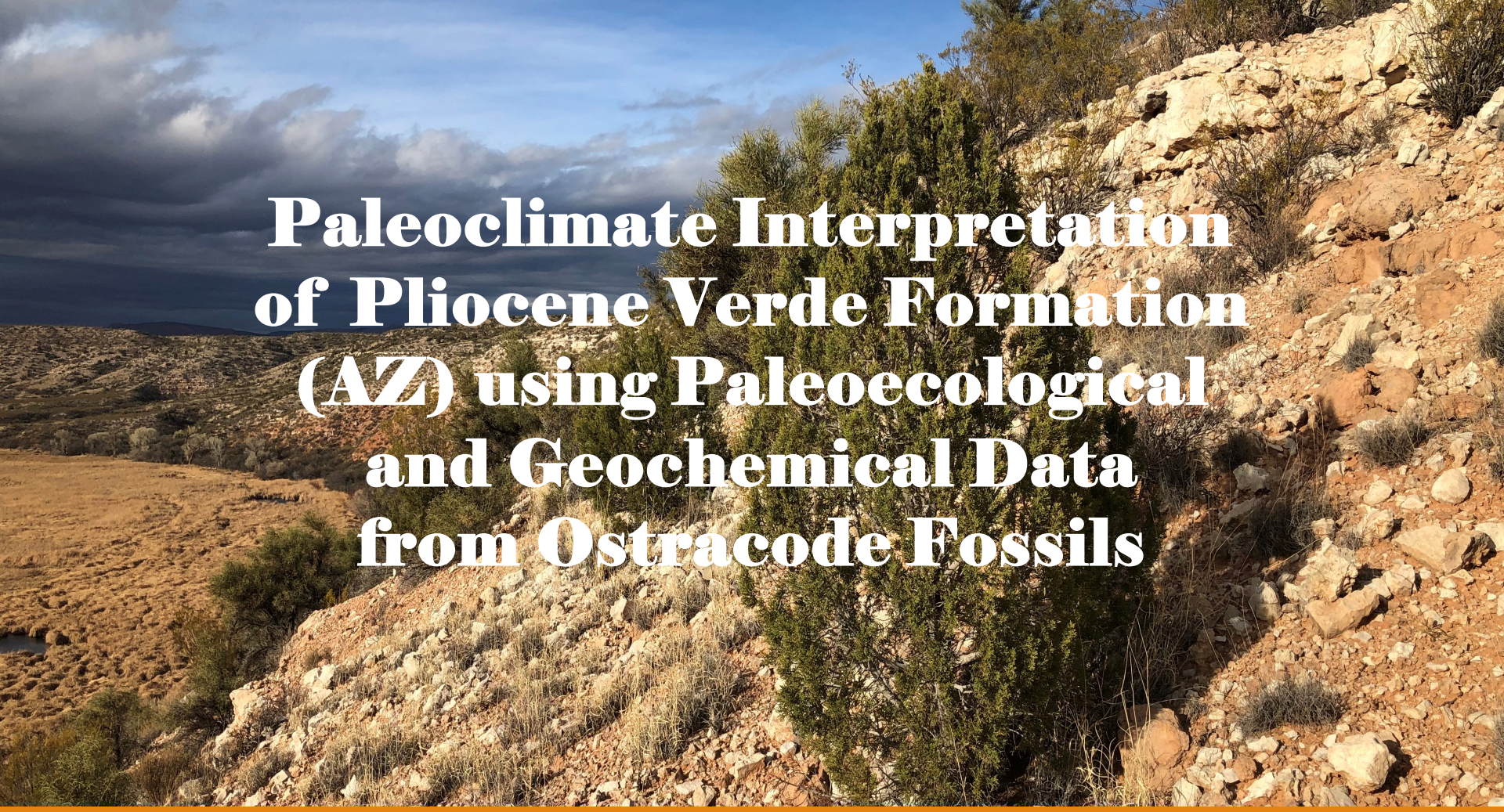

Paleoclimate Interpretation of Pliocene Verde Formation (AZ) using Paleoecological and Geochemical Data from Ostracode Fossils

