

# Climate signal in giant sequoia tree rings



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← 1297 BC

← 1380 BC

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# Climate signal in giant sequoia tree rings

## Objectives

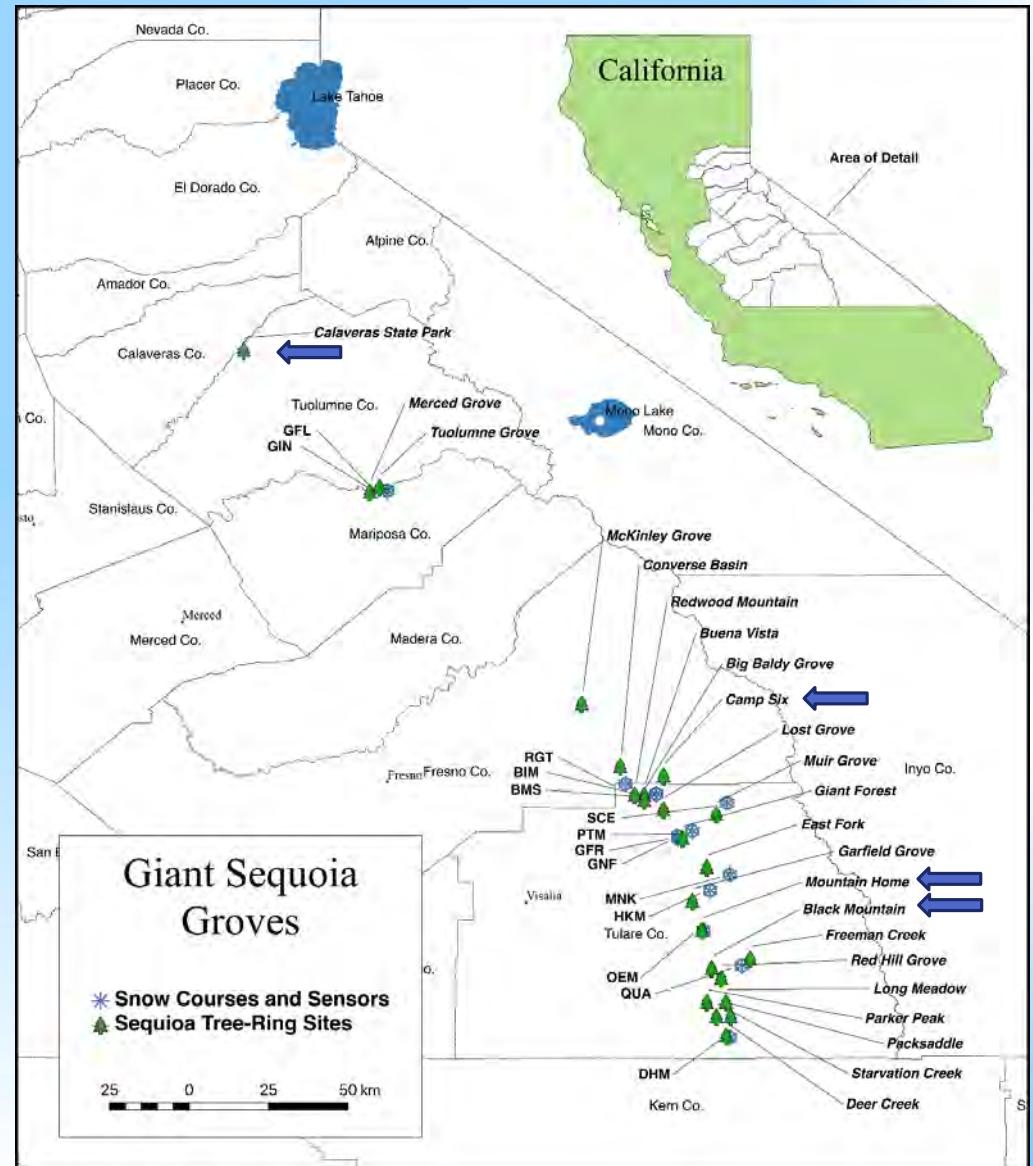
- Investigate the relationship between *Sequoiadendron giganteum* chronologies and climate data
- Spatial correlation analysis between 23 tree-ring chronologies and North American Drought Atlas (NADA)



