



Direct transport of mid-latitude stratospheric ozone into the lower troposphere and marine boundary layer of the tropical Pacific Ocean

O. R. Cooper (1) and the Pacific Sub-Tropical Jet Study Team

(1) University of Colorado/NOAA Aeronomy Laboratory, Boulder, USA,
(Owen.R.Cooper@noaa.gov / fax: 303 497 5686

The detailed survey of mid-latitude stratospheric intrusions penetrating into the northern hemisphere tropics was one goal of the Pacific Sub-Tropical Jet Study 2004, conducted from Honolulu, Hawaii during Jan. 19-29 and Feb. 28 - Mar. 15. Using the NOAA GIV jet aircraft, instrumented with dropsondes and a 1-second resolution ozone instrument, we targeted an intrusion above Hawaii on February 29. The data describe the strongest tropospheric ozone enhancements ever measured above Hawaii (in comparison to a 22 year ozonesonde record) and illustrate the mixing of stratospheric ozone into the mid-troposphere as a result of convection triggered by the advection of relatively cold mid-latitude air into the tropics. Measurements from the GIV and Mauna Loa Observatory (3.4 km) show the ozone reached the lower tropical troposphere. This paper also describes a similar intrusion that enhanced ozone at Mauna Loa on March 10, as well as Honolulu, which is located in the marine boundary layer. GIV flights in and out of Honolulu measured enhanced ozone associated with this event on several occasions. The Mar. 10 event transported an estimated 1.75 Tg of ozone into the tropical troposphere and we suggest that stratospheric intrusions that break away from the polar jet stream as they advect into the tropics are more effective at transporting ozone into the troposphere than intrusions that remain close to the polar jet stream in mid-latitudes. Analysis of the dynamic conditions indicates the frequency of stratospheric intrusions was not anomalous during Jan.-Mar. 2004 and that stratospheric intrusions of similar magnitude can be expected to occur in any year.