

Modulation of Antarctic stratospheric ozone induced by energetic particle precipitation in 2005-2014

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Ozone (O₃) and nitric acid (HNO₃) profiles retrieved from the Microwave Limb Sounder (MLS)/Aura for the 2005-2014 period have been analyzed looking for energetic particle precipitation (EPP) induced-effects in the southern polar atmosphere. The interannual variability of MLS HNO₃ is consistent with the Ap-parameterized EPP-NO_y obtained from Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)/Envisat observations. It suggests an increased EPP-NO_y production during the austral winters of 2005, 2012 and 2013. Consistent with their higher geomagnetic activity, these years usually showed lower (higher) O₃ (HNO₃) levels. The temporal evolution and the geographic distribution of the differences in O₃ and HNO₃ between a composite built by averaging the winters characterized by high EPP-NO_y (max composite) and another based on the remaining winters (min composite) have been also examined. Starting in late June, low O₃ volume mixing ratios descend from 1 to 10 hPa before disappearing by early September. O₃ depletion up to about 15-20 % is evident mostly in July and August in the polar regions and it is coupled with enhanced HNO₃ mixing ratios enhanced by up to 2 ppbv. These results are discussed in the light of recent observational and modeling studies.