# Climate signal in giant sequoia tree rings

## Methods

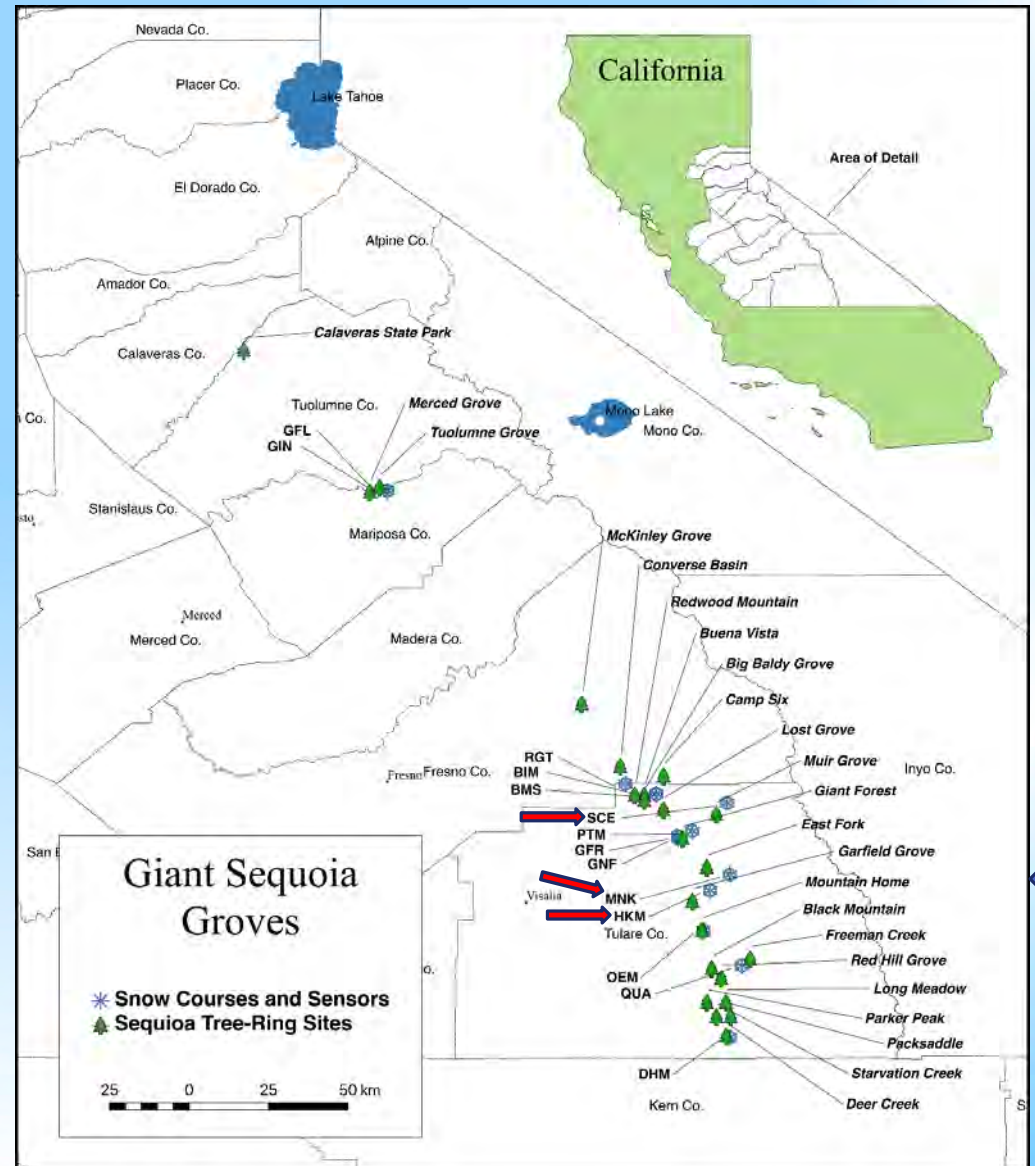
- Established twenty-two giant sequoia chronologies that were collected in 1993, 1994, and 1996 (Projected was supported by The National Park Service)
- Four chronologies were updated in 2011 (Support from WaterSmart\* Program-Bureau of Reclamation Agreement # R11 AP 81 457)



