A 50-year record of perchlorate at Dome A, East Antarctica

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Perchlorate (ClO_4^-) is an inorganic contaminant of anthropogenic and natural origin, which can interfere with iodide uptake by the thyroid gland and consequently affect the thyroid functions [1]. Modern analytical instrumentation has facilitated the detection of perchlorate in different kinds of environmental media. However, until now no measurements of perchlorate in Antarctic snow have been documented in literatures.

Dome A, located along the main glaciological dividing line of the East Antarctic Plateau, has the highest altitude in East Antarctica. Preliminary investigation has shown that Dome A has the snow accumulation rate of 2.32 cm water equivalent per year (w.e.a^{-1}) [2], which is among the lowest in Antarctica.

During the 26th Chinese Antarctic Research Expedition (CHINARE 26) in 2009/2010 austral summer, a 3 m snow-pit was excavated at a site (80.42°S, 77.11°E, elevation 4092 m) in the Dome A region. Dating result shows that the snow-pit covers the last 50 years, from 1959 to 2010. The quantification of perchlorate was performed by the ion chromatography coupled with tandem mass spectrometry (IC-ESI-MS/MS). Analysis results show that the perchlorate concentrations vary over range from 34.7 to 439 ng·kg^{-1}, with mean concentration of 179.6 ng·kg^{-1}. A distinct feature of the perchlorate concentration profile is the sharp decreasing trend during the time period from 2010 to 1967 and the slightly increasing trend thereafter. As previously reported, the typical nitrate profile of the top meter at Antarctic low-accumulation sites also shows a sharp decrease with depth due to the post-depositional processes. The similar decreasing pattern of perchlorate to nitrate indicates that post-depositional processes may also influence the perchlorate concentrations preserved in snow.

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[1] Greer *et al*. (2002) *Environ. Health Perspect* **110**, 927-937.
[2] Jiang *et al*. (2012) *J. Glaciol* **58**, 65-75.