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# Seasonal cycles of perchlorate in Antarctic precipitation: Implications for sources variation

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Perchlorate is an inorganic persistent pollutant, which can pose a significant health risk to humans [1]. Environmental perchlorate has both man-made and natural sources [2]. Natural perchlorate, widespread in the environment, is believed to be formed in the atmosphere [3]. Thus the magnitude and variability of natural perchlorate is linked to the atmospheric environment in general. However, knowledge on the sources and, in particular, the formation mechanisms of natural perchlorate is quite limited. Precipitation samples were collected during a whole year at China Zhongshan Station located in coastal East Antarctica and China Great Wall Station on King George Island, Antarctic Peninsula. Results show that there is an obvious seasonal cycle in atmospheric perchlorate concentration, with higher values in the austral autumn and lower values in winter and spring. Atmospheric perchlorate in spring and summer is mainly originated from formation processes in the troposphere. Elevated levels of oxidants brought by air mass from the inland Antarctic ice sheet and lower air humidity can increase the tropospheric production of perchlorate. Oxidants levels in the boundary layer can also influence perchlorate production in the troposphere. In spring, a large amount of perchlorate may be formed through reactions between reactive chlorine and ozone which also cause the significant depletion of stratospheric ozone over Antarctica. It would take several months for the stratospheric perchlorate to deposit on surface snow. Thus, the maximum atmospheric concentration in autumn may be associated with stratospheric perchlorate formed during spring. Perchlorate in winter may be also from the stratosphere due to the much weaker photochemistry in the troposphere. These results would improve our knowledge of the perchlorate formation process and of how environmental and climatic variables influence perchlorate production.

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