Compound specific terrestrial leaf wax records from the Cicogna section (Italy) during the PETM

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Compound specific isotopic analyses of higher-plant leaf waxes are a valuable tool in understanding climatic changes associated with early Eocene hyperthermals. In this study $\delta^{13}C$, δD compositions from terrestrially derived leaf waxes (n-alkanes) and TEX86-based sea-surface temperature records from the relatively expanded Cicogna section in the Venetian Southern Alps (NE Italy) are presented.

Previous work has shown that terrestrial negative carbon isotope excursions (CIE) during the Paleocene-Eocene Thermal Maximum (PETM) are larger (~4-8‰) than CIEs observed in marine records (~1-3‰). However, preliminary n-alkane $\delta^{13}C$ data from the Cicogna section indicate an attenuated CIE of ~2-3‰. This datum contrasts with the CIE of ~4-5‰ observed in the neighboring Forada section. Considering the proximity of these two sites, it is expected that the trends and magnitude of the CIE would mirror each other. Observed differences point to the influence of local vegetation, runoff or perhaps the relative continuity of the outcrops. Additionally, trends in n-alkane $\delta^{13}C$ at Cicogna are compared with the bulk carbonate $\delta^{13}C$ and bulk organic $\delta^{13}C$ datasets. This suite of data can potentially be used to isolate variability in CIE observed in terrestrial and marine realms.

[1] used higher-plant leaf waxes to reconstruct changes in the hydrological cycle at the Arctic during the PETM. Enrichment prior to the event was argued to reflect reduced rainout events during moisture transport resulting in drier mid-latitudes and wetter North Pole. Preliminary δD results generated from the Cicogna section do not indicate obvious D-enrichment (or depletion) prior to the event. This suggests that the changes in moisture transport hypothesized in [1] potentially occurred northwards of the Cicogna section. Further work is currently been conducted to generate a high-resolution D/H record through the main body of the PETM in order to evaluate precipitation gradients between the Arctic and the Cicogna section during the peak warmth of the PETM.

[1] Pagani *et al*. (2006) *Nature* **442**, 671–675.

Mass independent fractionation of mercury and microbiology: Where can they intersect?

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Mercury (Hg) is a redox-sensitive trace metal. While all chemical forms of Hg are toxic, organomercurial compounds are extremely neurotoxic. Mercury has now been shown to exhibit both mass-dependent (MDF) and mass-independent fractionation (MIF) and the emerging Hg isotope systematics is showing tremendous potential with regard to shedding light on its complex biogeochemistry and could be used to decipher the relative importance of its multiple abiotic and microbial transformations that lead to accumulation of organomercurial compounds in the ecosystems (see review (*1*)). Based on experimental results, the high spin orbit coupling (SOC) in Hg compounds, the low likelihood of suppression of SOC during dark biochemical processes, and the nature of known enzyme-Hg and microbe-Hg interactions, it has been suggested that that the nuclear spin dependent MIF is unlikely to occur during dark microbial processes (*2*).

However, not all microbial interactions of Hg occur in the 'dark' and many biological processes occurring in the dark can potentially interact with photo-activated compounds. In order to reliably apply Hg stable isotope distribution to ascertain relative role of microbial activities and microbial products on Hg speciation, it is essential to establish if MIF and microbiology of Hg will ever intersect? In addition to presenting a review of the present knowledge of Hg stable isotope systematics, this paper will attempt to innumerate and explore factors that can influence the above mentioned intersection. New and old experimental strategies or theoretical calculations that could be potentially applied to better understand these factors will also be discussed.

[1] B. A. Bergquist, J. D. Blum, (2009) *Elements* **5**, 353 [2] K. Kritee, T. Barkay, J. D. Blum, (2009) *Geochim. Cosmochim. Acta* **73**, 1285.