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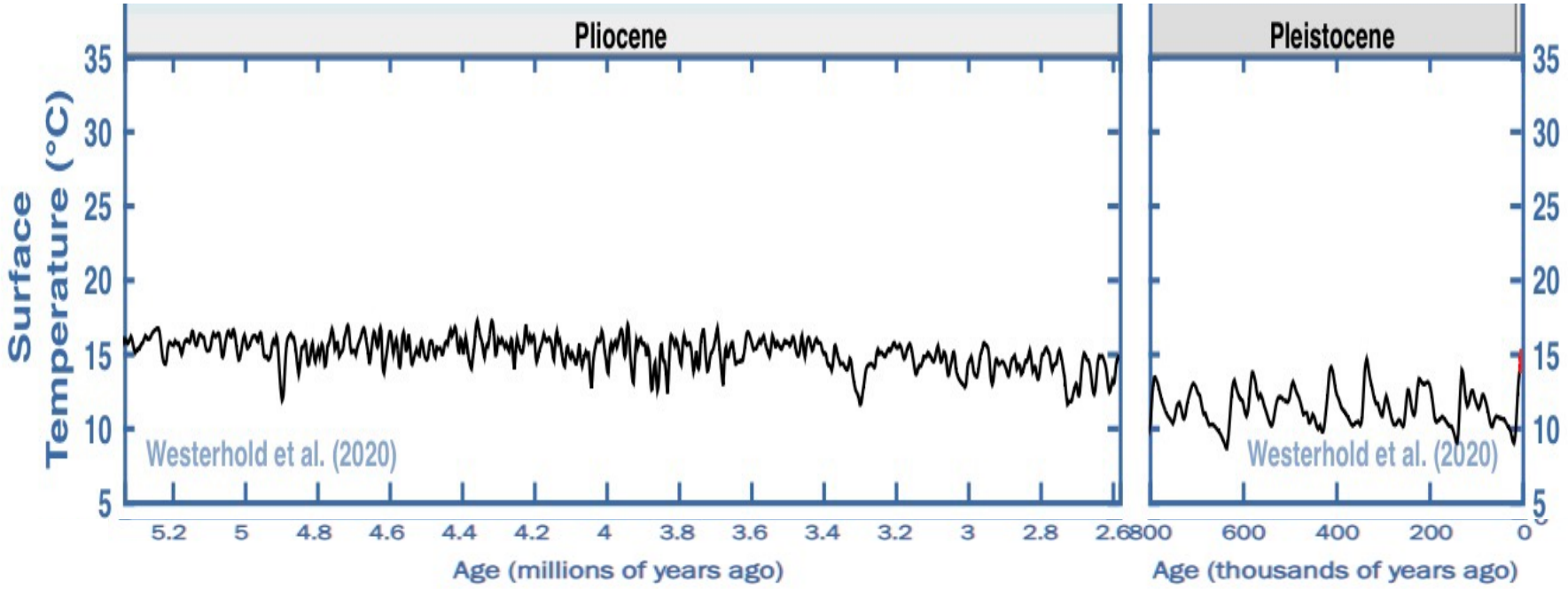
Project Background

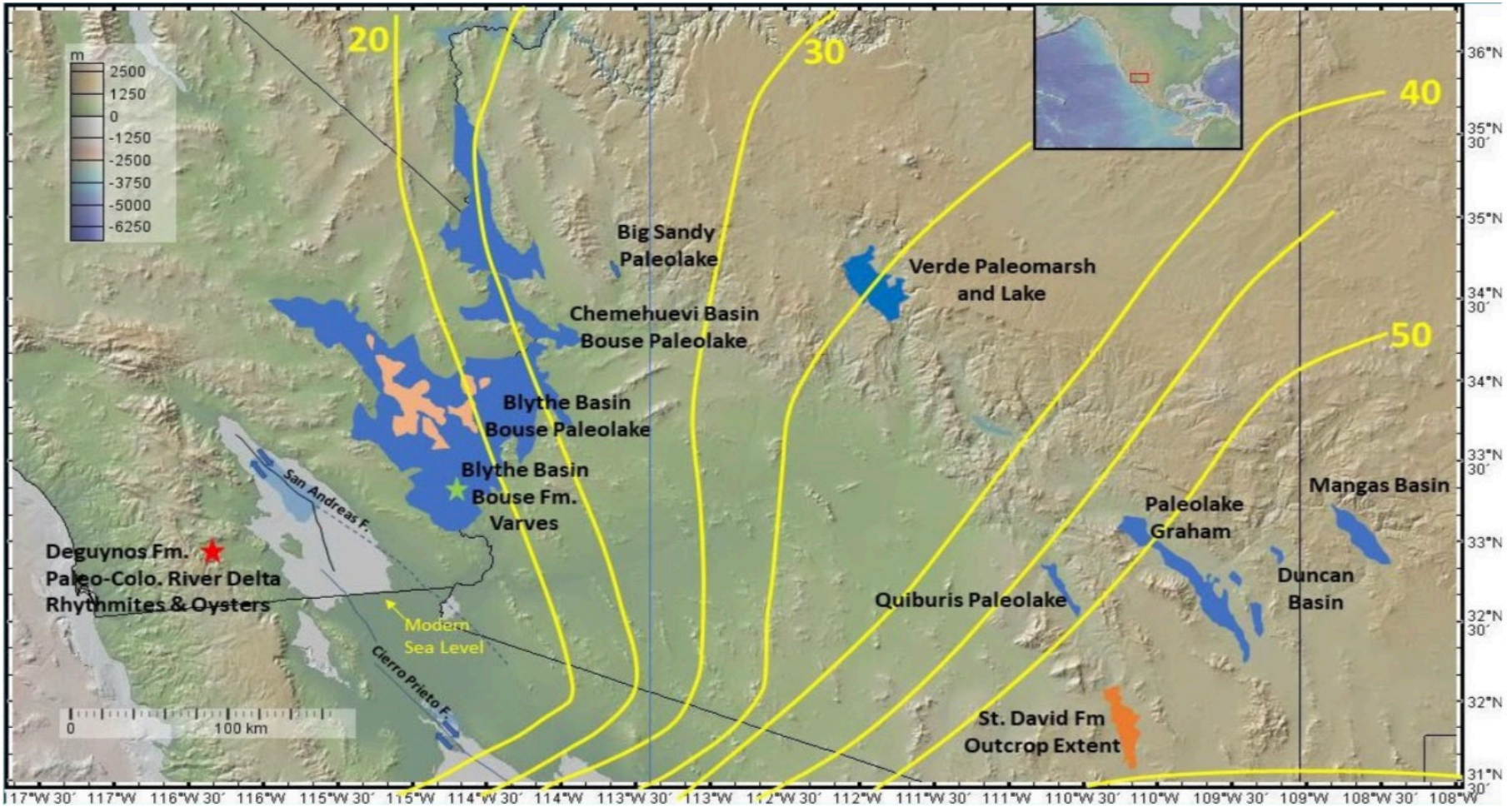
- **Pliocene models temperature and CO2 levels predicted for future climate conditions on Earth**



