The Potential for Reconstruction of Past Climate of Texas

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Outline

- Why reconstruct past climate of Texas?
- Paleoclimate ‘proxies’
- Tree rings
- Speleothems

Why study paleoclimate of Texas?

Rates and magnitudes of change in climate of the past, droughts in particular, may provide insight to future changes, via:

- More conservative estimate of magnitude of 'Worst case scenario'
- Constraints on recurrence interval of worst case scenario
- Understanding driving mechanisms

Approach to paleoclimate reconstruction

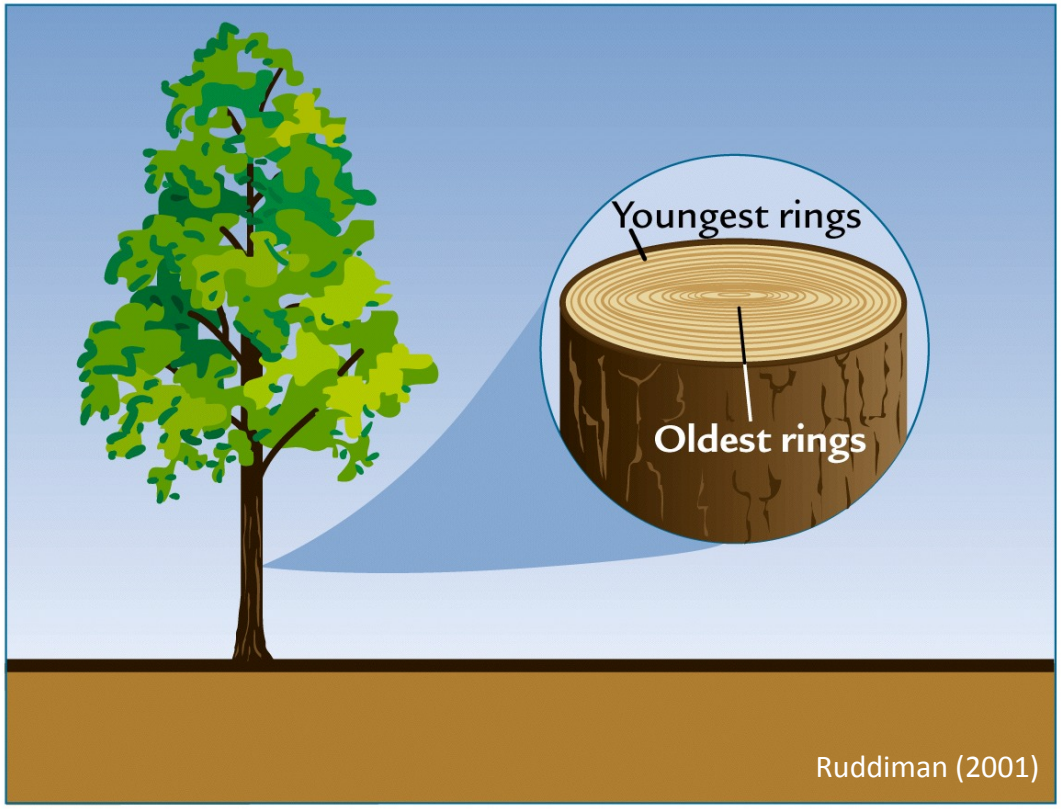
- Develop climate 'proxy' for pre-instrumental (pre-1900) part of record
  - Growth rate
  - Chemical, isotopic composition
- Develop geochronologic methods
  - Determine age interval of sample

Proxies for past climate change

- Tree rings
- Ice cores
- Ocean sediments and fossils
- Cave deposits (aka ‘speleothems')
- Lake sediments
- Soils

