates the air masses of interest came mostly from the mid troposphere (MT, 76%), but the contribution of the lower troposphere (LT, 19%) is also significant compared to those from the upper troposphere/lower stratosphere (UT/LS, 5%). Air coming from the LT appears to be mostly originating over Asia. The possible surface impact of the high O3 transported aloft on the surface O3 concentration through vertical and horizontal transport within a few days is substantiated by the influence maps determined from the Weather Research and ForecastingeStochastic Time Inverted Lagrangian Transport (WRF-STILT) model and the observed increases in surface ozone mixing ratios. Contrasting this complex case with a stratospheric-dominant event emphasizes the contribution of each source to the high O3 concentration in the lower altitudes over CA. Integrated analyses using models, reanalysis, and diagnostic tools, allows high ozone values detected by in-situ measurements to be attributed to multiple source processes.