Onset and Duration of the Hot Cretaceous Greenhouse: New Insights from Southern High Latitudes

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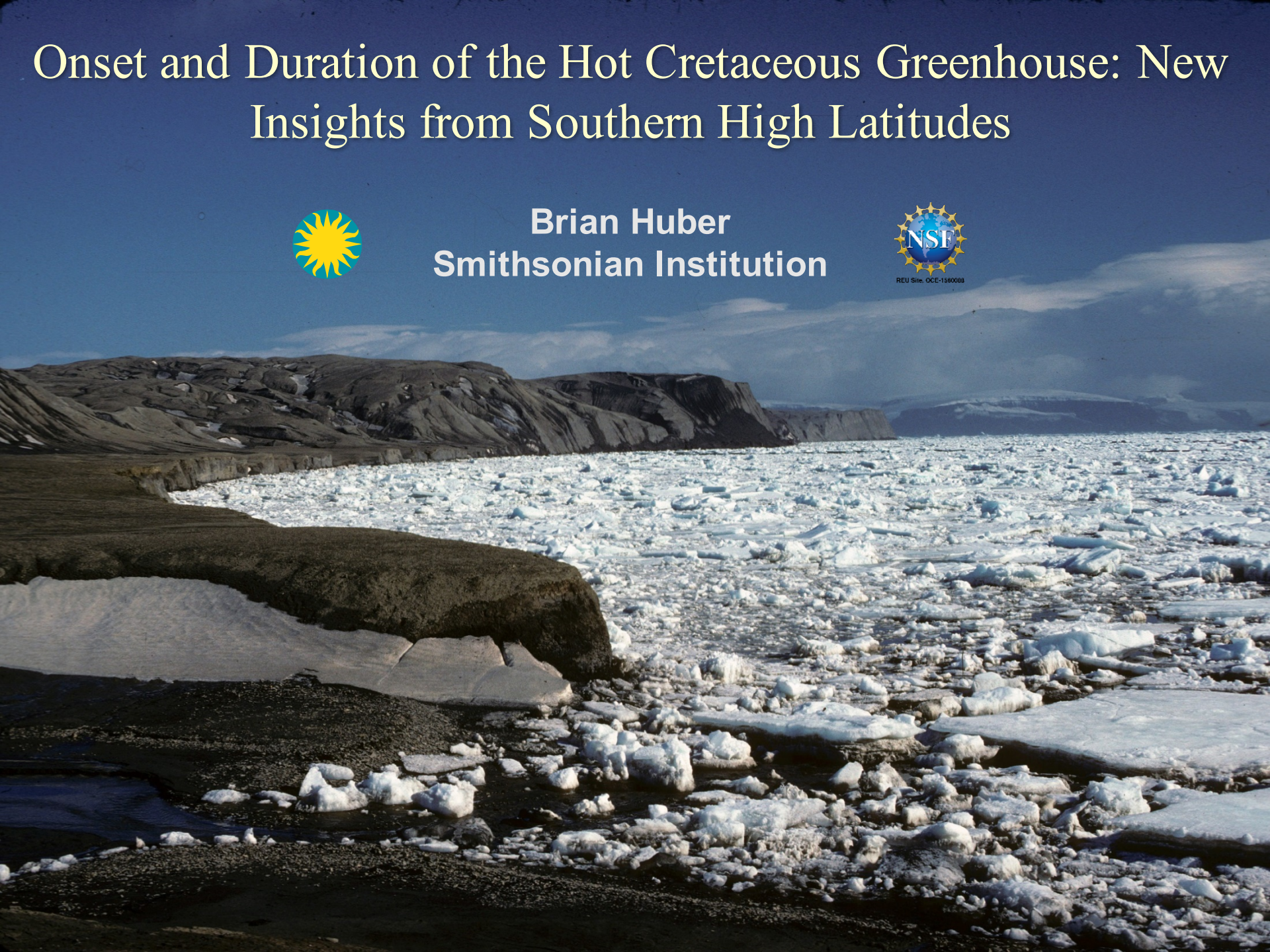
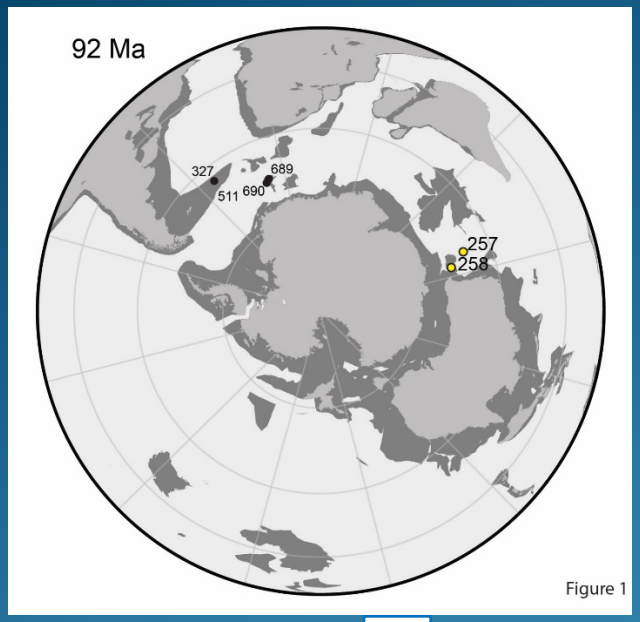
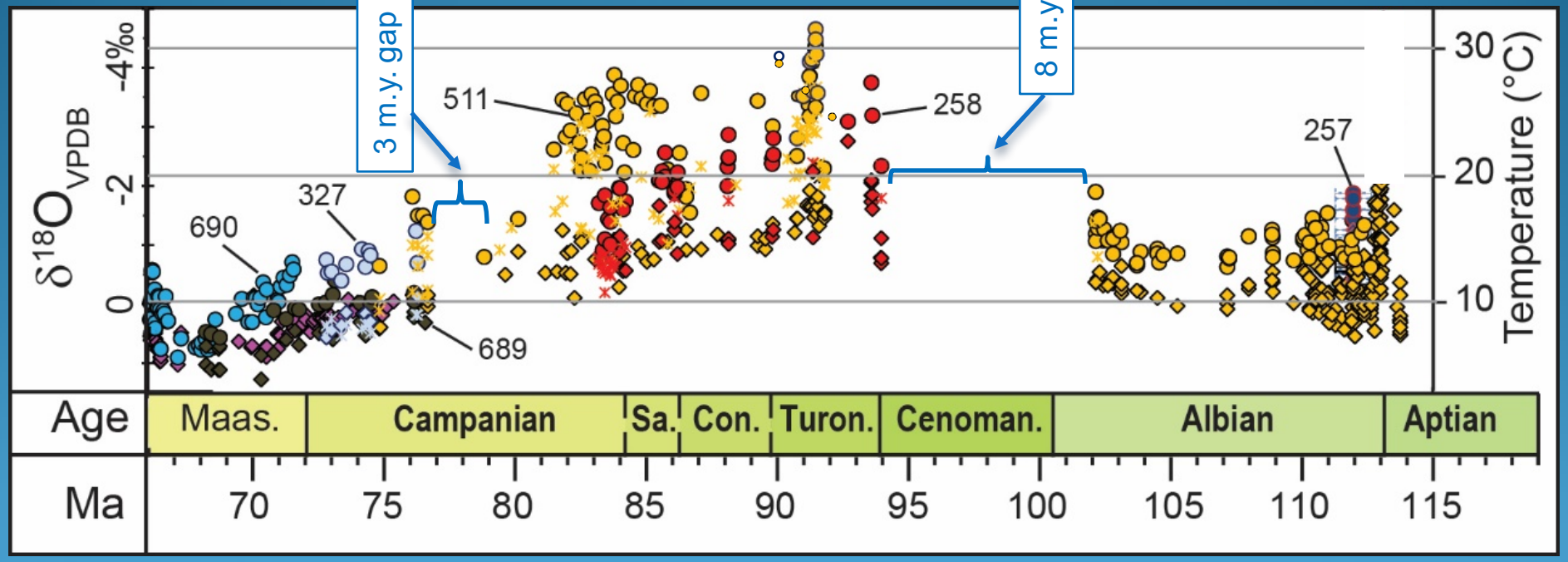