Tree rings

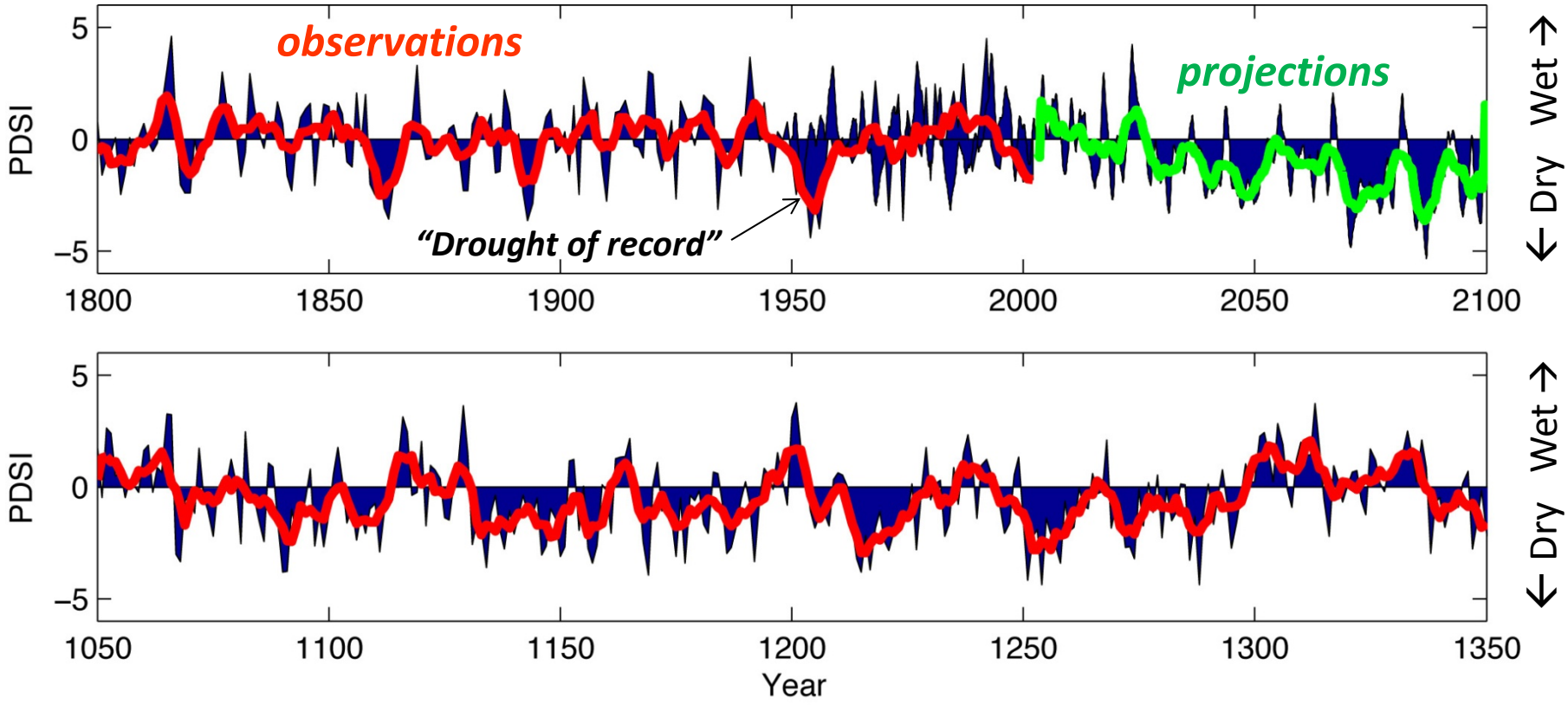
- Annual resolution is common
- Growth rate as proxy for drought index is well established



Annual tree rings

Texas droughts of the past millennium

Palmer Drought Severity Index (PDSI), West Texas



Also see Voettler talk – am session

Banner et al. (2010)