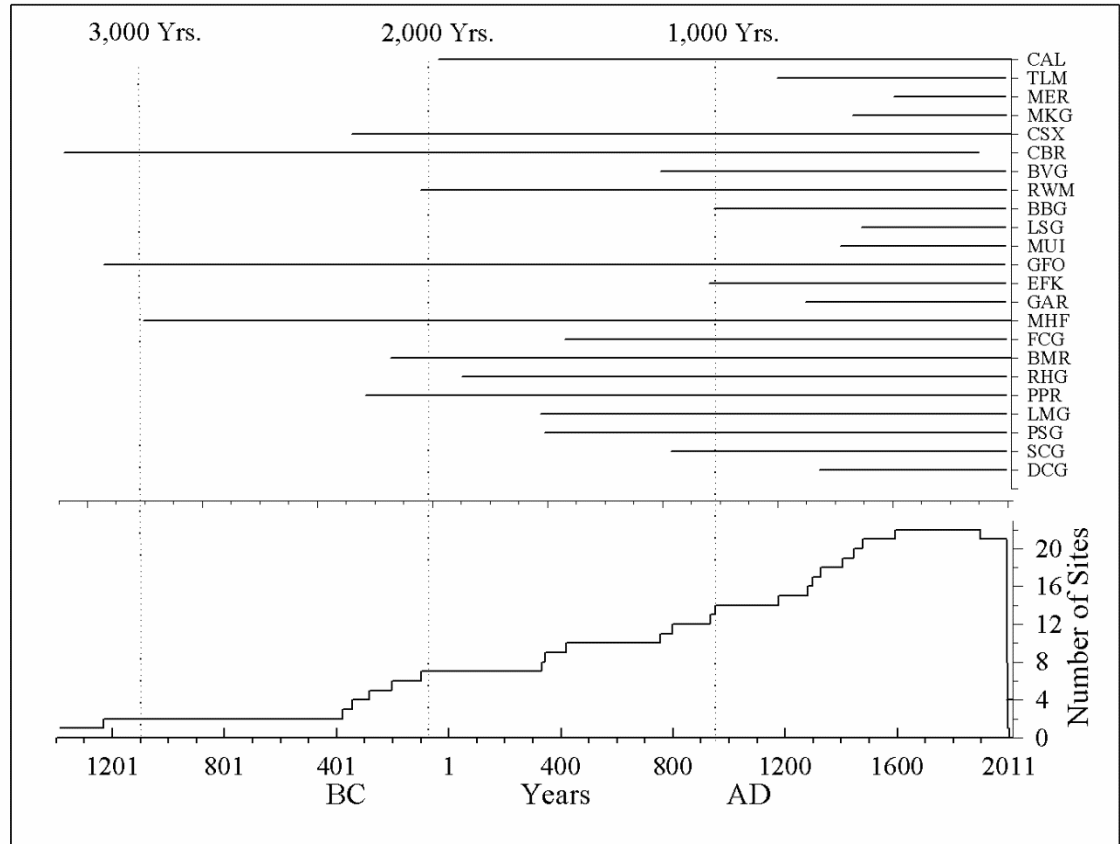
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## Methods

- Monthly PRISM precipitation and temperature data for each Sequoia tree-ring site from 1895 to 2017. Regional time series of precipitation and temperature were developed.
- A regional SWE time series was derived by taking the mean for each month of each year of standardized SWE time series at HKM, MNK, and SCE

