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Photochemical Production and Export of NOx from the Antarctic High Plateau via drainage winds through the Transantarctic Mountains

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Following a series of experiments on the high plateau of Antarctica it has become clear that high concentrations of NO in the planetary boundary layer are due to the release of nitrogen oxides (NO + NO2 = NOx) from firn due to the photolysis of nitrate. At South Pole during the austral spring/summer seasons, NOx levels within the planetary boundary layer are routinely in the 100-300 part per trillion (pptv) concentration range with some episodes leading to levels of 1500 pptv. Using airborne sampling platforms, these elevated levels of NOx have also been shown to be a common occurrence over vast areas of the plateau. Of significance are observations in 2003 and 2005 along the Antarctic coast which reveal sudden shifts in the levels of NOx that are factors of 3 to 20 times higher than background levels. Here we have taken advantage of meteorological studies over the past half century that have painted a picture of a large scale drainage wind system originating on the high plateau that, based on topography, channels plateau air into coastal regions. Thus, to be discussed is a new hypothesis that this drainage wind system is responsible for the loss of plateau photochemically-generated NOx by its transport to coastal areas. Both studies on Byrd and Reeves Glaciers will be highlighted.