Speleothems

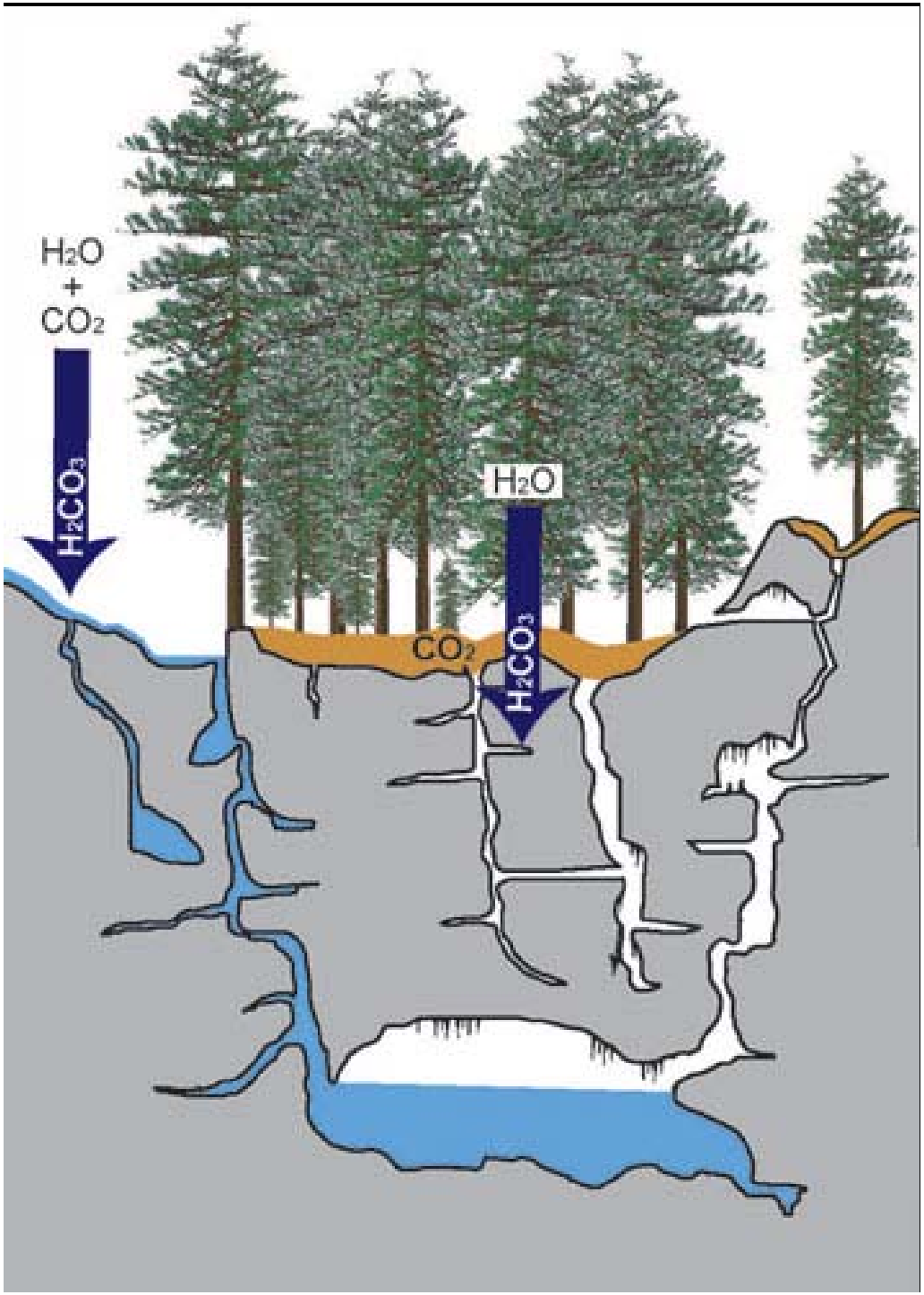
Cave calcite deposits
(stalagmites, stalactites, flowstones)

- Longer-growing than trees
- Annual resolution rare
- Proxies still being developed

Examples from Texas caves:

