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What was the role of the Iceland plume in triggering the Eocene-Oligocene cooling?

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The largest cooling event of Cenozoic at the Eocene-Oligocene transition (EOT) has occurred in two main steps of the δ^{18}O and δ^{13}C increase. In the first step, the *precursor*, the increase in the δ^{18}O is related to cooling and minor glaciation, attested by Mg/Ca ratio and the absence of sea level decline. The 2^{nd} step in the δ^{18}O increase is related to domination of the Antarctica glaciation, attested by dramatic sea level fall.

Abelson et al. [*EPSL*, **265**, 33-48, 2008] have shown that the shut down of the Iceland plume at the EOT, and the plume renewal at the late Oligocene, strikingly correlate with the global signal of δ^{18}O and ε_{Nd} in the southern Atlantic. This suggests that the Iceland plume suppression enabled the overflow of deepwater from the Nordic seas, initiating one of the major engines of global thermohaline circulation for the first time in the Cenozoic. This notion is confirmed by several sedimentary records from the North Atlantic.

We suggest that this initiation of the proto-NADW due to the suppression of the Iceland plume has triggered a vigorous intensification of the thermohaline circulation, that in turn was the trigger for global cooling and CCD deepening during the *precursor* event; this event promoted the oceans stirring that increased the availability of nutrients which has increased productivity of primary producers contributing to drawdown of Atmospheric CO_2. As recently inferred from Boron isotopes, the CO_2 decrease could initiate the Antarctic glaciation, hence forming the proto-AABW that has contributed to further invigoration of the thermohaline circulation, which initiated the 2^{nd} event of the EOT cooling accompanied by dramatic sea level fall. This scenario of bipolar perturbation via 2-steps of cooling may be corroborated by the shift in occurrences between the δ^{18}O and δ^{13}C increase, indicated in several sites: in the first step, the δ^{18}O increase slightly lags the δ^{13}C shift, whereas in the 2^{nd} step, it shows the opposite relationship.