

# O-17 excess of nitrate and sulfate from Greenland deep ice core: implications for variability of atmospheric oxidants

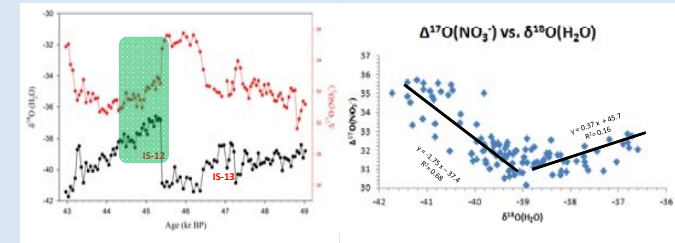
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## Abrupt changes

1. Values of  $\Delta^{17}\text{O}(\text{NO}_3^-)$  and  $\Delta^{17}\text{O}(\text{SO}_4^{2-})$  vary with Atmospheric oxidation capacity (represented by the tropospheric  $\text{O}_3$ ,  $\text{OH}$ ,  $\text{H}_2\text{O}_2$  concentrations): in general, the higher the tropospheric  $\text{O}_3$  concentration, the higher the  $\Delta^{17}\text{O}$  values.
2. Variations in atmospheric oxidation capacity between different climates can be assessed by the changes in  $\Delta^{17}\text{O}(\text{NO}_3^-)$  and  $\Delta^{17}\text{O}(\text{SO}_4^{2-})$  recorded in polar ice cores.



## Glacial-interglacial variations in $\Delta^{17}\text{O}(\text{NO}_3^-)$ and $\Delta^{17}\text{O}(\text{SO}_4^{2-})$ and their relationship with atmospheric oxidant change

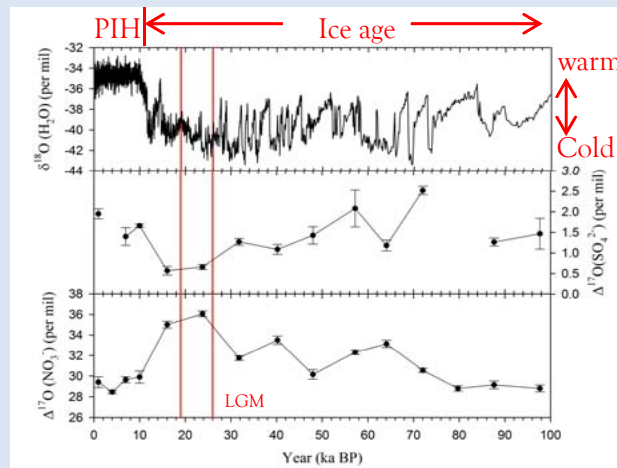
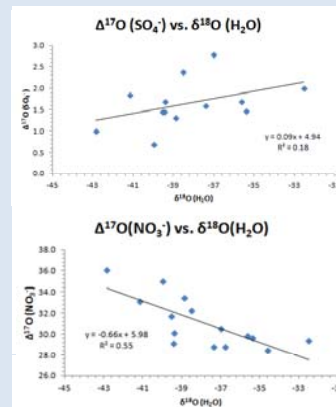


Figure 4.  $\Delta^{17}\text{O}(\text{NO}_3^-)$  and  $\Delta^{17}\text{O}(\text{SO}_4^{2-})$ , versus  $\delta^{18}\text{O}$  of  $\text{H}_2\text{O}$  (temperature proxy) from the GISP2 ice core. Numbers in the top figure label the abrupt climate change events (interstadial events, IS) in the last ice age.



Higher  $\text{O}_3/\text{HO}_x$  ratio in glacial period

Factor(s) controlling atmospheric oxidation capacity shifts at a certain atmospheric temperature.

## Future work: Coupling ICECAP model

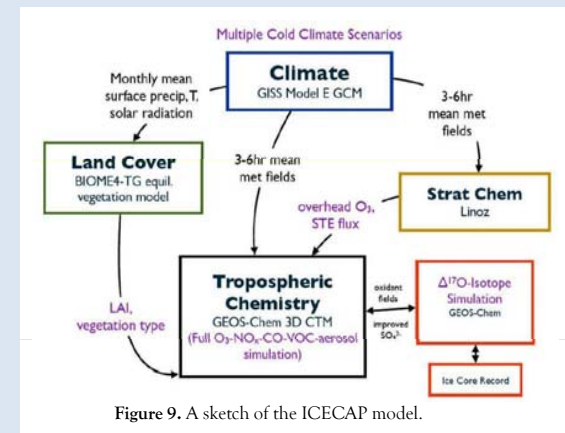


Figure 9. A sketch of the ICECAP model.