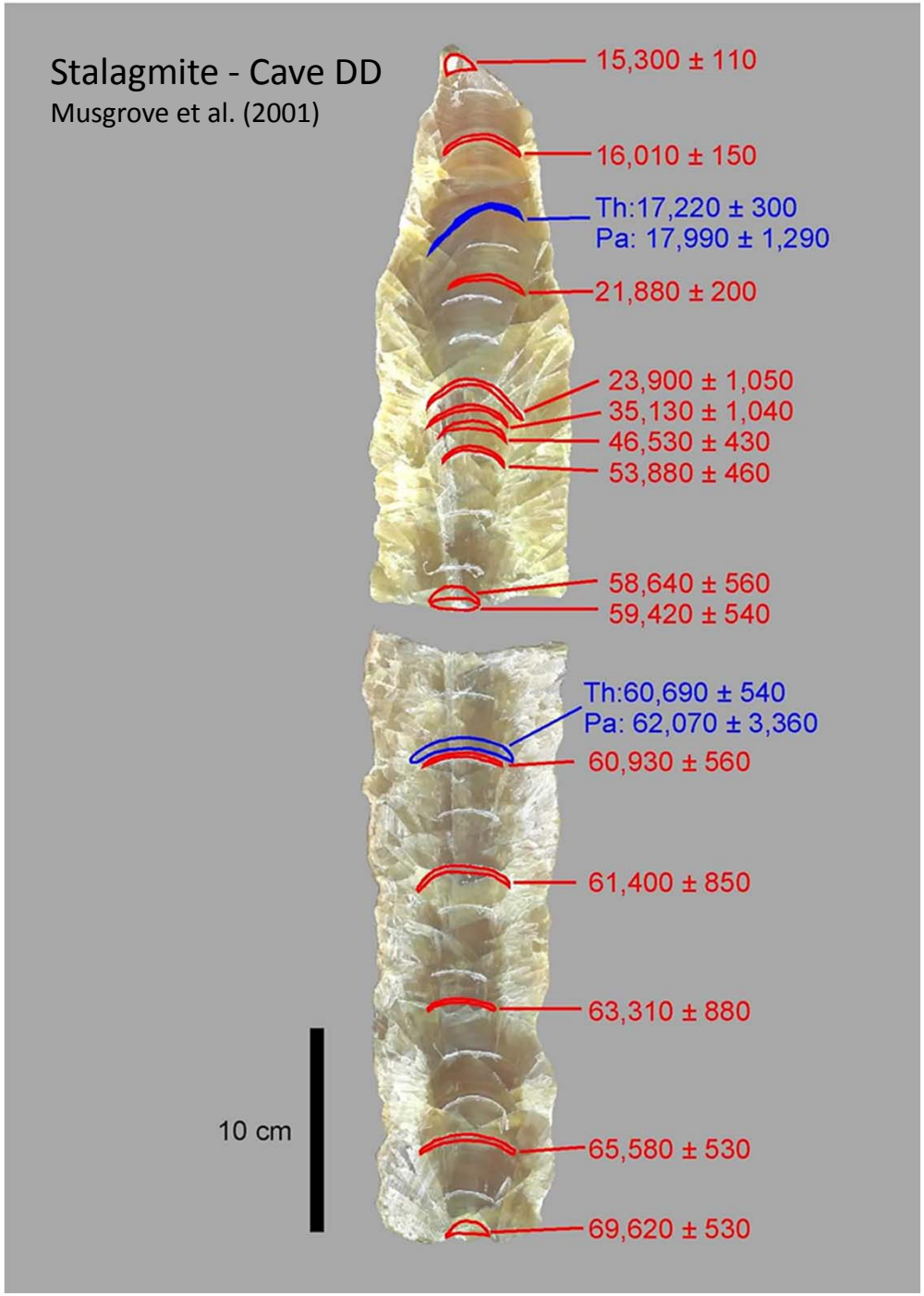
Proxies

Temporal resolution

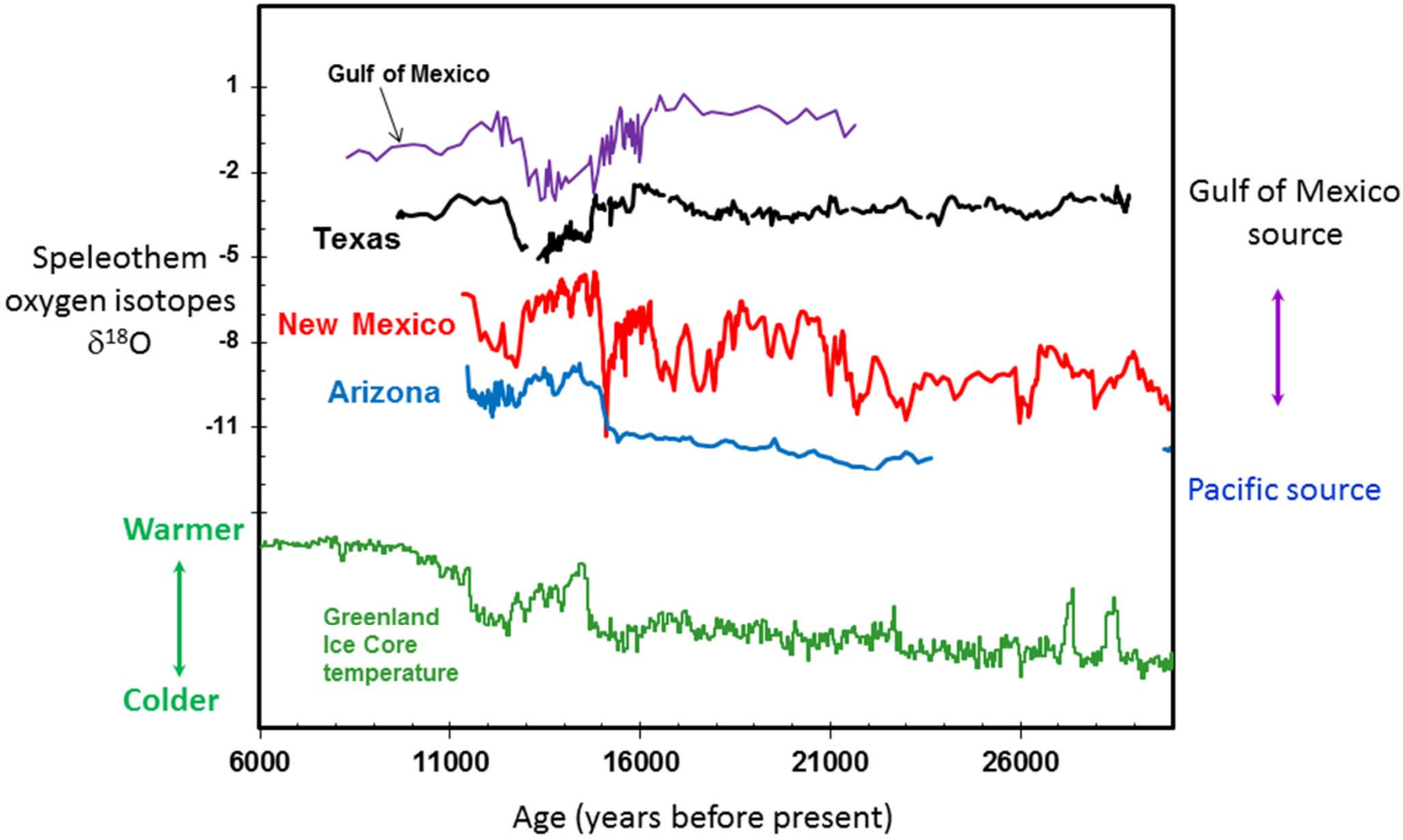