Cretaceous Southern High Latitude $\delta^{18}O$ Compilation



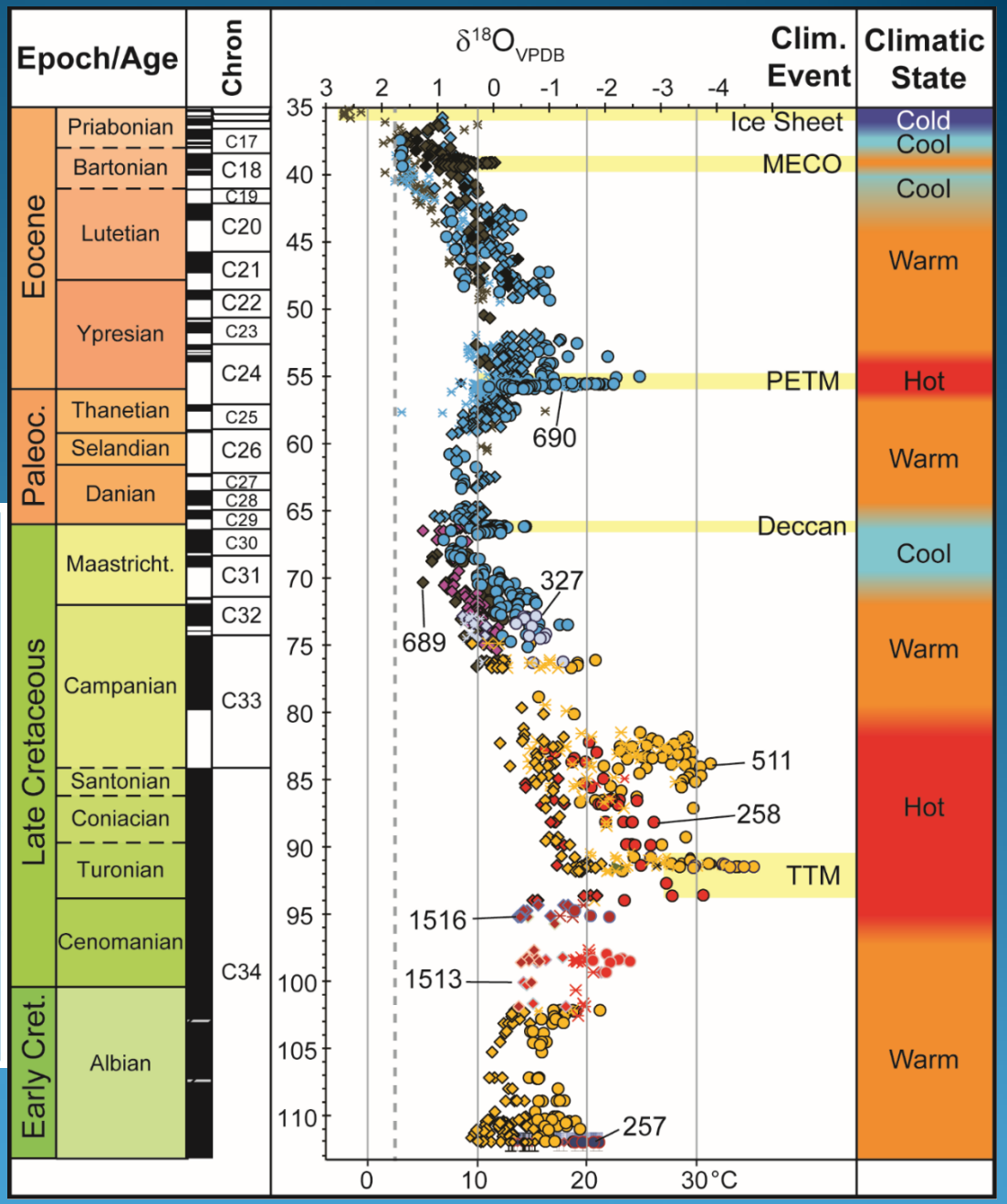
- Surface planktic
- Deeper planktic
- Benthic



Huber et al., 2018, Glob. Planet. Chg.

