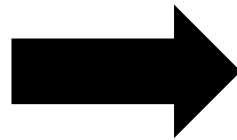


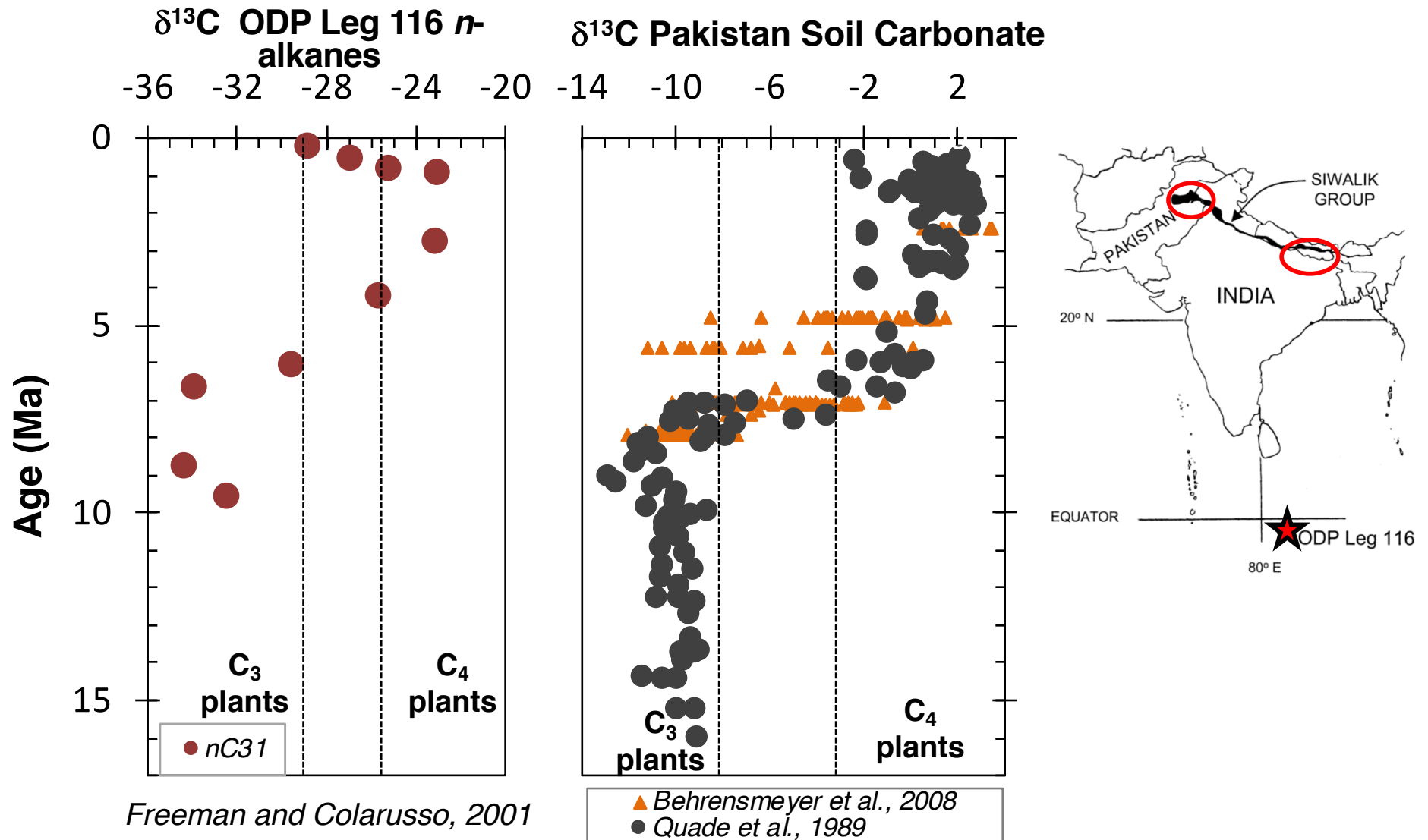
Did Hydrologic Change Drive the Expansion of C₄ Grasslands in the Siwaliks during the Late Miocene?

Jennifer Pensky¹, Samuel Phelps²,
Kevin Uno², Pratigya Polissar²

¹Barnard College, New York, NY; ²Lamont-Doherty Earth Observatory, Palisades, NY



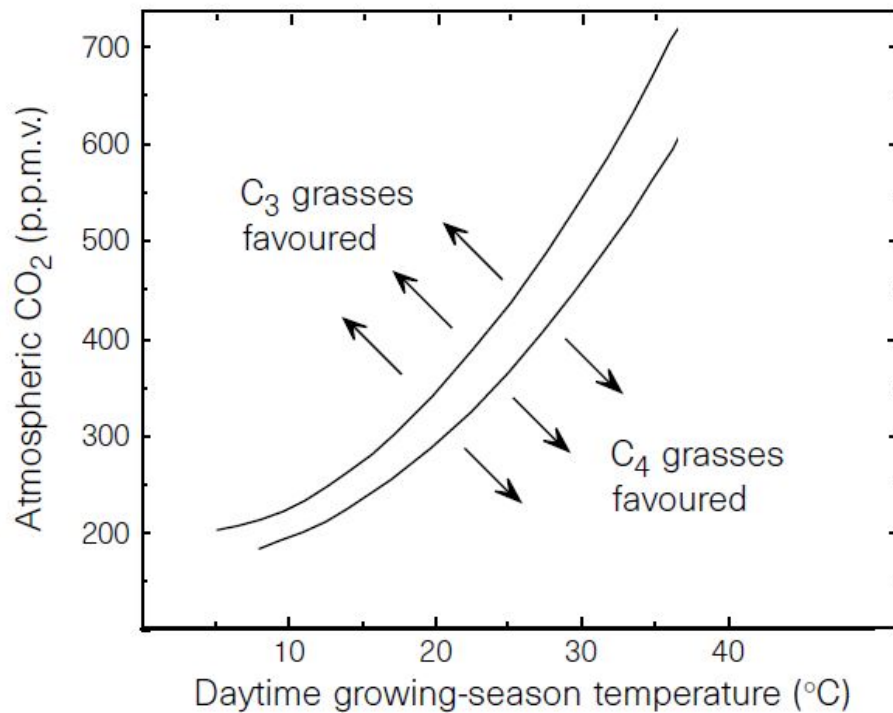
C₄ Expansion in the Siwaliks



Cause of the Expansion?