Speleothems: Paleo-rainfall proxy

Growth rates over
long time scales



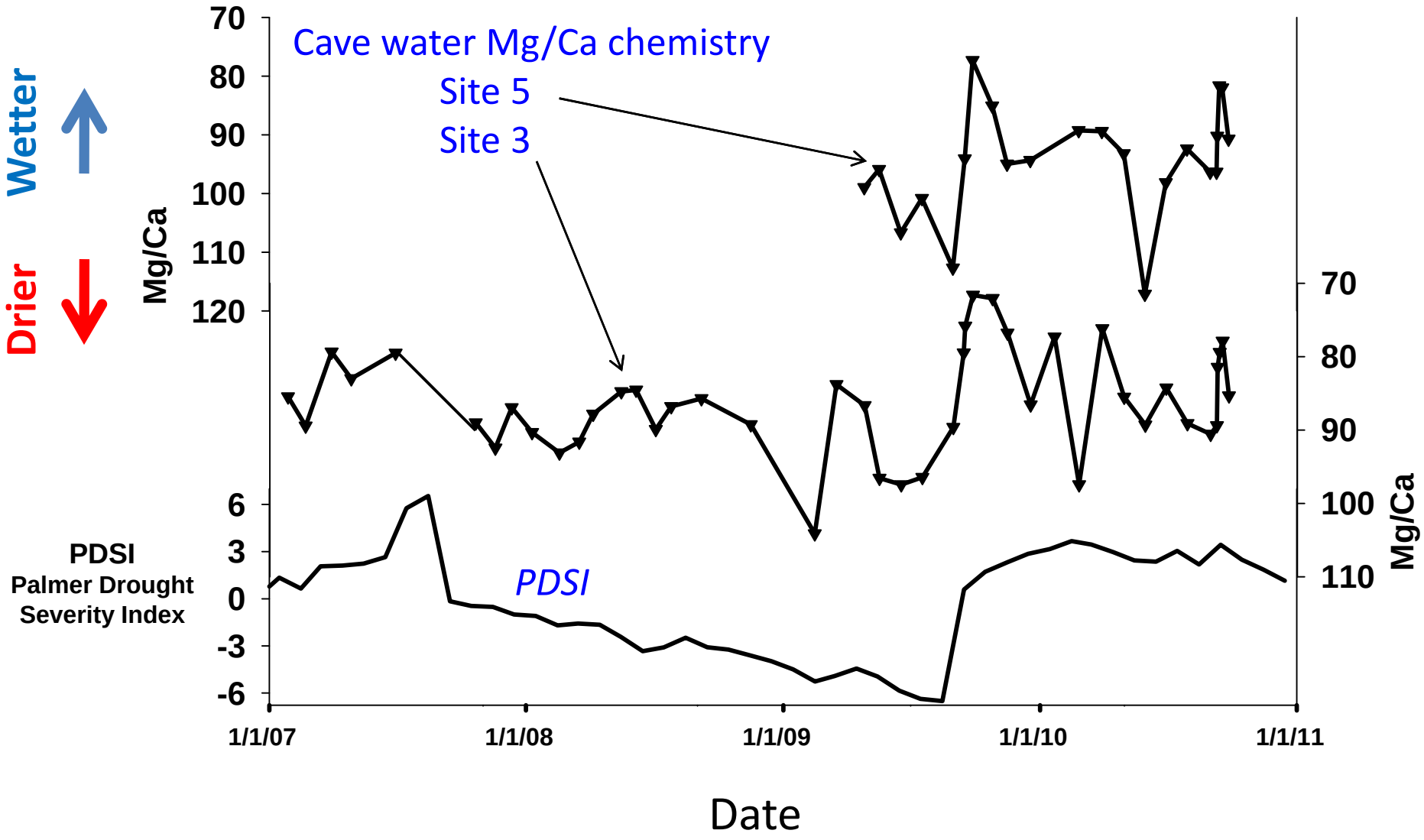
Speleothems: Moisture source proxy



Meyer et al. (2011)

