

Another Step Toward Stratospheric Ozone Recovery as Observed by Multiple Network for the Detection of Atmospheric Composition Change (NDACC) LiDARs and Satellite Instruments

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Long-term variability in stratospheric ozone at Mauna Loa Observatory (MLO), Hawaii, Table Mountain Facility, California, Hohenpeissenberg, Germany, Observatoire de Haute-Provence, France, and Lauder, New Zealand, was investigated using various observational records. The analysis comprises a comparison of collocated ozone measurements from several NDACC LiDARs and a long-term time series merged from different satellite instruments. Regression analysis was performed on the deseasonalized monthly mean ozone time series for each 1 km-altitude bin between 20 and 40 km from January 1995 to April 2011 (a period of low volcanic aerosol loading). Among others interannual and annual components, the mid-latitude Ozone Depleting Gas Index (ODGI) was found to significantly improve the regression model. A strong positive response to the ODGI was observed over mid-latitude sites in the upper stratosphere since 2005 as well as a negative response at MLO in the lower stratosphere. Clear signatures of the 11 year Solar Cycle and El Niño-Southern Oscillation (ENSO) were also identified above MLO showing negative response in the lower stratosphere. These responses were already identified by models as a change in tropical upwelling which leads to the strengthening of the Brewer-Dobson circulation and thus to accelerate the process of ozone recovery above mid-latitudes.

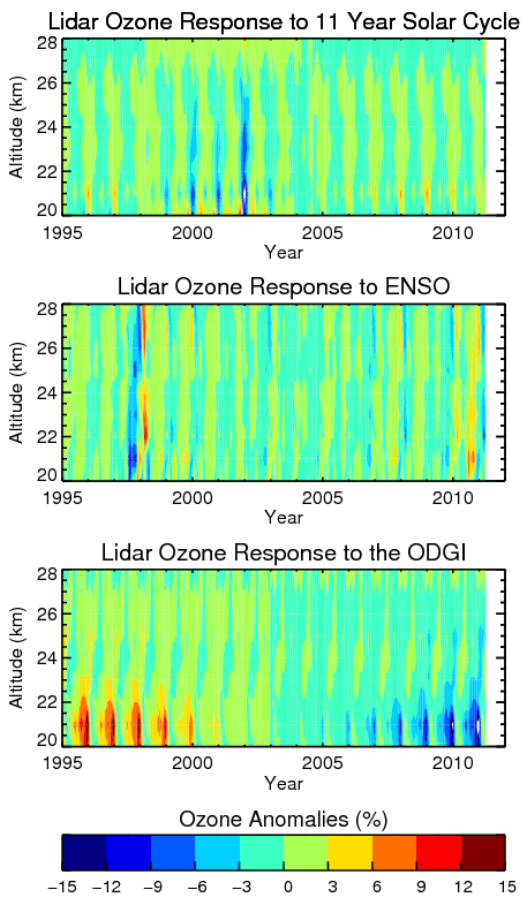


Figure 1. MLO LiDAR ozone response to 11 year Solar Cycle (top), ENSO (middle) and ODGI (bottom).

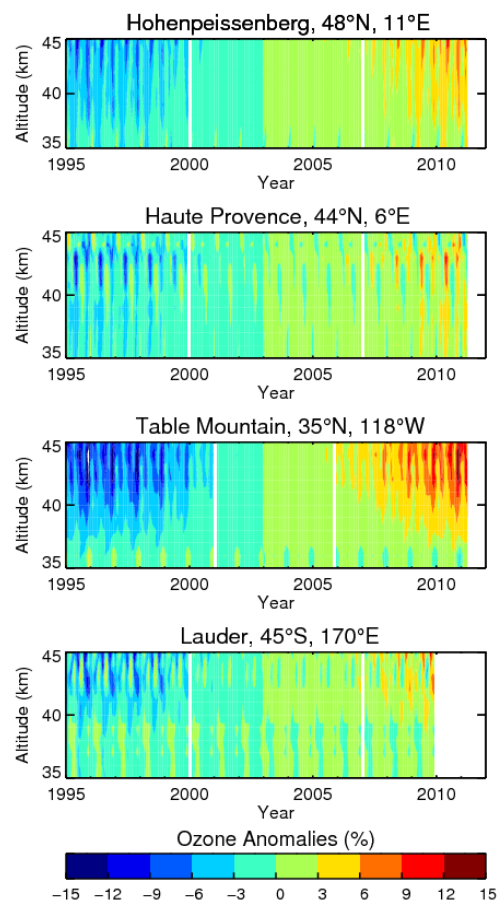


Figure 2. LiDAR ozone responses to the ODGI above four mid-latitudes Network for Detection of Stratospheric Change sites. White lines mark the two steps of ozone recovery (stop of the ozone decrease and start of recovery).