Decrease in atmospheric CO₂

Hydrologic change

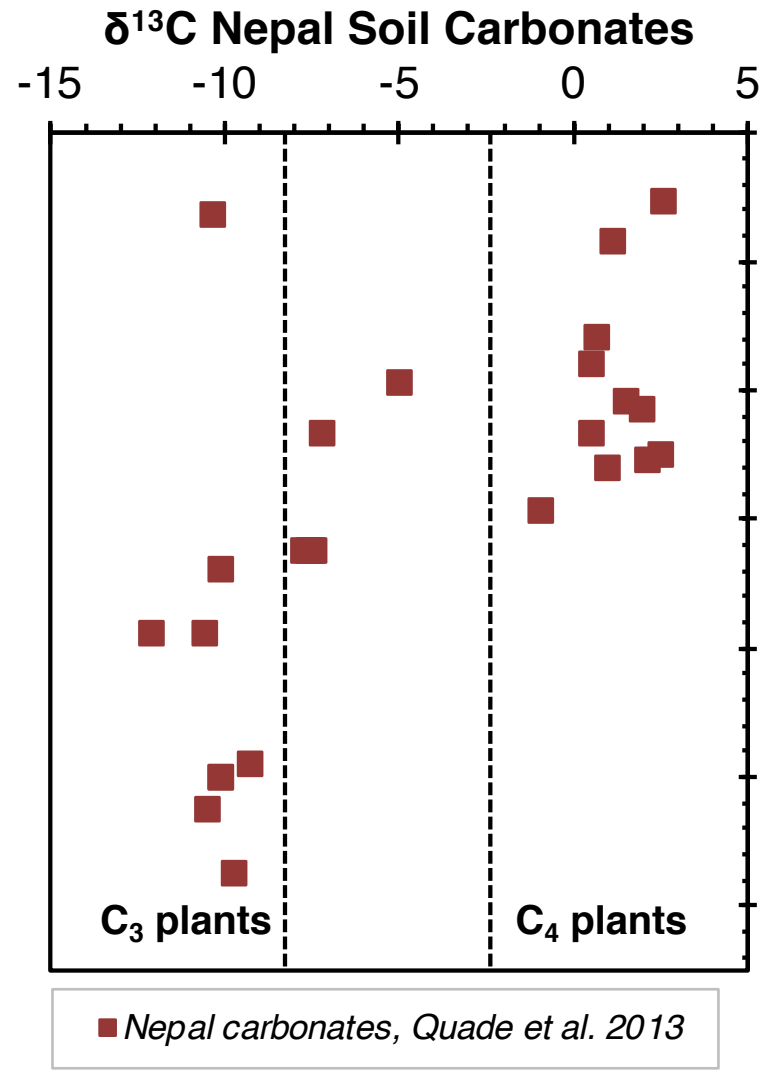
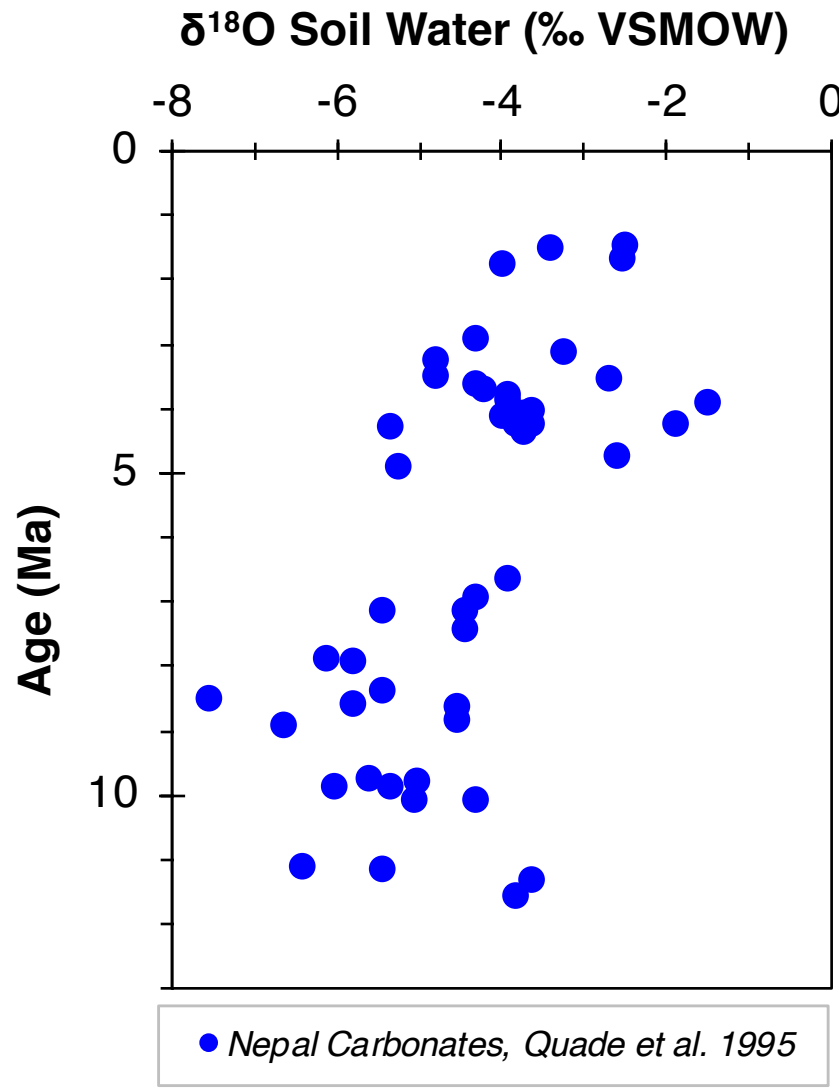


Cerling et al., 1997

Rainfall amount

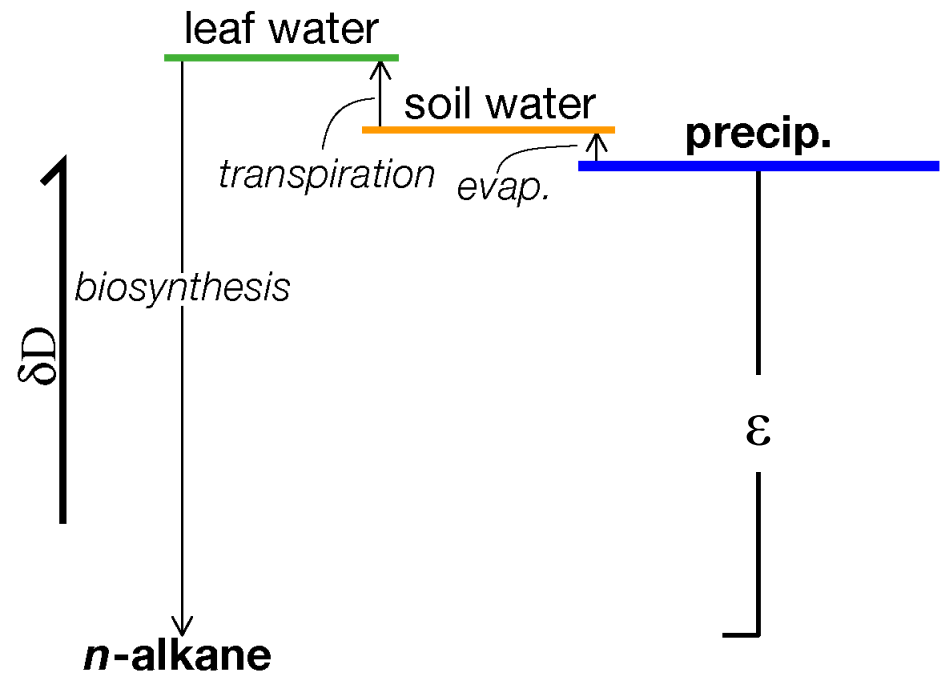
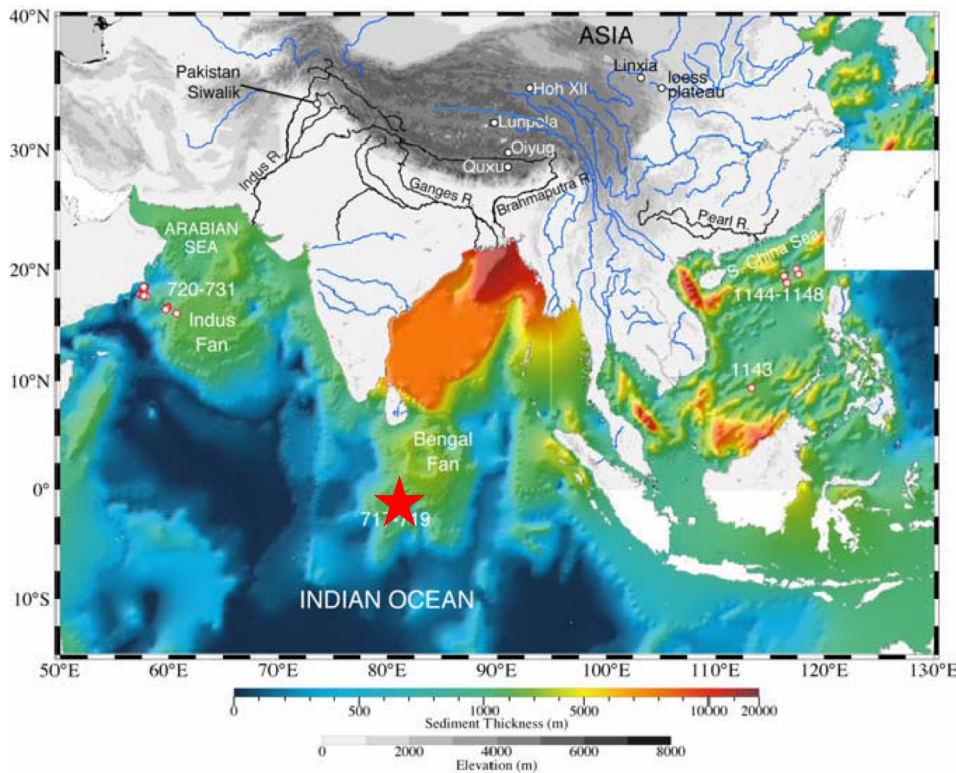
Rainfall seasonality