- **Improve understanding of climate in Southwestern US during the Pliocene.**

Project Background

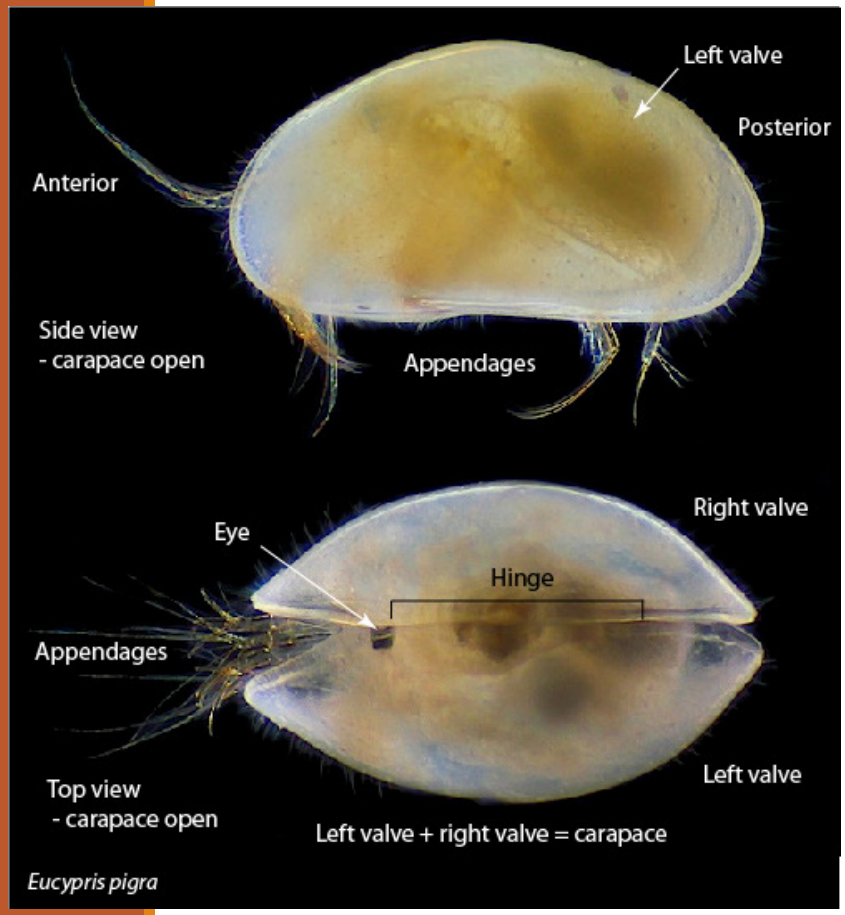
- Clear controversy about past climate and environmental conditions during Pliocene
- Focused on studying Ostracode fossils



Map modified from Chapin, 2008)

Introduction to Ostracodes

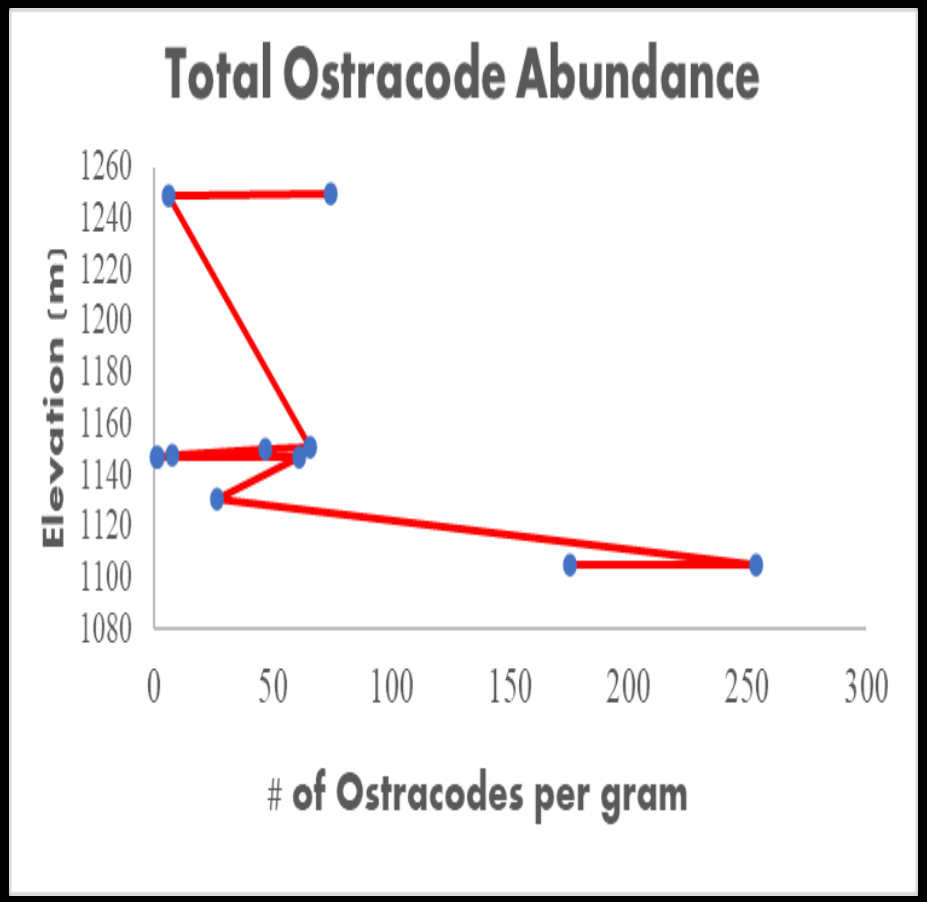
- Microscopic crustaceans found in almost all bodies of water, including marine and freshwater.
- Size range from 0.4mm to 3-4 mm.
- Grow bivalved shells made from calcium carbonate
  - Individual valves or carapaces molted and replaced 8 times as animal grows
- Fossils provide environmental and ecological clues about past conditions

