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Meteorological factors affecting surface chemistry at the South Pole from a climatological perspective

William Neff

University of Colorado, CIRES, NOAA/ESRL/PSD, Boulder, United States (william.neff@noaa.gov)

Past work has established a robust connection between easterly surface winds at the South Pole and high nitrogen oxide (NO) concentrations during field programs in 1998, 2000, 2003, and 2006 (Neff and Davis, EGU 2016): Light surface winds from the east coupled with clear skies, strong radiative losses, and shallow inversions lead to high concentrations of NO. Previously, we found indications in these four years that such conditions were most likely to occur prior to the breakup of the polar vortex in the austral spring. In this presentation, we look at the long term climatology of boundary layer conditions vis-à-vis the seasonal evolution of winds at tropopause/lowermost stratosphere levels using rawinsonde data and surface observations starting in 1961. We consider various metrics including timing of wind reversals at 50 hPa (e.g. Harnik et al 2011), time of formation of the thermal tropopause (Neff, 1999), and simply, the timing of the seasonal cycle using fixed day number. Complicating the picture is year-to-year variability in synoptic “noise.”