Evidence for Hydrologic Change



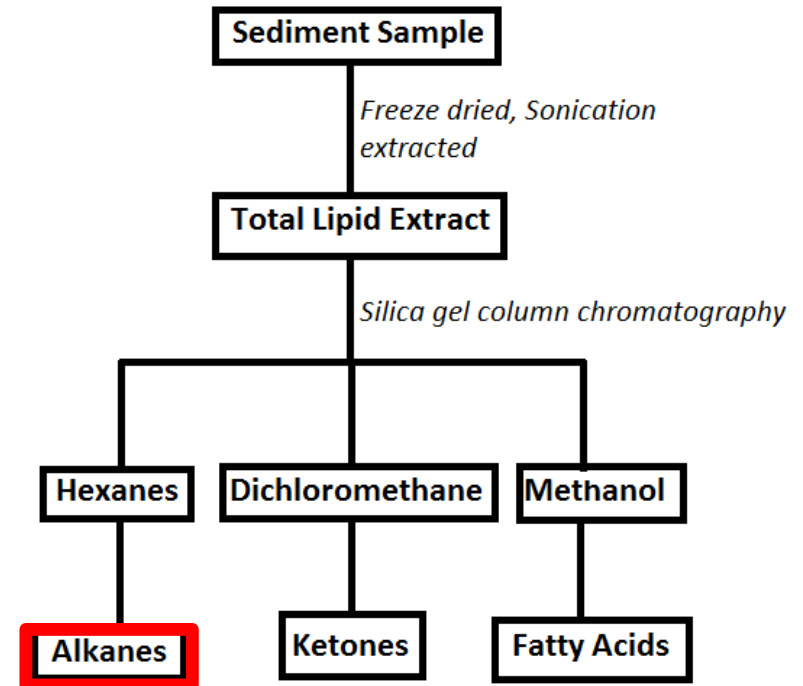
Our Approach

- Extract leaf waxes from Bengal Fan sediments
- Use of δD isotopes in leaf waxes to assess hydrologic change