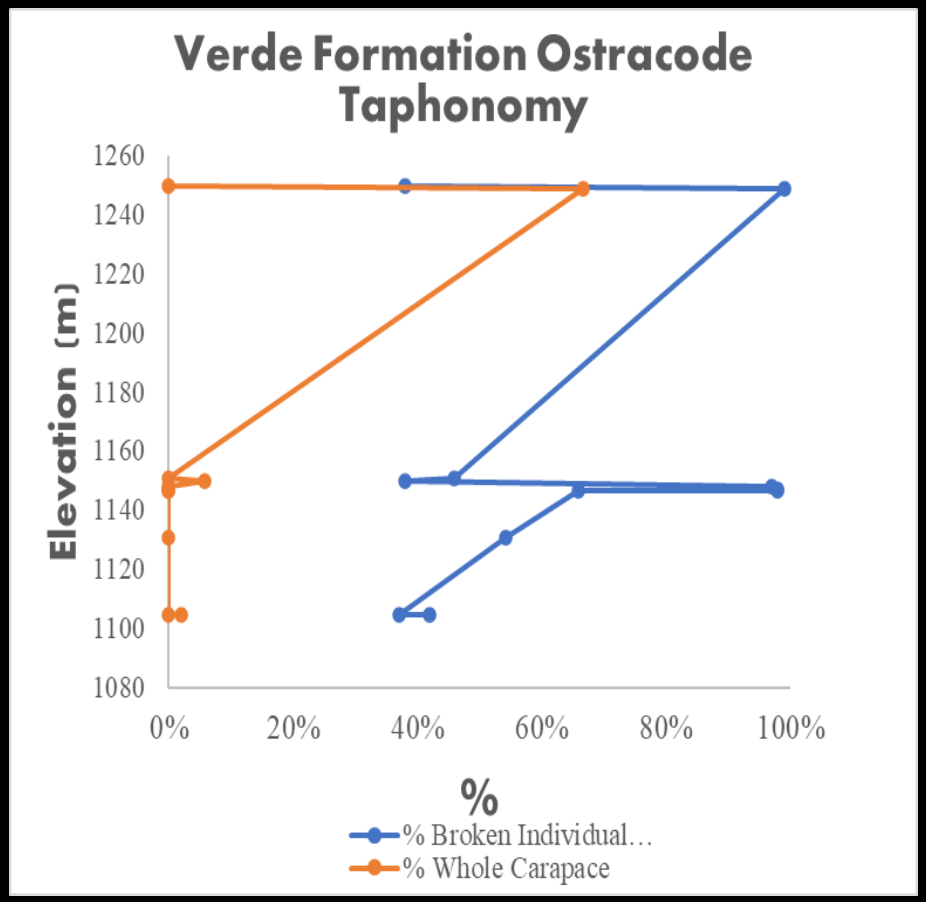


https://www.biwahaku.jp/smith/ostracod_carapace.html

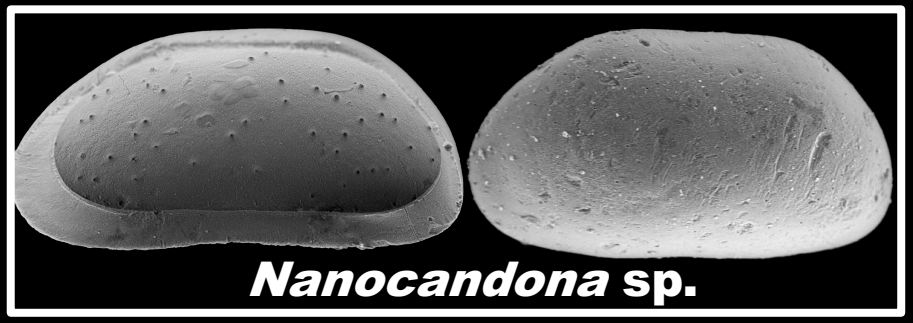
Methods

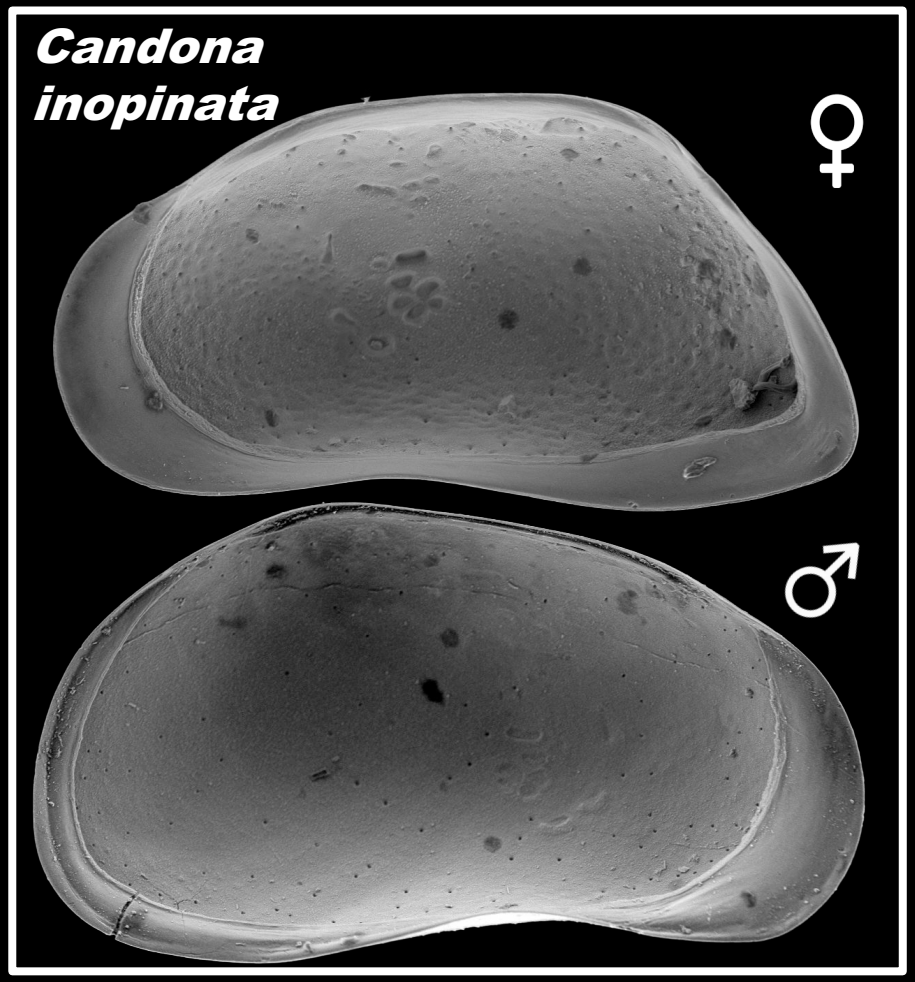
- Total of 11 sediment samples from Verde outcrops collected prior to research
  - Prepped by freeze-thawing and then underwent a sieving process
- Counted each sample for abundance, breakage, type of species. (Preservation indicates environmental conditions)
- Cods picked out and cleaned to photograph on scanning electron microscope (SEM) (for species level identification)
- Mass spectrometry for C and O isotope analysis for paleolake conditions (evaporation and temperature)

