**INTRODUCTION**

The positive δ13C excursion and pCO₂ decrease during OAE2, including the Pienus Cold Event (PCë), and the initially rapid δ13C recovery during the termination of the PETM are hypothesized to be the result of enhanced organic C (C_{org}) burial.

In this study, we present results from carbon-cycle box models, LOSCAR and a new C-O2-P model (NMP_UU), which includes coastal marine environments, to assess the potential drivers of enhanced C_{org} burial and their impact on the carbon cycle during OAE2 and the PETM. We focus on the role of eutrophication, deoxygenation and redox-dependent P recycling and also present a data compilation for the PETM.

Using an emission scenario of 8000Pg/50kyr in LOSCAR-P we show that the pCO₂ decrease and δ13C increase can be attributed to enhanced C_{org} burial through eutrophication and ocean deoxygenation.

By comparing long emission scenarios in LOSCAR with short ones we show that only the latter produces the simultaneous drop in pCO₂ and increase in δ13C, which is seen in data.

**RESULTS: OAE2**

Increased external P together with redox-driven P recycling are required to simulate the required C_{org} burial for CO₂ drawdown in NMP_UU.

**RESULTS: PETM**

Using emission scenarios from literature, we show with NMP_UU that, besides increased external P input, redox-dependent P recycling is required to cause excess burial of ~2000 Pg C during the termination of the PETM. Shelf burial generally accounts for more than 70% of burial.

**CONCLUSIONS**

1. Increased C_{org} burial, coincident with a break or drop in CO₂ emissions, is key for reconstructing OAE2 pCO₂ and δ13C trends.
2. Deoxygenation and reduced P burial are required for 2000+ Pg excess C_{org} burial during PETM.