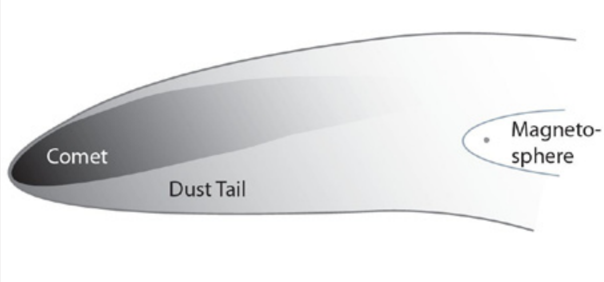
Magnetopause displacements: the possible role of dust

Article published in *Annales Geophysicae*

Abstract

Large compressions of the magnetopause are proposed to occasionally result from temporary encounters of the magnetosphere with dust streams in interplanetary space. Such streams may have their origin in cometary dust tails or asteroids which cross the inner heliosphere or in meteoroids in Earth's vicinity. Dust ejected from such objects when embedding the magnetosphere for their limited transition time should cause substantial global deformations of the magnetopause/magnetosphere due to the very large dust grain mass and momentum which compensates for the low dust density when contributing to the upstream pressure variation.



Schematic of the magnetosphere embedded into a wide cometary dust tail. (Credit: Treumann and Baumjohann)

Reference

Treumann, R. A. and Baumjohann, W. (2011): Magnetopause displacements: the possible role of dust, *Ann. Geophys.*, 29, 2219–2223

Glacial CO_2 cycle as a succession of key physical and biogeochemical processes

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Abstract

During glacial-interglacial cycles, atmospheric CO_2 concentration varied by about 100ppmv in amplitude. While testing mechanisms that have led to the low glacial CO_2 level could be done in equilibrium model experiments, an ultimate goal is to explain CO_2 changes in transient simulations through the complete glacial-interglacial cycle. The computationally efficient Earth System model of intermediate complexity CLIMBER–2 is used to simulate global biogeochemistry over the last glacial cycle (126kyr). The physical core of the model (atmosphere, ocean, land and ice sheets) is driven by orbital changes and reconstructed radiative forcing from greenhouses gases, ice, and aeolian dust. The carbon cycle model is able to reproduce the main features of the CO_2 changes: a 50ppmv CO_2 drop during glacial inception, a minimum concentration at the last glacial maximum 80ppmv lower than the Holocene value, and an abrupt 60ppmv CO_2 rise during the deglaciation. The model deep ocean $\delta^{13}C$ also resembles reconstructions from deep-sea cores. The main drivers of atmospheric CO_2 evolve in time: changes in sea surface temperatures and in the volume of bottom water of southern origin control atmospheric CO_2 during the glacial inception and deglaciation; changes in carbonate chemistry and marine biology are dominant during the first and second parts of the glacial cycle, respectively. These feedback mechanisms could also significantly impact the ultimate climate response to the anthropogenic perturbation.

Reference

Brovkin, V. et al. (2012): Glacial CO_2 cycle as a succession of key physical and biogeochemical processes, *Clim. Past*, 8, 251–264