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Meteoric smoke in polar ice cores

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Meteoric smoke particles are originated from extraterrestrial meteoroids vaporization and re-condensation in the high atmosphere. Recently, these particles have been detected in a glacial archive thanks to a Greenland ice record of iridium and platinum which were determined with a new analytical methodology, based on inductively coupled plasma sector field mass spectrometry (ICP-SFMS) coupled with a micro-flow nebulizer and desolvation system. Ultra-clean procedures were adopted during the pretreatment phases in our laboratories in order to avoid possible contamination problems and a pre-concentration step by evaporation at sub-boiling temperatures was necessary. We found that a remarkably constant fallout of extraterrestrial matter to Greenland occurred during the Holocene, whereas a greatly enhanced input of terrestrial iridium and platinum masked the cosmic flux in the dust-laden atmosphere of the last glacial age. Nanometric meteoric smoke particles, formed from the recondensation of ablated meteoroids in the atmosphere above 70 km, are possibly transported into the winter polar vortices by the mesospheric meridional circulation and preferentially deposited in the polar ice caps. This implies an average global fallout of 14 ± 5 kt y^{-1} of meteoric smoke during the Holocene. Here we present two new records of iridium and platinum from the EPICA Dome C and Vostok ice cores, Antarctica, back to 240 kyrs. These records show a meteoric smoke fallout strongly correlated with coldest periods that could be evidence of an enhanced descent of cold air masses from the upper troposphere during coldest glacial periods. A clearly not-chondritic higher input of Ir and Pt suggests a more pronounced terrestrial flux during warmer periods.