Speleothems

Cave water chemistry reflects drought conditions



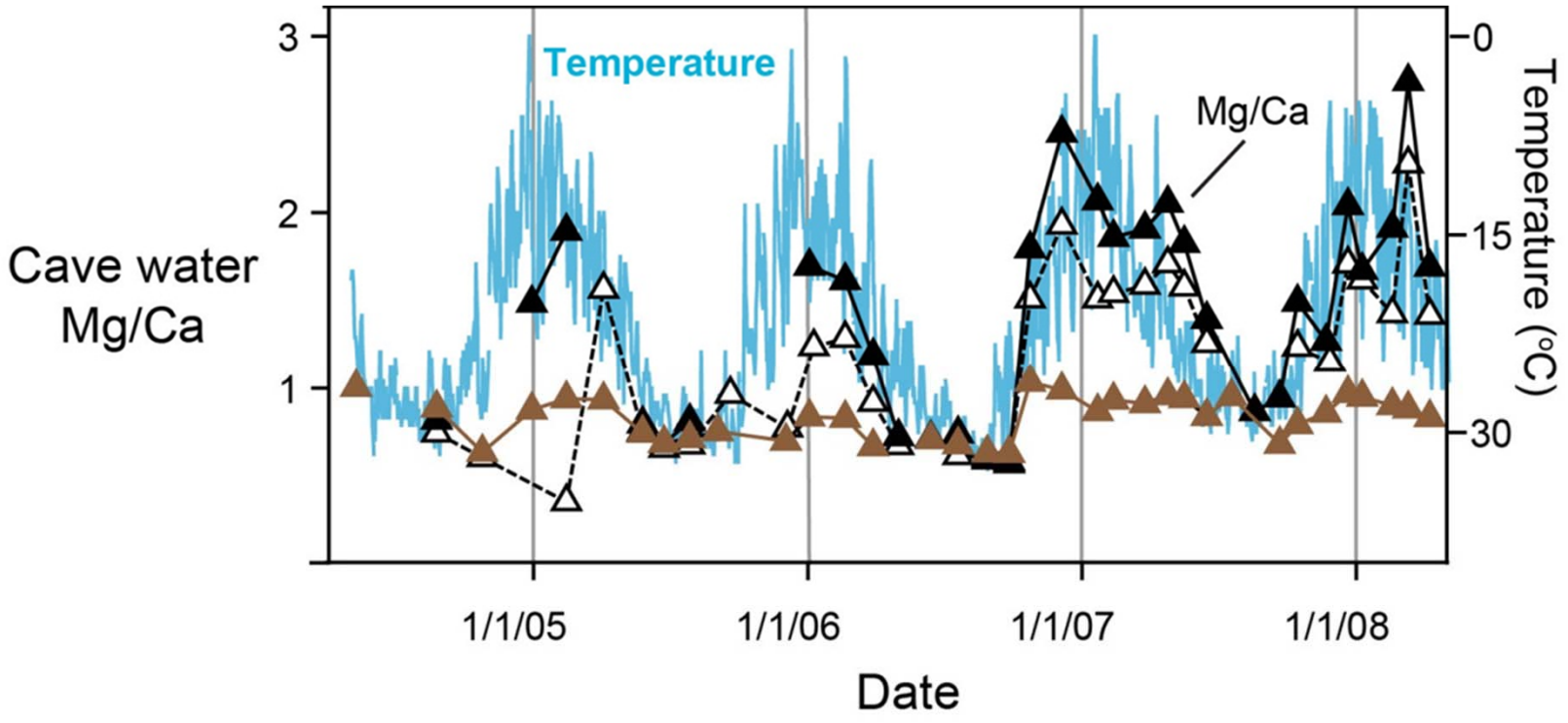
Cave IS , Williamson County

(Casteel et al., 2011)

Speleothems

Seasonal resolution of cave water chemistry

Cave NB, Comal County



Wong et al. (2011)

Summary and ripe areas for research

- Tree-rings – a proven proxy, reveals megadroughts over past millennium

- Speleothems – a developing proxy with high potential:
  - Extend time interval of Texas climate history
  - Potential to more fully capture recurrence interval and magnitude of past droughts (e.g., '500 year drought')
  - Important baseline for projections of future droughts
    (e.g., past periods of warming; Climate model ground-truthing)
  - Cross-calibration: Instrumental record - tree rings - speleothems
  - Advancement will require time and resources

Houston Chronicle Op-Ed:
"Get Ready for a Drier Texas"
by Banner et al.

Sunday, January 17, 2010

"… The likelihood of some effects is becoming clear, however, with improved consensus from the scientific community… the American Southwest will likely become drier throughout this century, marking a transition to a new average climate … similar to the drought of the 1950s..."

Houston Chronicle Comments on Op-Ed

Posted by Aggie58, January 17, 2010

“You clowns are full of problems that don't exist so you can con the feds out of grant money... Many of yhe cycles you project are very natural and have been going on for thousands of years. All of a sudden you want to make them a crisis for which you NEED MORE MONEY... You are no different than a street corner con with initials after his name...”

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