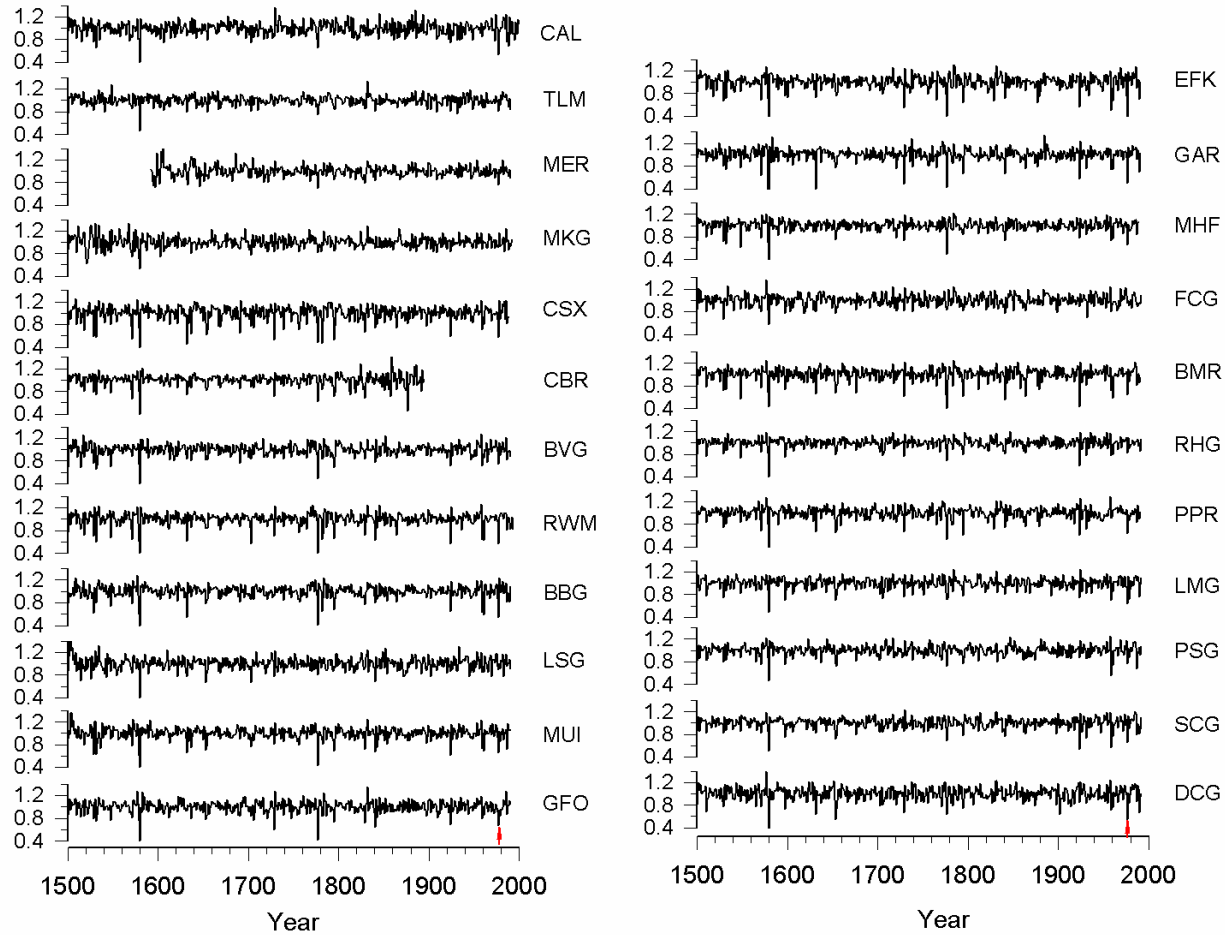


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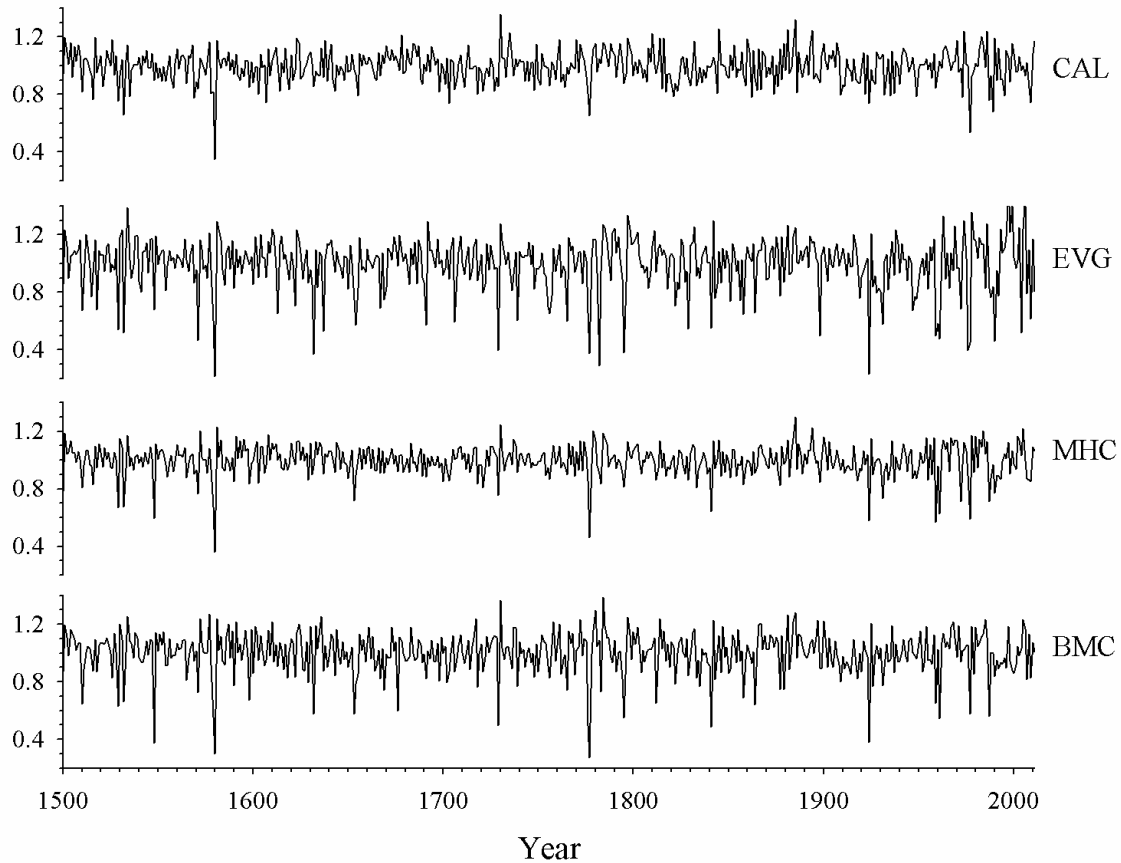