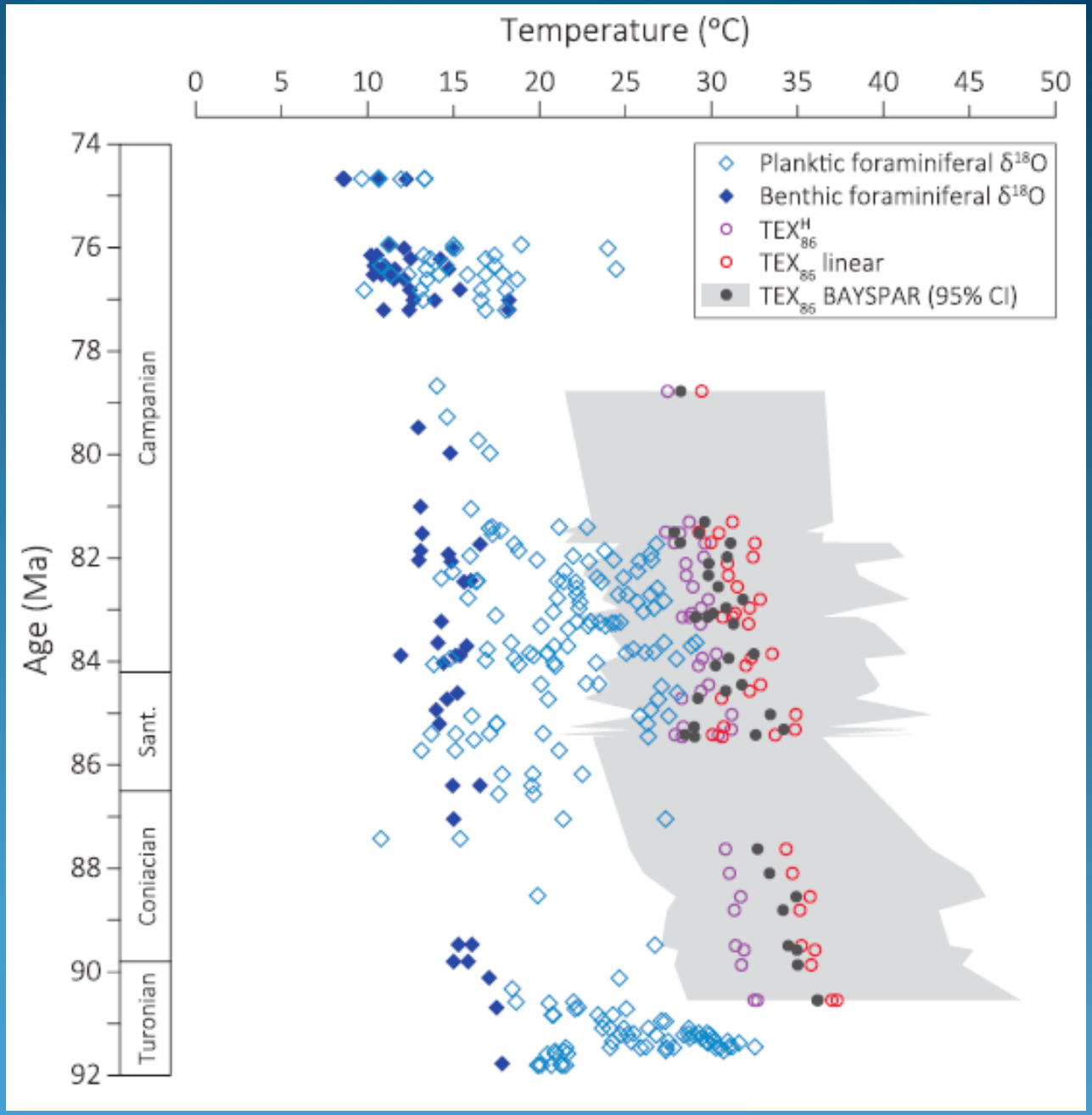
IODP Expedition 369: Australia Cretaceous Climate and Tectonics

"Rise and Fall of Hot Cretaceous Greenhouse Climate"



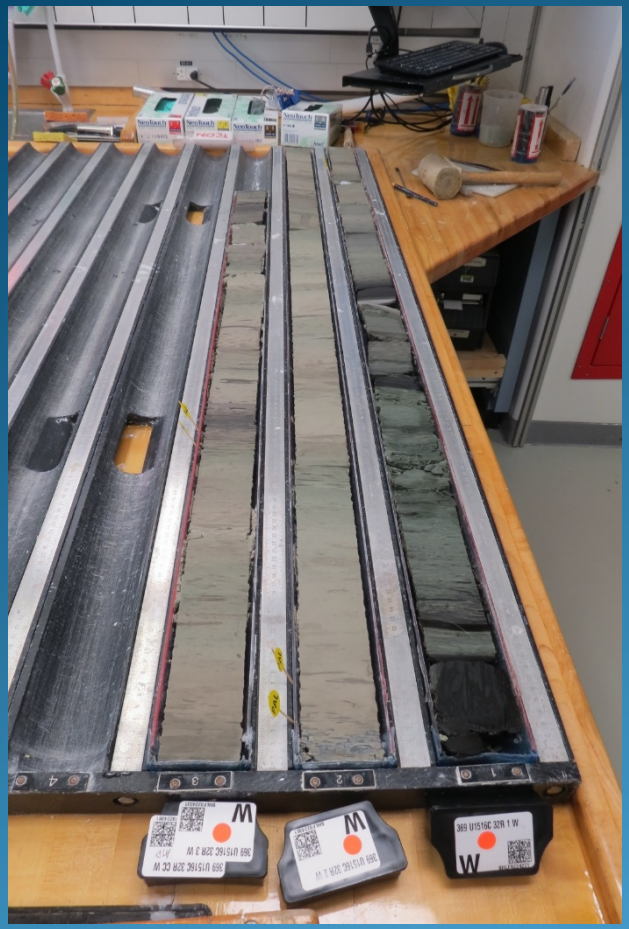
Huber et al., 2018, Glob. Planet. Chg.

