CENOZOIC EXPRESSION OF ROLLING WINDOW REGRESSION IN MARINE CARBONATES AROUND THE GLOBE

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PROJECT OBJECTIVES

- Evaluate RWR trends in geochemical parameters (stable isotopes, trace elements) from:
  - Shallow marine environments
    - Clino, Unda, Enewetak, San Salvador.
  - Periplatform settings
    - Great and Little Bahama Banks, Maldives.
  - Pelagic Environments
    - Walvis Ridge, Nicaraguan Rise, Queensland Plateau, Madingley Rise.
- Assess the utility of RWR in chemostratigraphic correlations, biogeochemical cycling, and reconstruction of diagenetic events in a range of Cenozoic depositional environments.

PROJECT RATIONALE

Rolling window regression (RWR) analysis has recently been shown to be a useful tool in identifying the types of diagenetic processes that affect stable isotope records ($\delta^{13}C$ and $\delta^{18}O$ values) in shallow marine carbonates (Oehlert and Swart, 2019). Statistically significant and unique trends in RWR analysis were observed in relation to subaerial exposure, the development of marine hardgrounds, and periods of reduced sedimentation. Although its utility has been demonstrated in relation to diagenetic events in shallow marine settings, the applicability of RWR to basinal/global chemostratigraphic correlations and major biogeochemical events in Earth history remains untested. Preliminary results from the Nicaraguan Rise (ODP Site 1000) and the Queensland Plateau (ODP Site 811) suggest there may be globally observed patterns in RWR analysis that reflect Cenozoic changes in biogeochemical cycling (Fig. 1). If proven useful, RWR could be another tool to employ when interpreting sedimentological, stratigraphic and diagenetic histories in marine carbonates in the geological record.

APPROACH

We will conduct RWR analysis in 30 m windows on stable isotope and trace element records from cores like Clino, Unda and San Salvador which were collected from shallow marine environments in the Bahamas. RWR analysis in periplatform environments will be tested in cores collected from Great and Little Bahama Bank, and the Maldives. Cores from the Walvis Ridge, Nicaraguan Rise, Queensland Plateau, and the Madingley Rise will be analyzed in order to characterize the pelagic endmember.

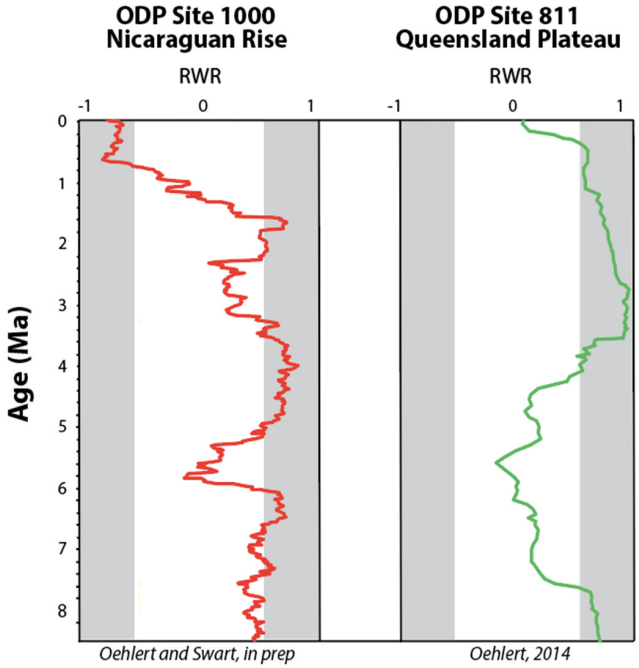

Figure 1: Comparison of 15 m RWR analyses on $\delta^{13}C$ and $\delta^{18}O$ values from pelagic settings at ODP Site 1000 on the Nicaraguan Rise with ODP Site 811 on the Queensland Plateau.

SIGNIFICANCE

Despite differences in sample frequency, both the high resolution RWR record from ODP Site 1000 on the Nicaraguan Rise and the lower resolution RWR record from ODP Site 811 on the Queensland Plateau exhibit similar trends through time, with similar periods of positive RWR relationship, especially over the past 4 million years (Fig. 1). Further investigation is required to identify whether these trends are globally significant by comparing to other pelagic environments. Comparison between shallow and periplatform depositional settings will also aid in the determination of Cenozoic trends in RWR, and whether they can be used to better define sedimentological, stratigraphic, and diagenetic events through time.

REFERENCES

Oehlert, A.M. and Swart, P.K., 2019. Rolling window regression of $\delta^{13}C$ and $\delta^{18}O$ values in carbonate sediments: Implications for source and diagenesis. The Depositional Record, 5, pp. 613-630.