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Antarctic ozone hole modifies iodine geochemistry on the Antarctic Plateau

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Polar stratospheric ozone has decreased since the 1970s due to anthropogenic emissions of chlorofluorocarbons and halons, resulting in the formation of an ozone hole over Antarctica. The effects of the ozone hole and the associated increase in incoming UV-radiation on terrestrial and marine ecosystems are well studied, however the impact on geochemical cycles of ice photoactive elements, such as iodine, remains almost unexplored. Here, we present the first iodine record from the inner Antarctic Plateau (Dome C) that covers approximately the last 212 years (1800-2012 CE). Our results show that iodine concentration in ice remained fairly constant during the pre-ozone hole period (1800-1974 CE) but has declined twofold since the onset of the ozone hole era (~1975 CE), closely tracking the total ozone evolution over Antarctica. Based on ice core observations, laboratory measurements and chemistry-climate model simulations, we propose that the iodine decrease since ~1975 is caused by enhanced iodine re-emission from snowpack due to the ozone hole driven increase in UV-radiation reaching the Antarctic Plateau. These findings suggest the potential for ice core iodine records from the inner Antarctic Plateau as an archive for past stratospheric ozone trends.