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An assessment of the oxidizing canopy surrounding the Antarctic plateau

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With the completion of the first major atmospheric field study at South Pole Antarctica in 1998 (Investigation of Sulfur Chemistry in the Antarctic Troposphere, ISCA T 1998), a highly unusual set of near surface atmospheric observations were reported. These revealed NO values ranging from 10 to 600 pptv (parts per trillion by volume) with a median value of 225 pptv. Thus it quickly became apparent that the chemical environment at this site was quite unlike anything previously written or suggested. Subsequent studies at South Pole in 2000 and 2003 (ISCAT 2000 and ANTCI 2003) not only confirmed these earlier results, but revealed that NO levels as high as 1 ppbv could be reached. Given these high concentrations of NO, it was expected and found that many other atmospheric chemical species were also significantly elevated. These included: 03, OH, HO2, HN03, and HO2NO2. However, a key question that persisted from these studies concerned the spatial distribution of this phenomenon, i.e., was there something unique to the South Pole site or was the entire Antarctic plateau of a similar chemical nature? The fact that the source of the NO was found to be the UV photolysis of nitrate ions in firn and that nitrate had been measured in firn at comparable levels to that at South Pole at many plateau sites, suggested that the production should be widespread. If the latter were true one could then argue that the oxidation characteristics of the entire plateau environment might be surprisingly high. This follows from the well know chemical observation that atmospheric NO levels are typically strongly coupled to hydroxyl radical (OH) levels. During the ANTCI (Antarctic Tropospheric Chemical Investigation) 2003 study, this question was only partial ex-

plored. To be reported here are the 2003 results and some of the new observations from the more extensive airborne study carried out during ANTCI 2005.