Effects of energetic particle precipitation and solar irradiance on ozone

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The term energetic particle precipitation (EPP) commonly refers to particles of different energy which routinely impact the polar regions. EPP ionizes the atmosphere and triggers catalytic cycles of ozone depletion driven by odd nitrogen (NOx) and odd hydrogen (HOx) species. While the most energetic particles can directly affect ozone in the mesosphere, during winter the (almost) continuous flux of auroral electrons produces high NOx amounts which can be transported downwards inside the polar vortex and influence stratospheric ozone. On the other hand, the wavelength dependence of the solar irradiance variation can induce stratospheric ozone changes in phase with solar activity. Here, we investigated ozone variability in response to EPP and solar activity during the 1979-2014 period by combining satellite ozone observations from Solar Backscatter Ultraviolet Radiometer and Microwave Limb Sounder on Aura. In particular, we analyze the correlation of the polar ozone variability with EPP and with solar irradiance in an attempt to distinguish between the two effects and to quantify the ozone variations caused by EPP on long time scales.

Keywords: Energetic particle precipitation (EPP), ozone, solar radiation