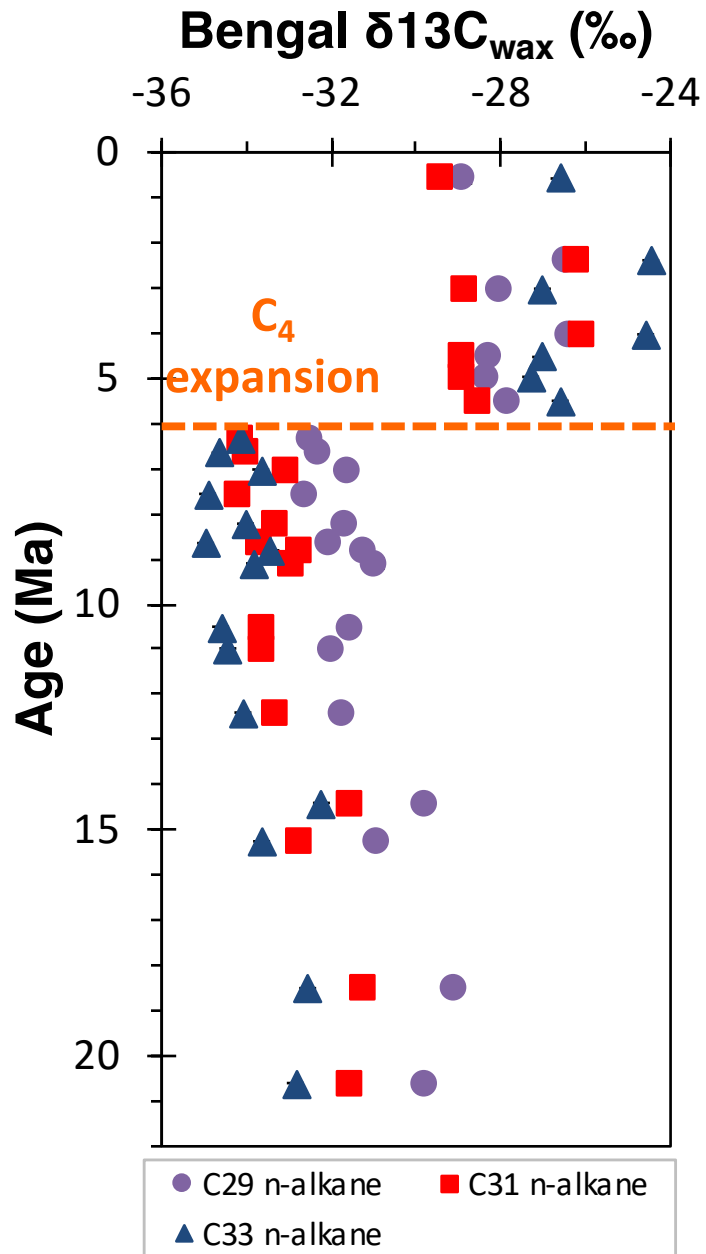


Methods

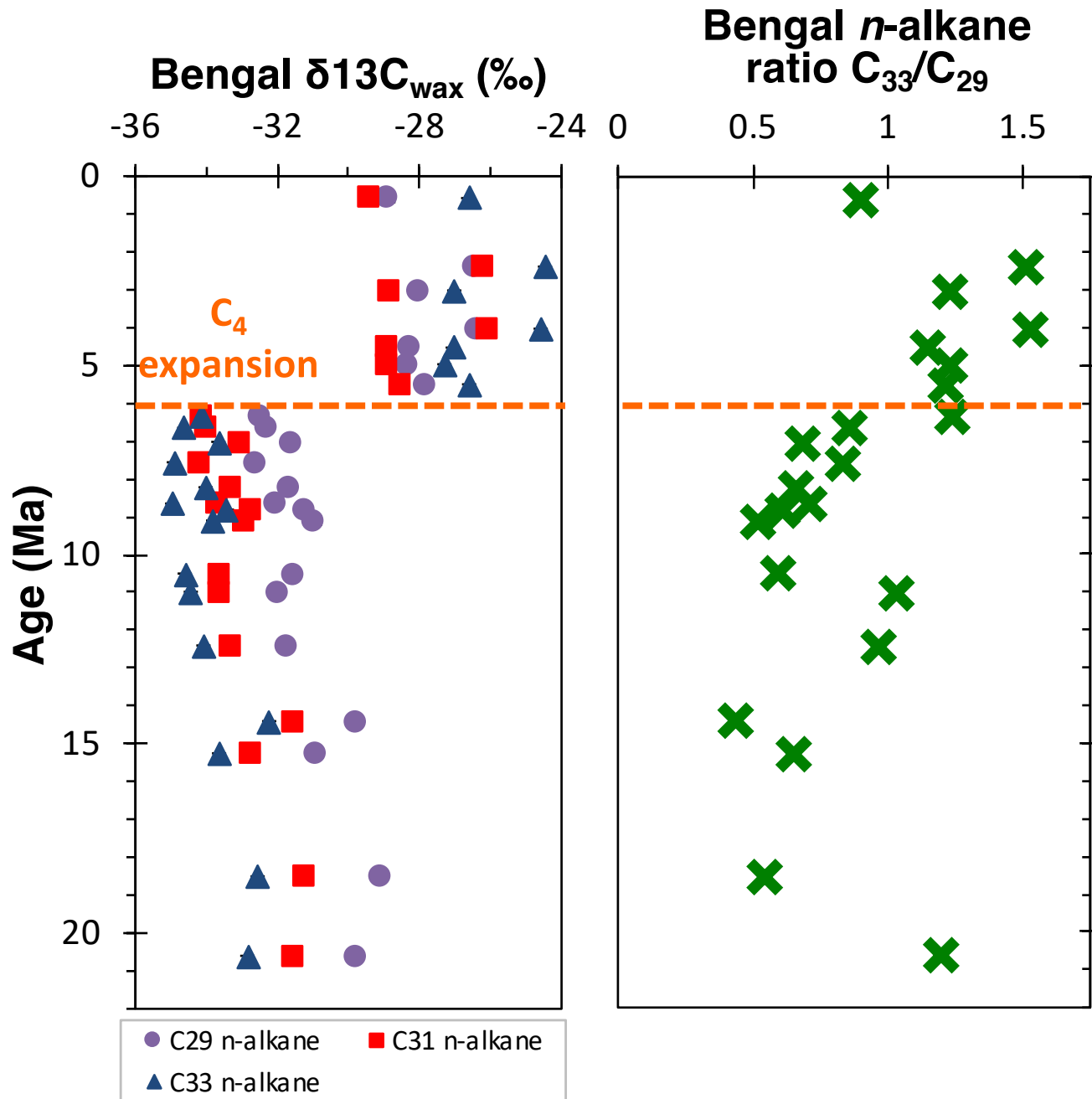
- Extract lipids from ODP Sites 717 and 718 turbidites
 - 62 total, 22 extracted
- Isolate *n*-alkane fractions
- Quantify *n*-alkanes (GC-MS)
- Measure molecular $\delta^{13}\text{C}$ and δD using GC-irMS