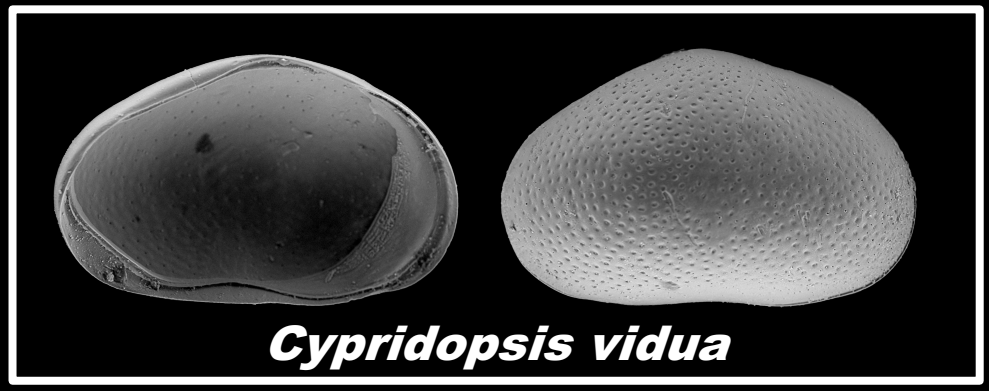


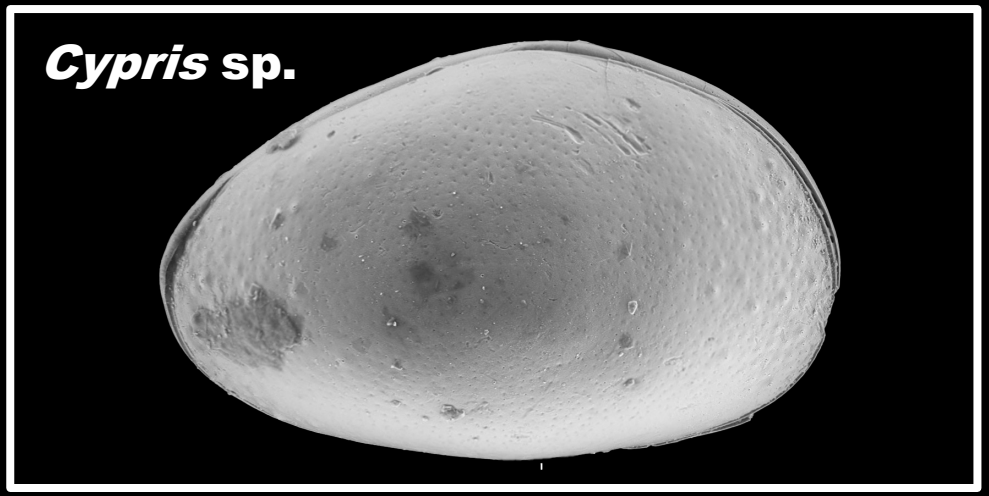


Counting Data



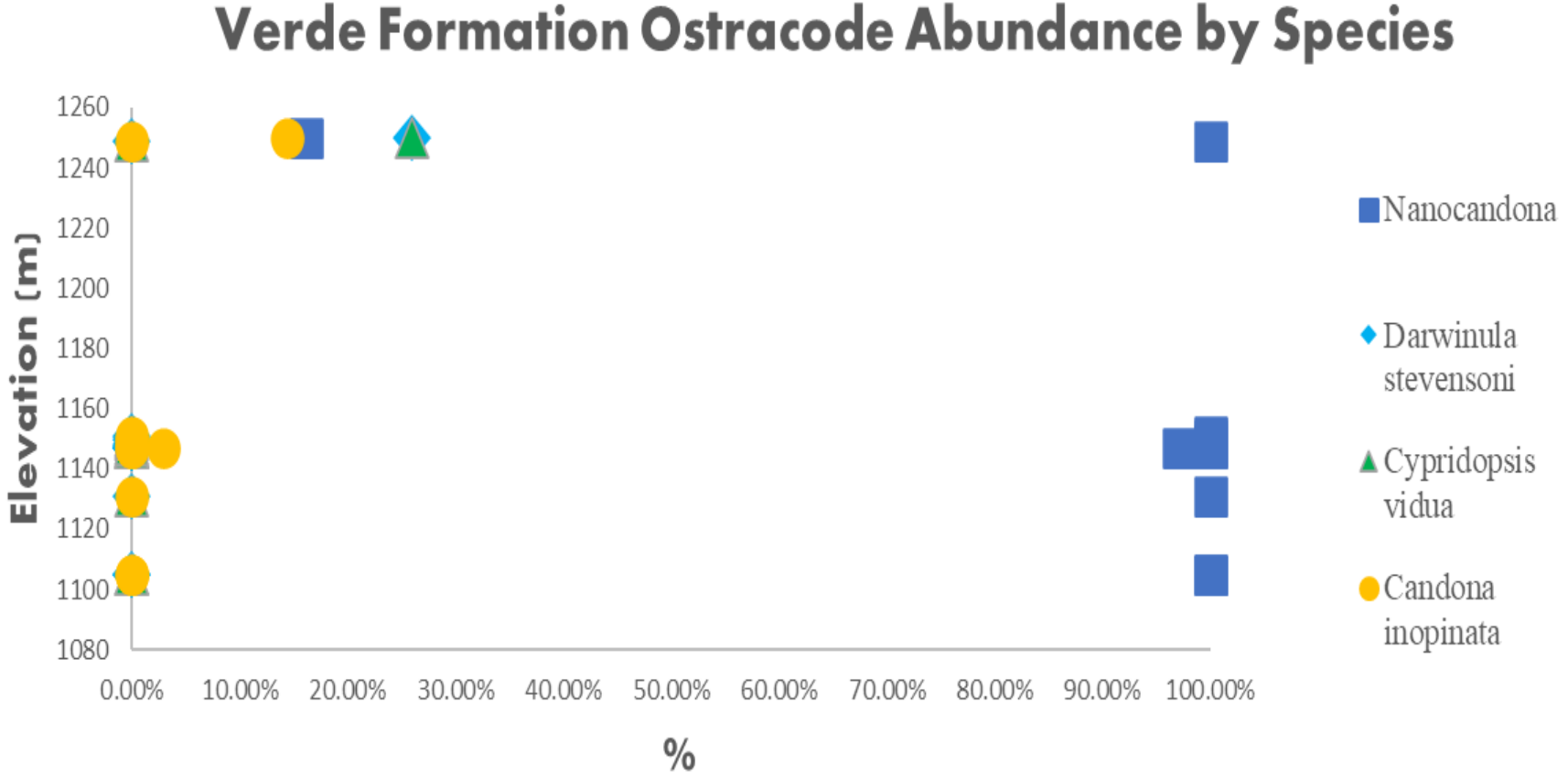






1mm

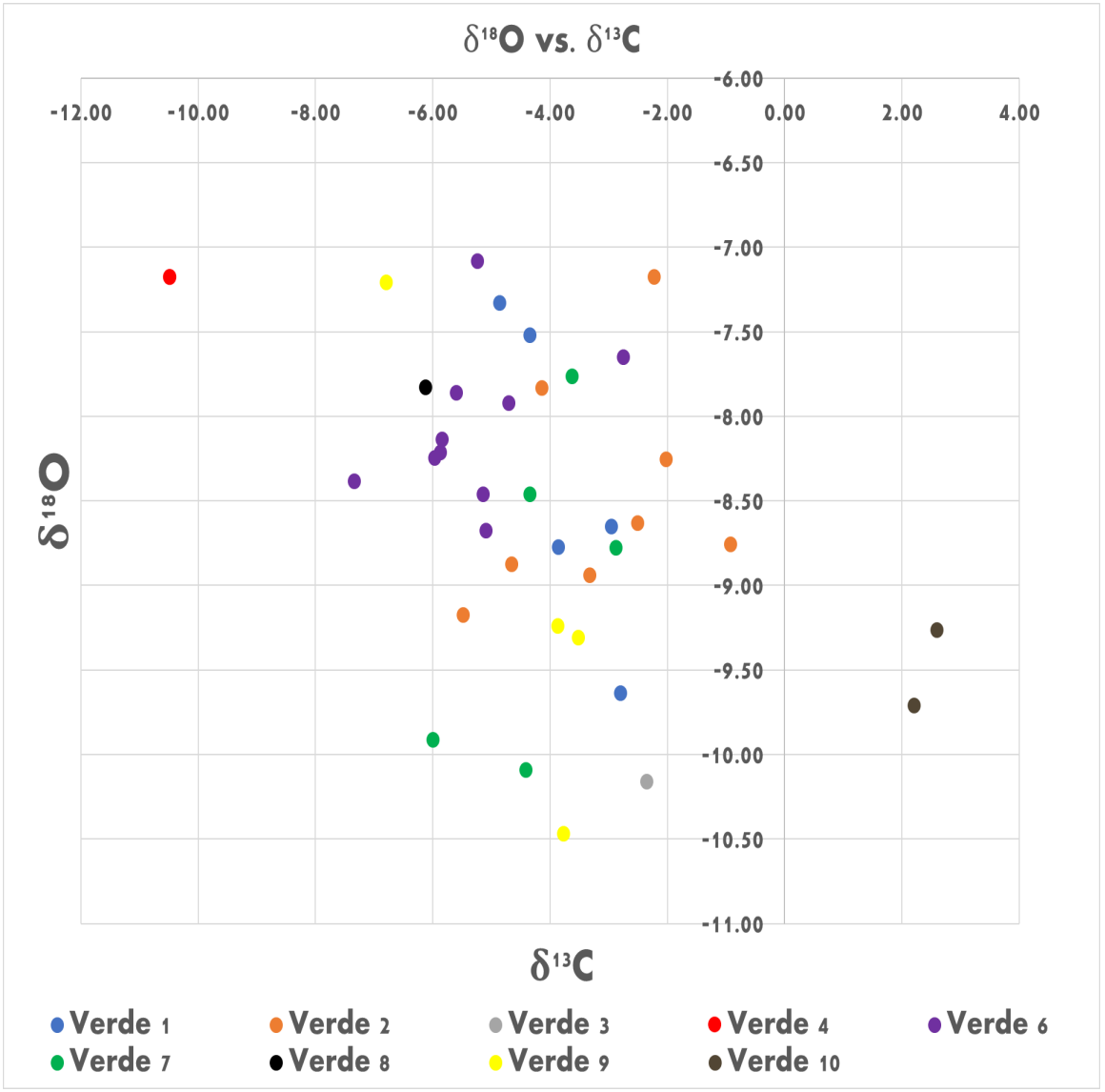
Ostracode Species



Counting Data

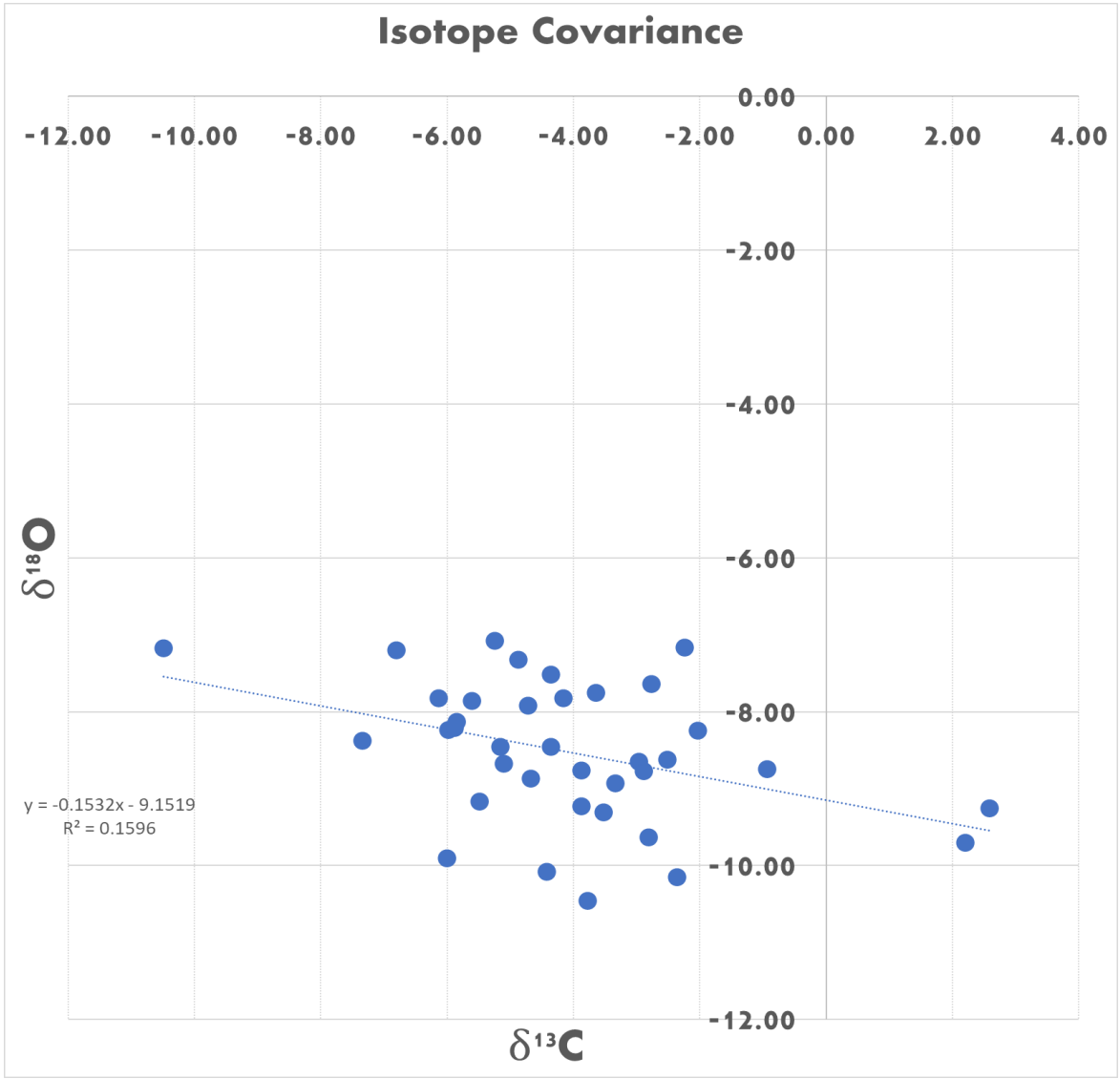
Isotope Data

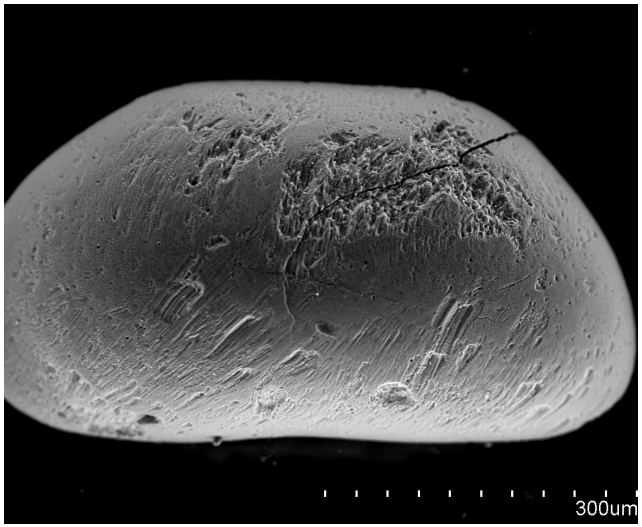
- Isotopes are different versions of an element (based on number of neutrons)
  - Stable isotopes, not radioactive
  - Sensitive to temperature and evaporation
  - No trend through time between Carbon and Oxygen isotopes, points are scattered.



Isotope Data

- No correlation = open basin (lake with an outlet, water flows in and out)
- If data was more linear = closed basin (no outlet, water primarily leaves through evaporation) (Talbot and Kelts, 1990)





Discussion/Synthesis

- Nanocandona most abundant species and a typical groundwater species.
  - Consistent with what we know about Verde lake deposits (spring deposits)
  - Candona inopinata (MAP 500-1000mm) shows Verde was wetter vs. modern Verde valley (350mm) (Curry et al., 2012)
  - Presence of calcium carbonate incrusted reeds (typical in spring systems)
- Negative oxygen values = less evaporative conditions (climate was wetter and warmer)
- Lack of covariance = lake with an outlet ie. Wetter climate (Talbot and Kelts, 1990)

Conclusions

- Results point to a wetter Pliocene, supported by Ostracode species and isotope data.
- Results are preliminary and only a small piece of the big picture.
- Future research would involve looking at other records from Pliocene lakes

- **Special Thanks:**
  - Grace Potter and Tristan Nolan, for SEM training
  - Dr. John Douglass, for sample collecting
  - Aniket Dhar, for loading and running samples through mass spectrometer.
  - NSF, for project funding and C2C program for providing the opportunity.

NSF

Clouds to the Core

Southwest Geoscience Research Experience