<https://www.google.com/search?q=giant+sequoia+photos&client>

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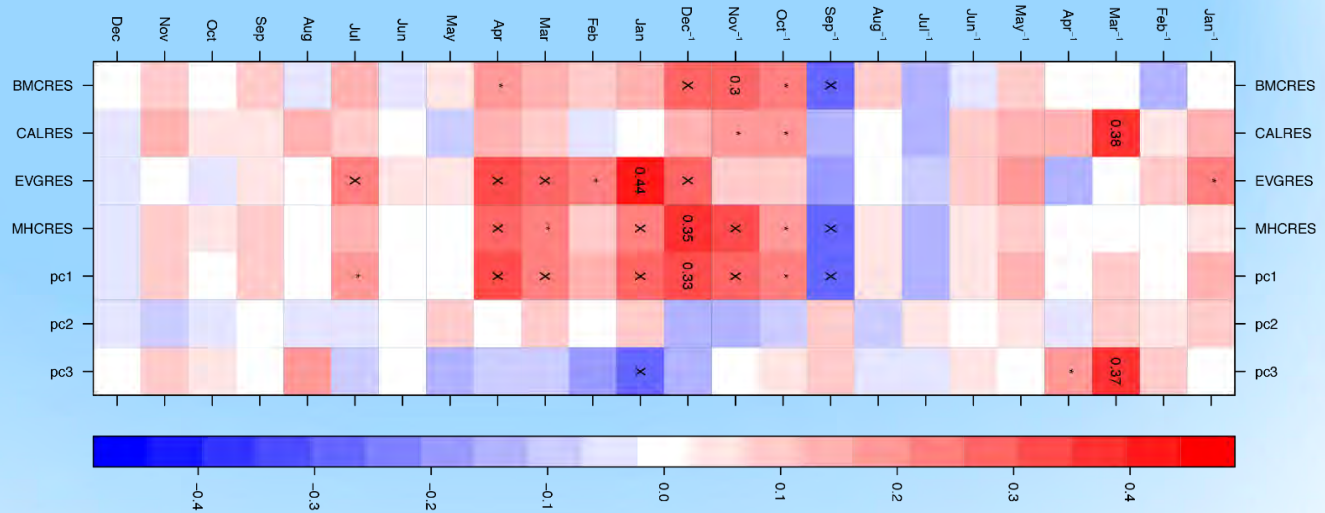