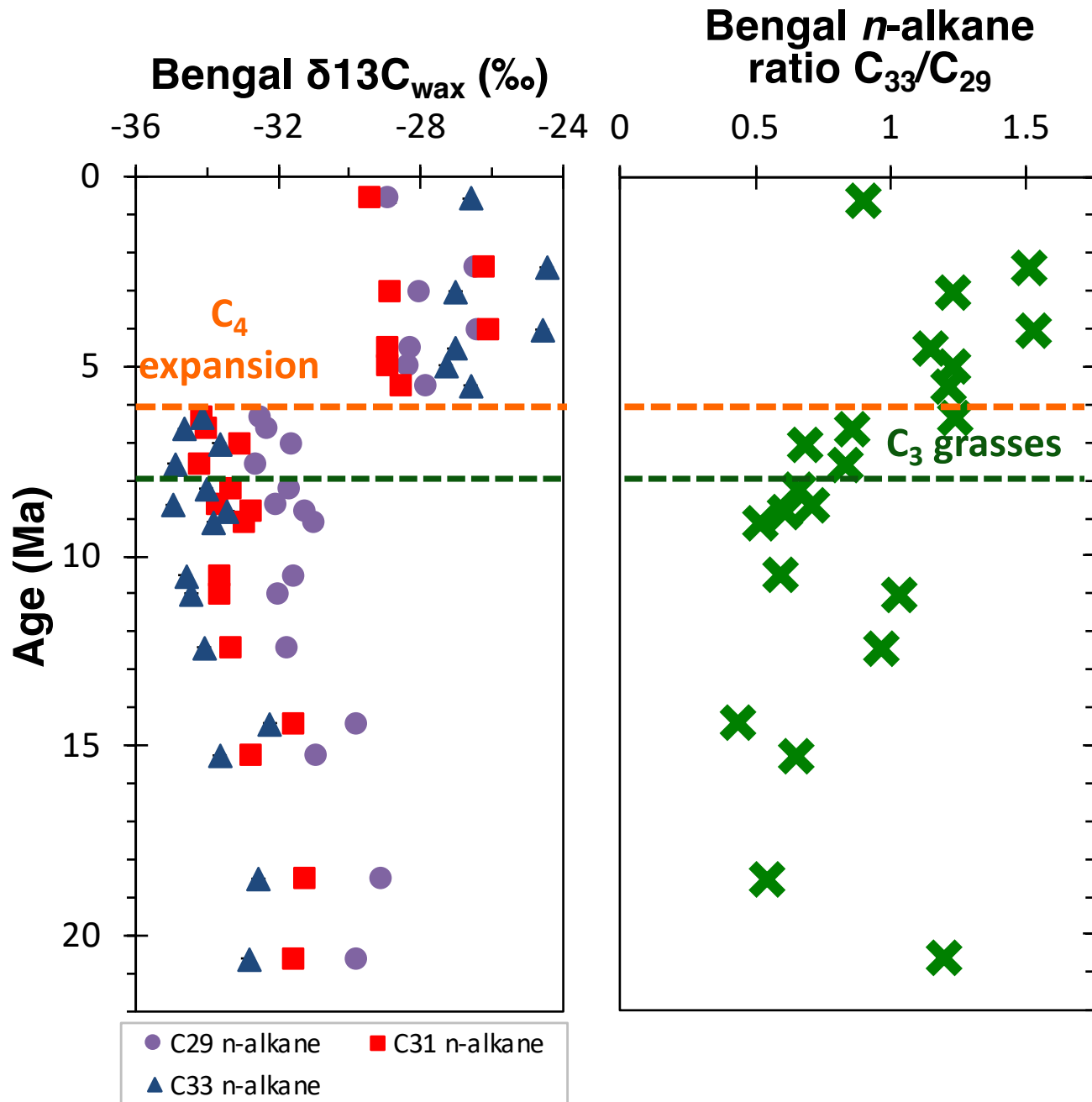
Results



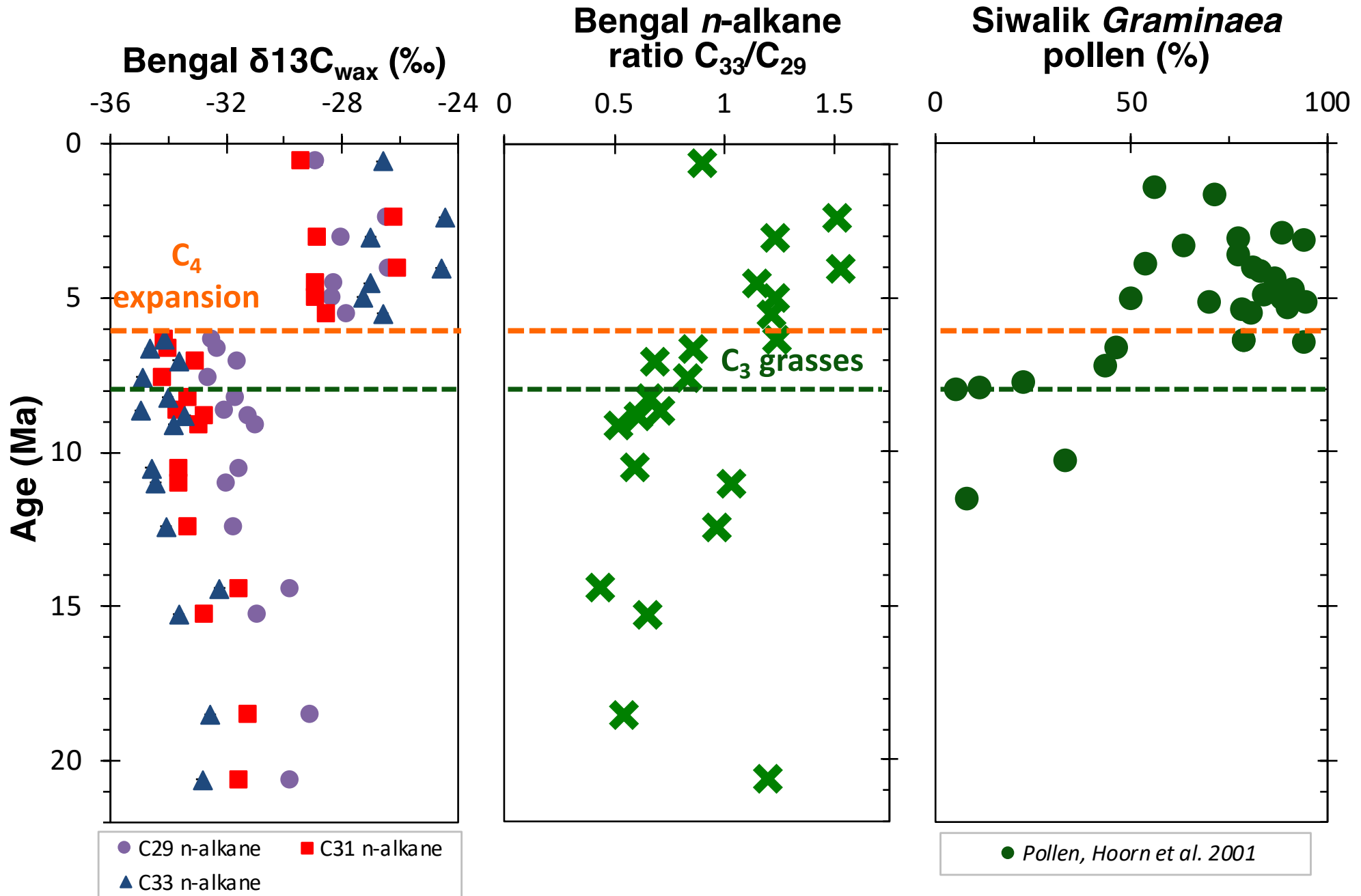
Results



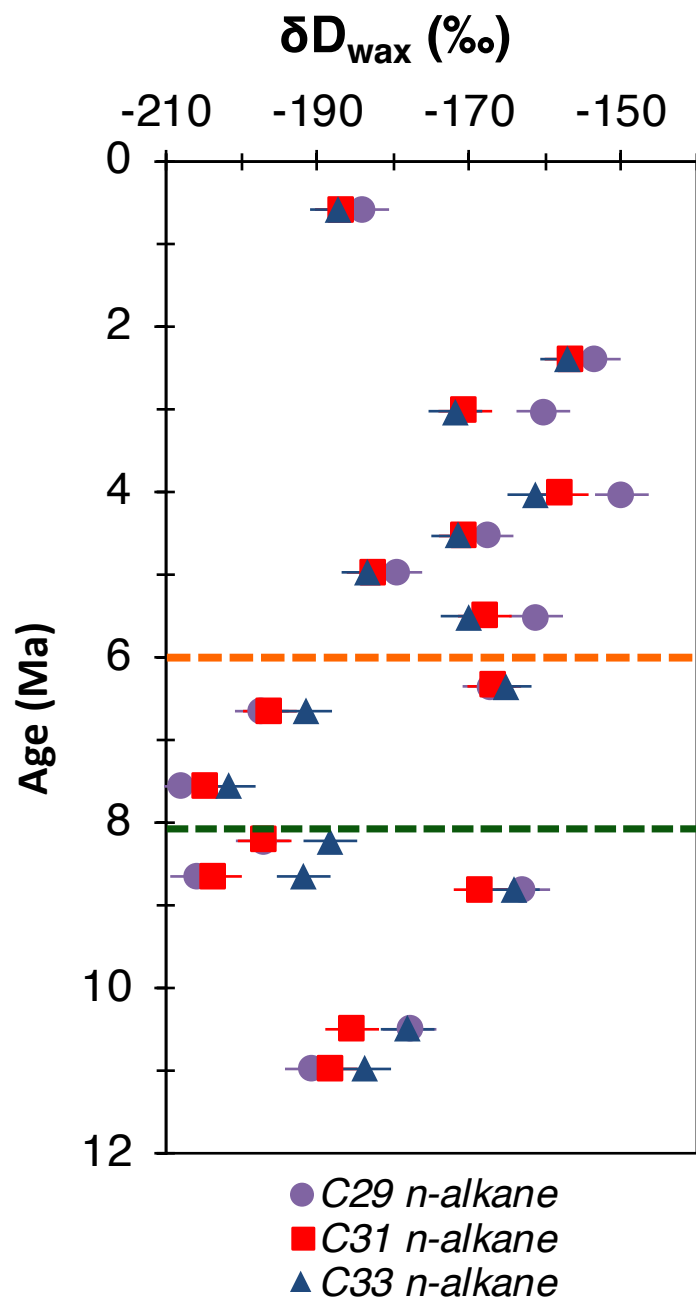
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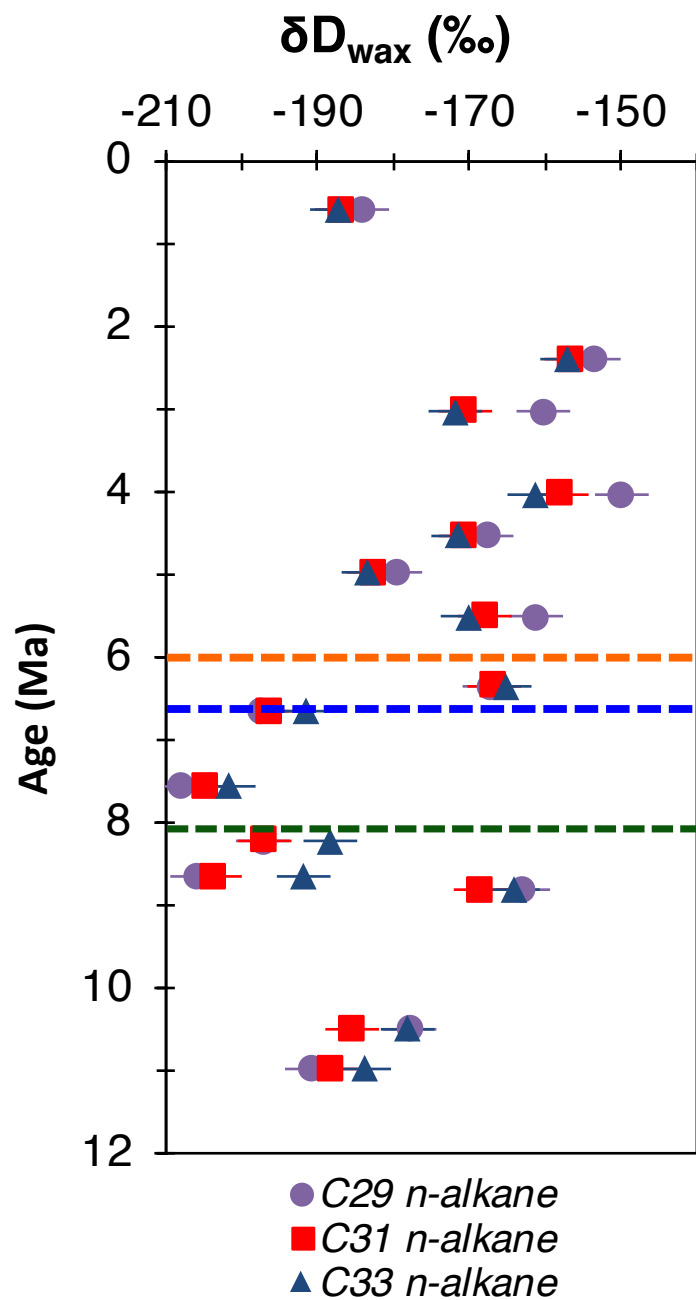
