Response of marine aerosol to changes in phytoplankton induced by perturbations to aeolian iron input

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The sensitivity of marine aerosol to changes in dimethysulfide (DMS) emissions from the ocean resulting from pertubed iron deposition fluxes is investigated in sophisticated process models of atmospheric aerosol and the marine ecosystem.

Primary production in large areas of the oceans is known to be iron limited. Additionally, bioavailable iron delivery to the ocean from the atmosphere is very poorly known, due to uncertainty in the emission, processing and deposition of aeolian dust [1]. DMS is produced by phytoplankton, and can influence the marine aerosol, cloud optical properties and climate [2]. There is therefore a possible link between cloud albedo and aeolian iron input to the ocean, via phytoplankton.

The strength of this link is investigated in an offline model study in three parts. The first stage uses the detailed aerosol model GLOMAP [3] to calculate dust and bioavailable iron deposition to the oceans. The bioavailable iron deposition is used by the marine ecosystem model PlankTOM5 [4] to calculate global surface ocean DMS fields. Simple (doubling and halving) perturbations to the bioavailable iron field in PlankTOM5 provide an estimate of the sensitivity of the marine phytoplankton production of DMS to the bioavailable iron input. The surface ocean DMS concentrations calculated in PlankTOM5 are then fed back to the GLOMAP aerosol model, and the impact on aerosol is calculated.

Early results with this approach suggest that the sensitivity of marine aerosol to bioavailable iron perturbations is quite low on a global scale.

[1] Mahowald *et al*. (2009) *Annual Review of Marine Science*, **1**, 245–278. [2] Charlson *et al*. (1987) *Nature* **326**, 655–661. [3] Manktelow *et al*. (2007) *GRL* **34**, L14803. [4] Vogt (2010) *JGR*-Oceans, accepted.

$\delta^{34}S$ isotopes from carbonate associated sulfate and chromium-reducible sulfur from the traditional Lower–Middle Cambrian

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We present high resolution $\delta^{34}S_{CAS}$ and $\delta^{34}S_{CRS}$ data from carbonate and mixed carbonate-siliciclastic successions from three Gondwanan sections and one locality from Laurentia respectively the Siberian Platform, covering the traditional Lower–Middle Cambrian boundary interval. $\delta^{34}S_{CAS}$ values of Gondwana vary between 13.1 and 33.2‰, with CAS concentrations between 2 and 903 ppm, and $\delta^{34}S_{CRS}$ data reaching from -5.1 to 26.5‰ with maximum CRS concentrations of 3706 ppm. $\delta^{34}S_{CAS}$ data from Laurentia show a higher variation between -1.3 and 36.8‰. CAS concentrations are similar to those from Gondwana, ranging from 7 to 388 ppm. $\delta^{34}S_{CRS}$ values varying between 11.3 and 43.7‰ with a maximum CRS concentration of 149 ppm. $\delta^{34}S_{CAS}$ data from the Siberian Platform ranging from 0.2 to 29.9‰ with CAS concentrations up to 1552 ppm. $\delta^{34}S_{CRS}$ values vary around 12.9‰ with a maximum CRS concentration of 7008 ppm. No correlation exists between sulfate abundance and sulfur isotopic composition.

Whereas two of the Gondwanan sections show sympathetic shifts in their $\delta^{34}S_{CAS}$ and $\delta^{34}S_{CRS}$ curves, and thus indicate similar paleoenvironmental conditions, respective trends could be not observed for the other localities. Also a regional correlation of $\delta^{34}S_{CAS}$ data seems possible, but is non-existent on intercontinental scale.

A diagenetic overprint can be largely excluded, based on respective proxies ($\delta^{18}O$, Mn/Sr, Ca/Mg). These don't show any correlation with $\delta^{34}S_{CAS}$. Hence, sulfur isotope values are considered as primary seawater values.

Apparent differences in $\delta^{34}S_{CAS}$ between the Gondwanan, Laurentian, and Siberian sections provoke a discussion whether the recorded sulfate sulfur isotope values reflect the global seawater signature.