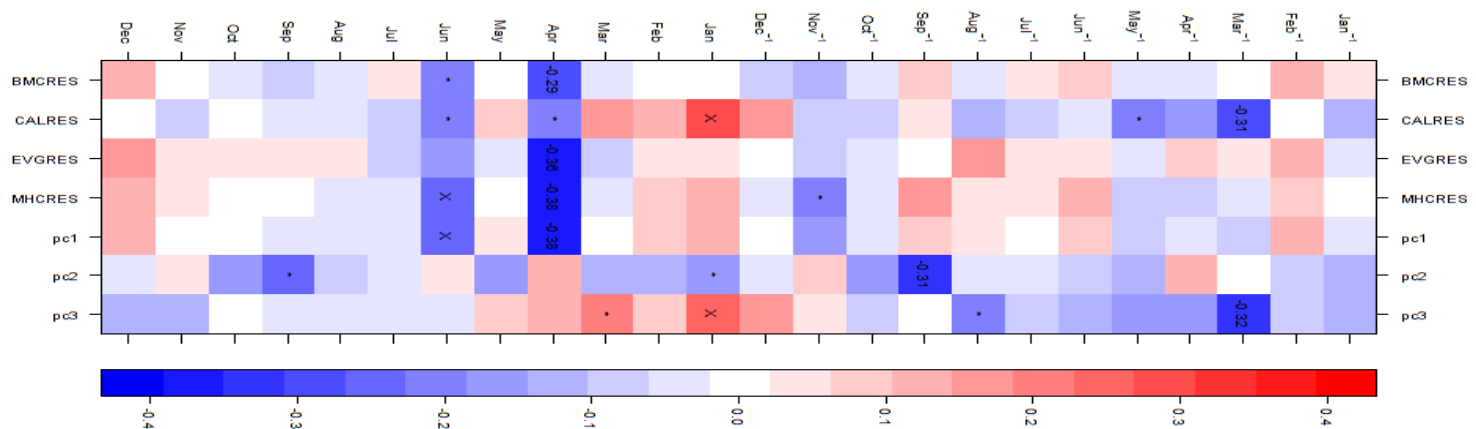


# Climate signal in giant sequoia tree rings

Sequoia 1991  
Correlations with  
Regional  
Precipitation