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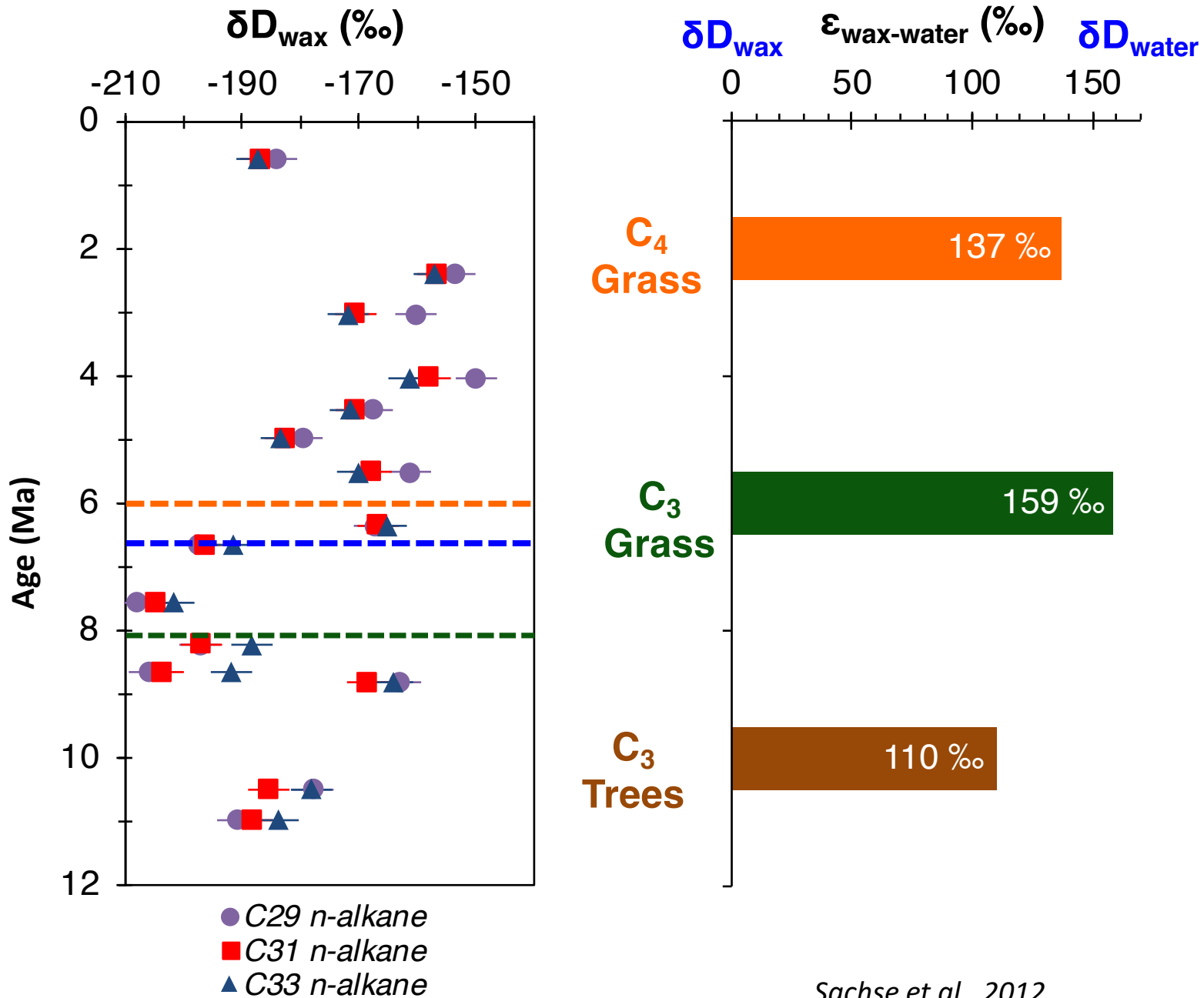
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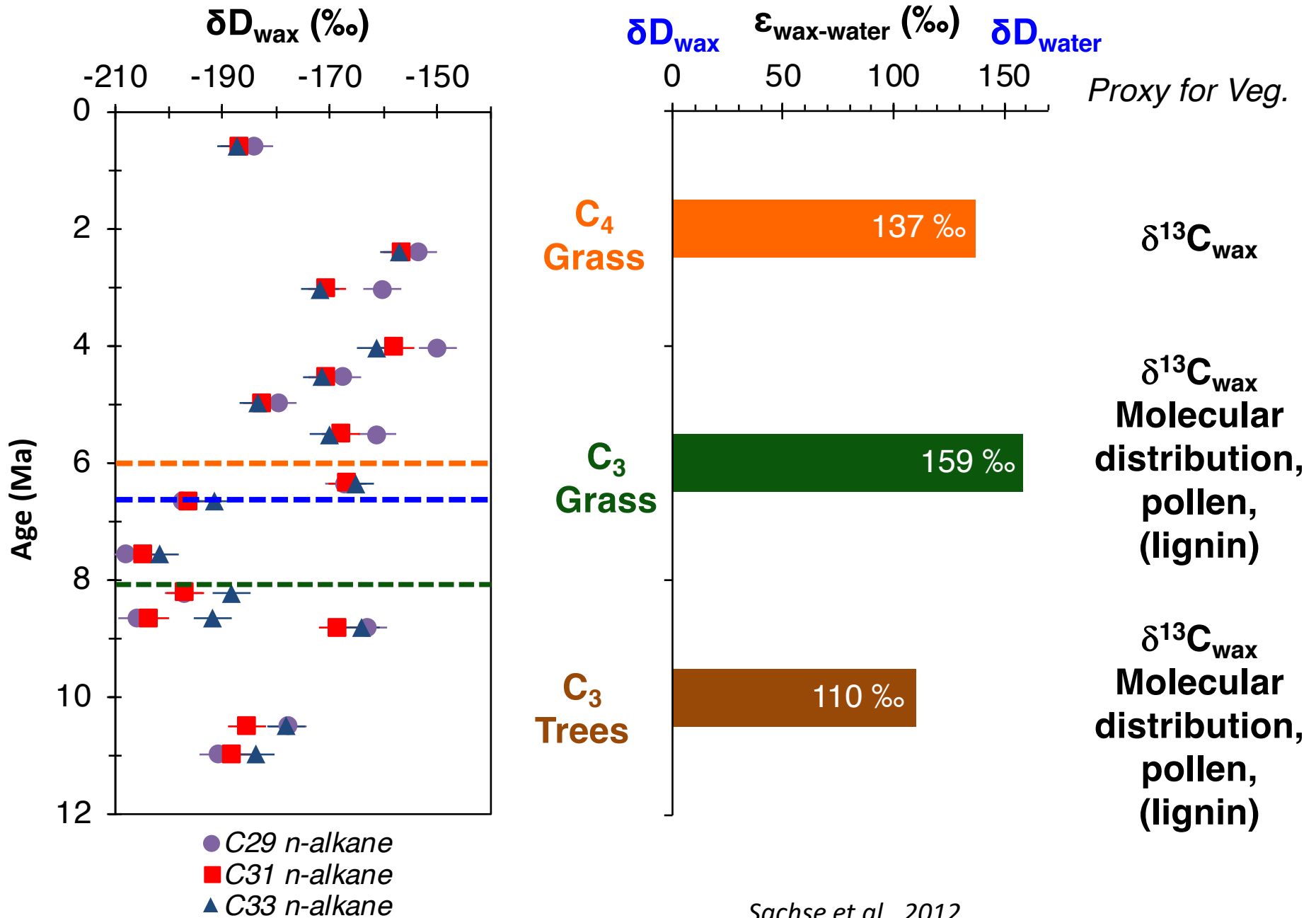
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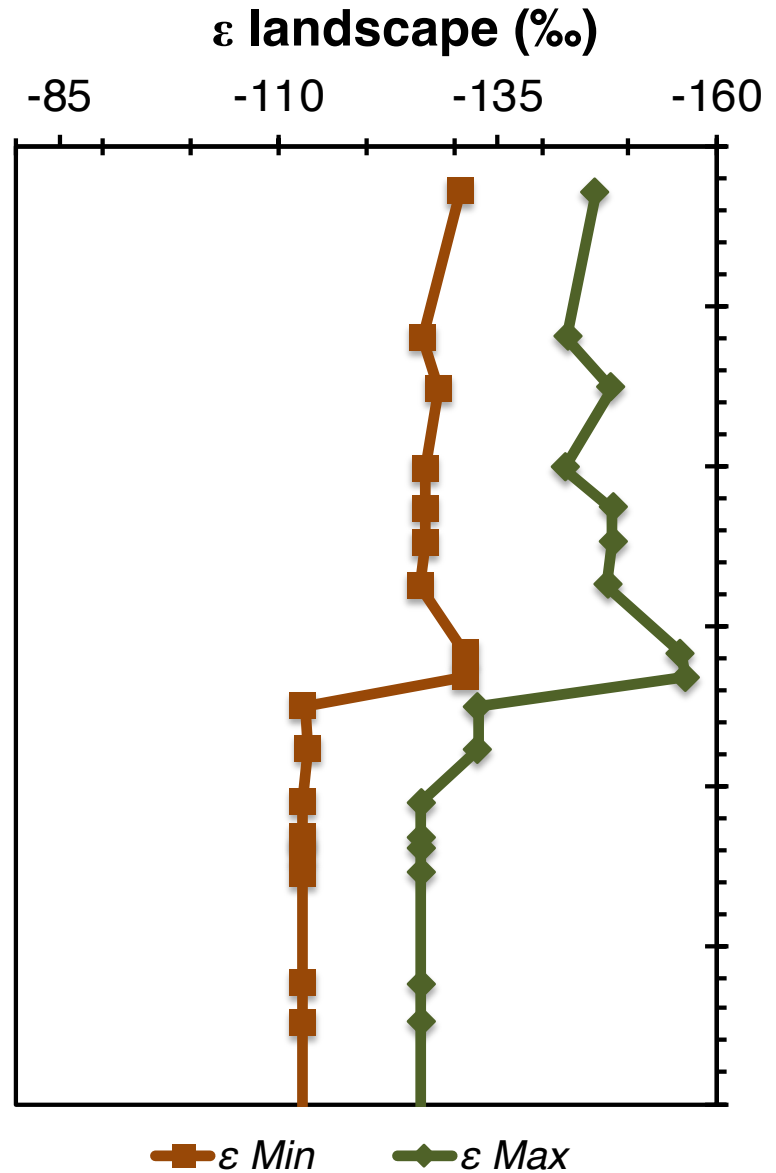