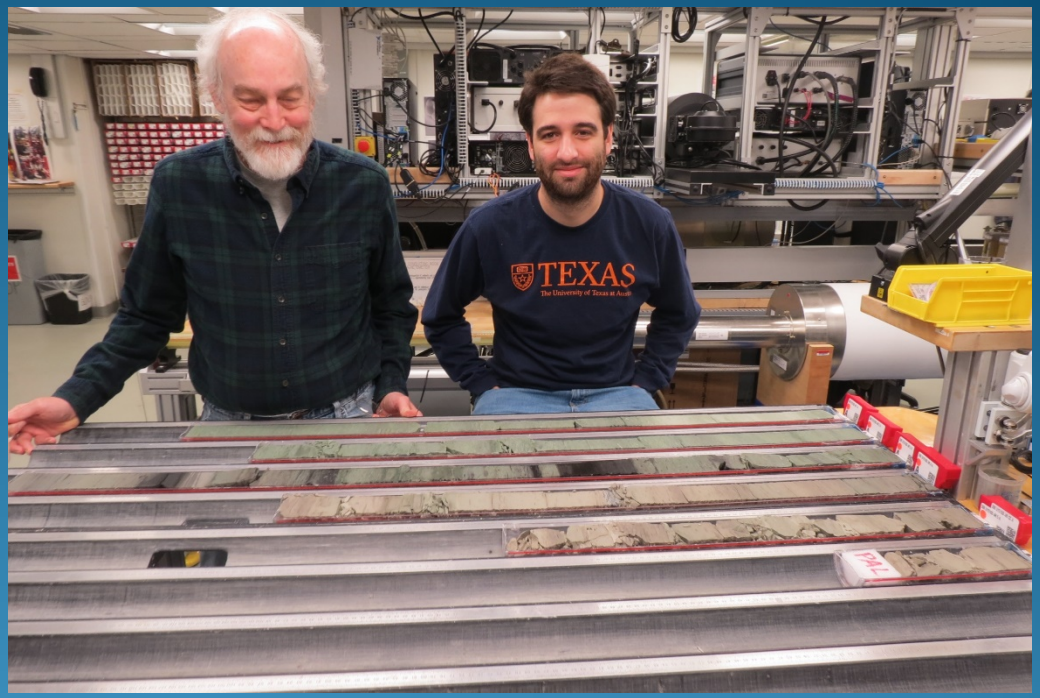
"Late Cretaceous Temperature Evolution of the Southern High Latitudes: A TEX_{86} Perspective"



O'Connor et al., 2019, Paleoc. & Paleoclim.

OAE 2 Black shale beds





Hole U1516C

Hole U1516D

Future Challenges

1. Discrepancies between deep-time paleotemperature proxies
    a. Oxygen isotopes
        i. Isotopic composition of ambient seawater
        ii. Carbonate ion and vital effects
        iii. Diagenesis
    b. TEX_{86}
        i. Sometimes unrealistically warm estimates (>$\delta^{18}O$ by 8-10°C)
        ii. Not always measureable (isoGDGT lipids absent)
        iii. non-linear TEX_{86}^{H} calibration model
    c. Clumped isotopes
        i. Sometimes yield unrealistically warm estimates (>$\delta^{18}O$ by 8-10°C)
        ii. Large sample size required
        iii. Diagenesis
    d. Mg\Ca ratios
        i. Uncertain Mg/Ca of ancient oceans
        ii. Vital effects for extinct species
        iii. Diagenesis

2. Stratigraphic data gaps
    a. Mid – Late Cretaceous
    b. >114 Ma