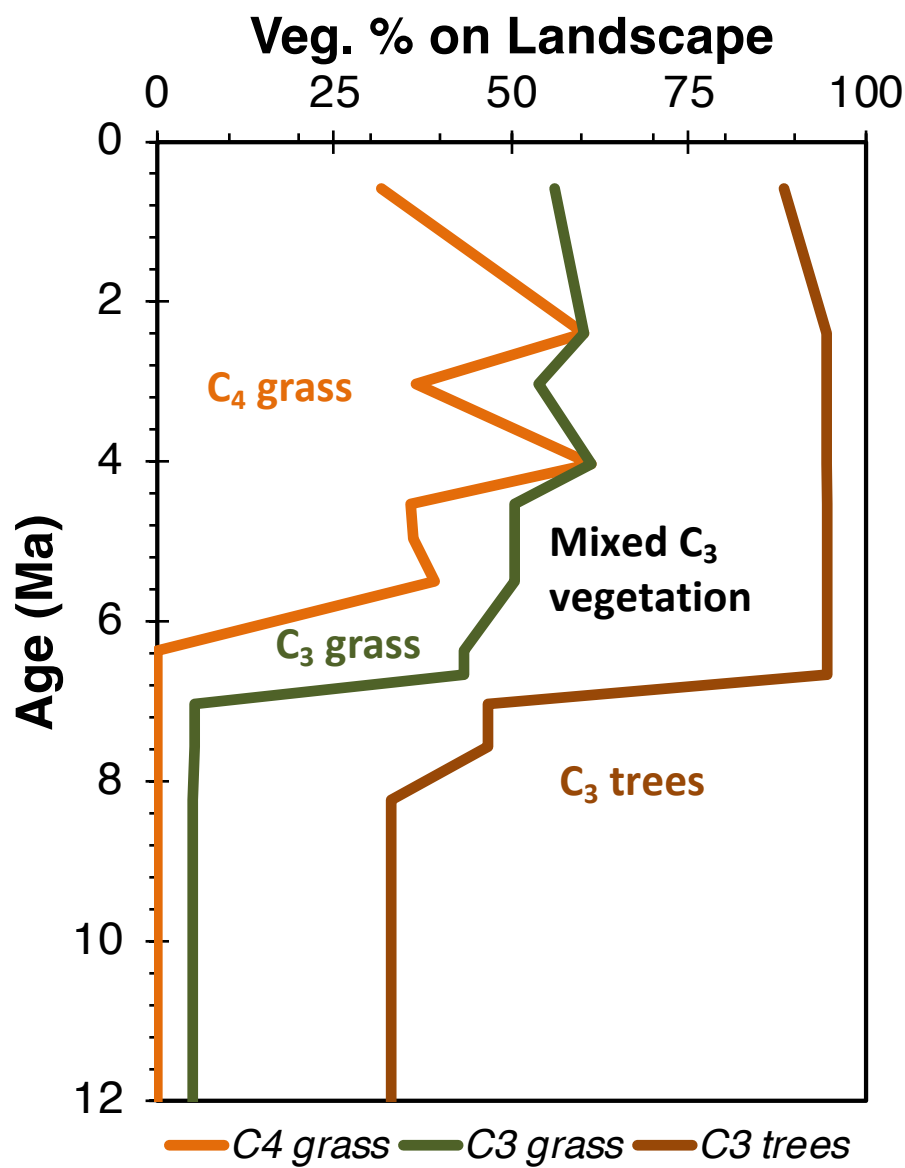
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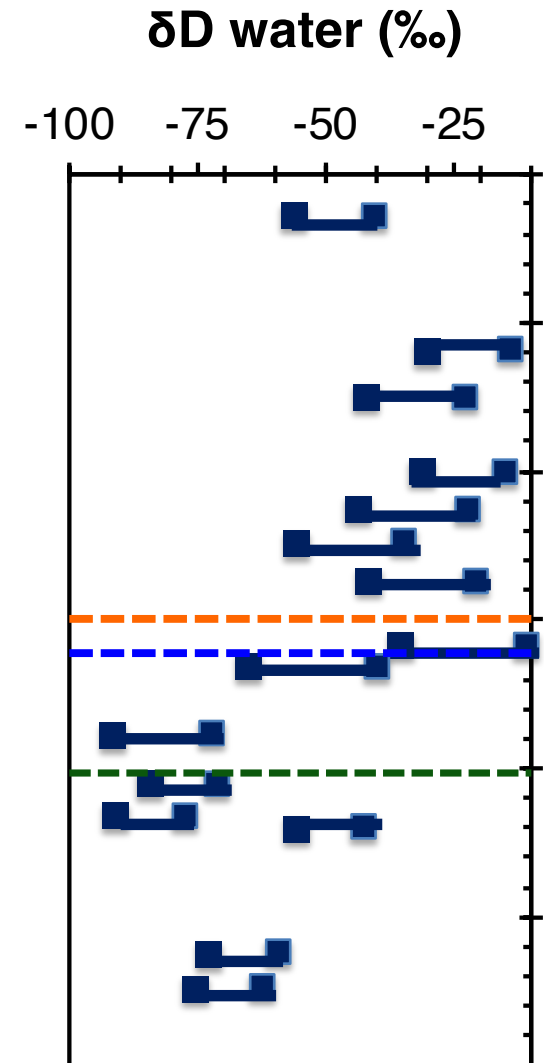
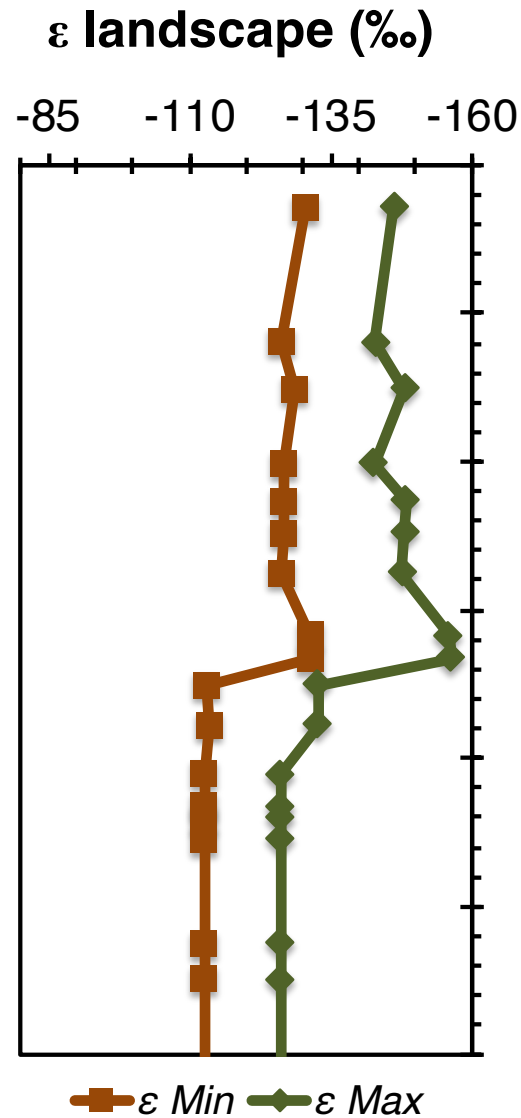
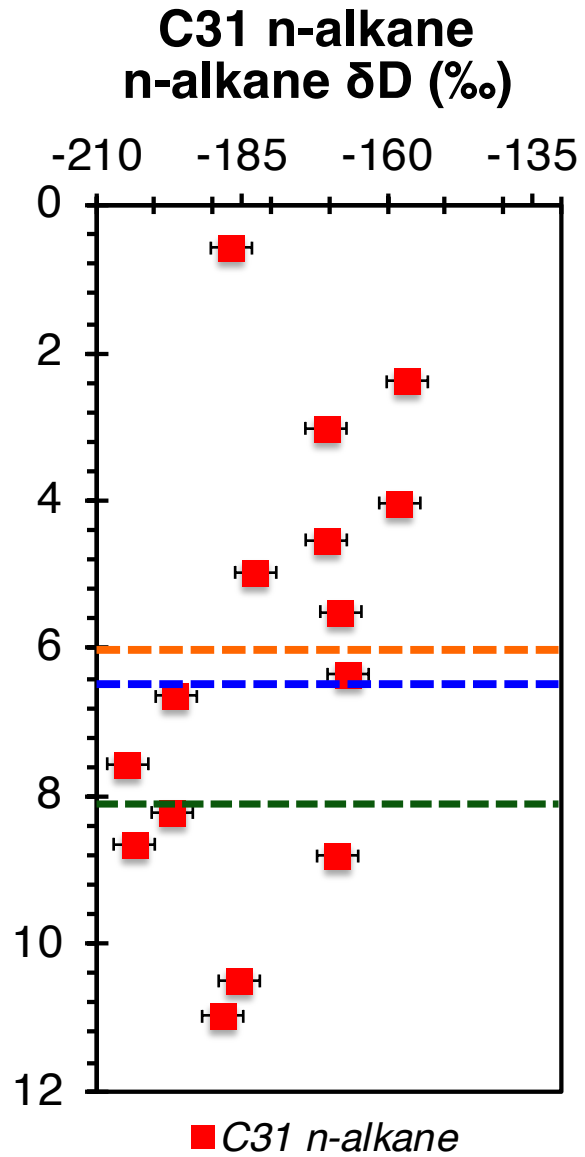
Results



Building Epsilon



Results



Conclusions

- **$\delta^{13}\text{C}$ shift consistent with prior studies**
 - Extends Bengal Fan record to 20 Ma
- **Molecular evidence for grasses earlier than C_4 expansion**
 - Follow up with lignin and other biomarkers
- **Abrupt δD shift precedes C_4 expansion**