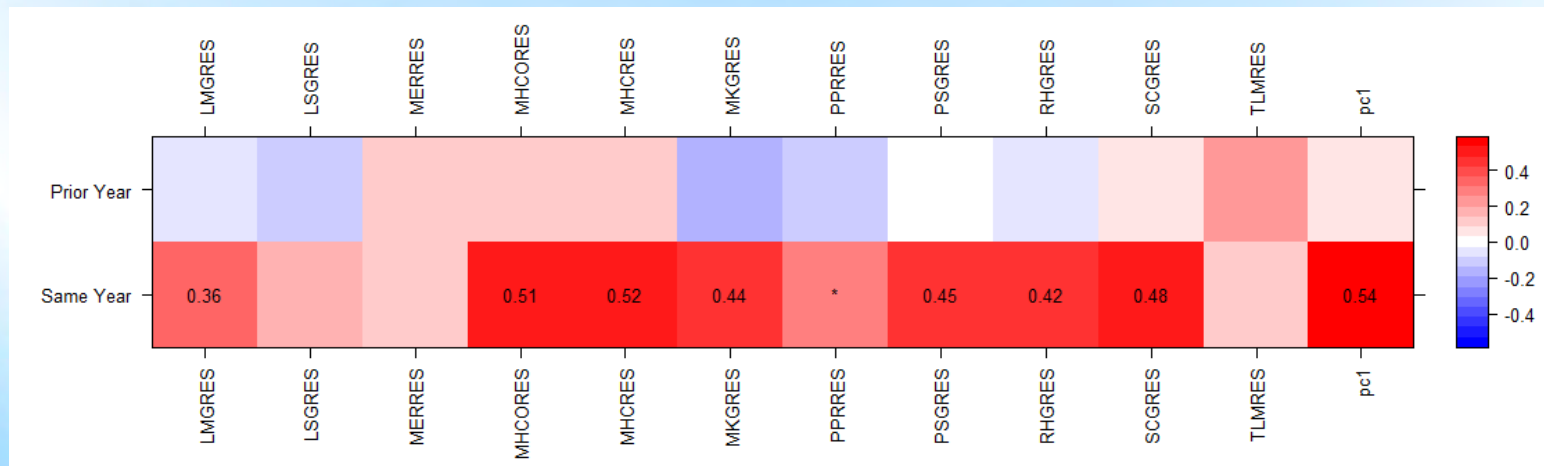
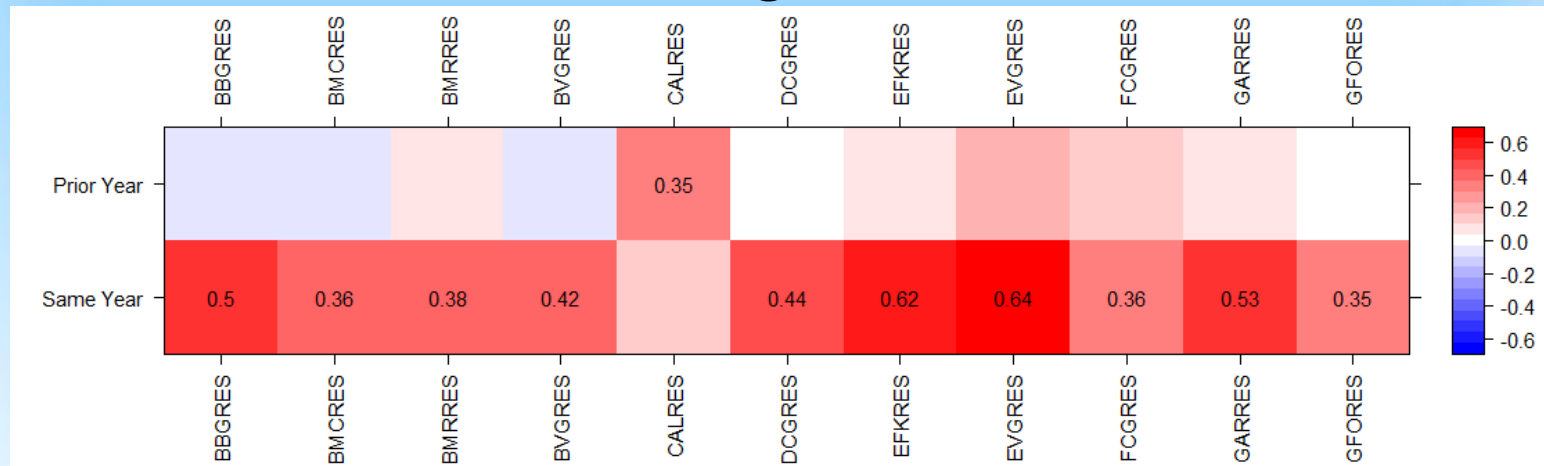


Sequoia 1991  
Correlations  
with Regional  
Temperature



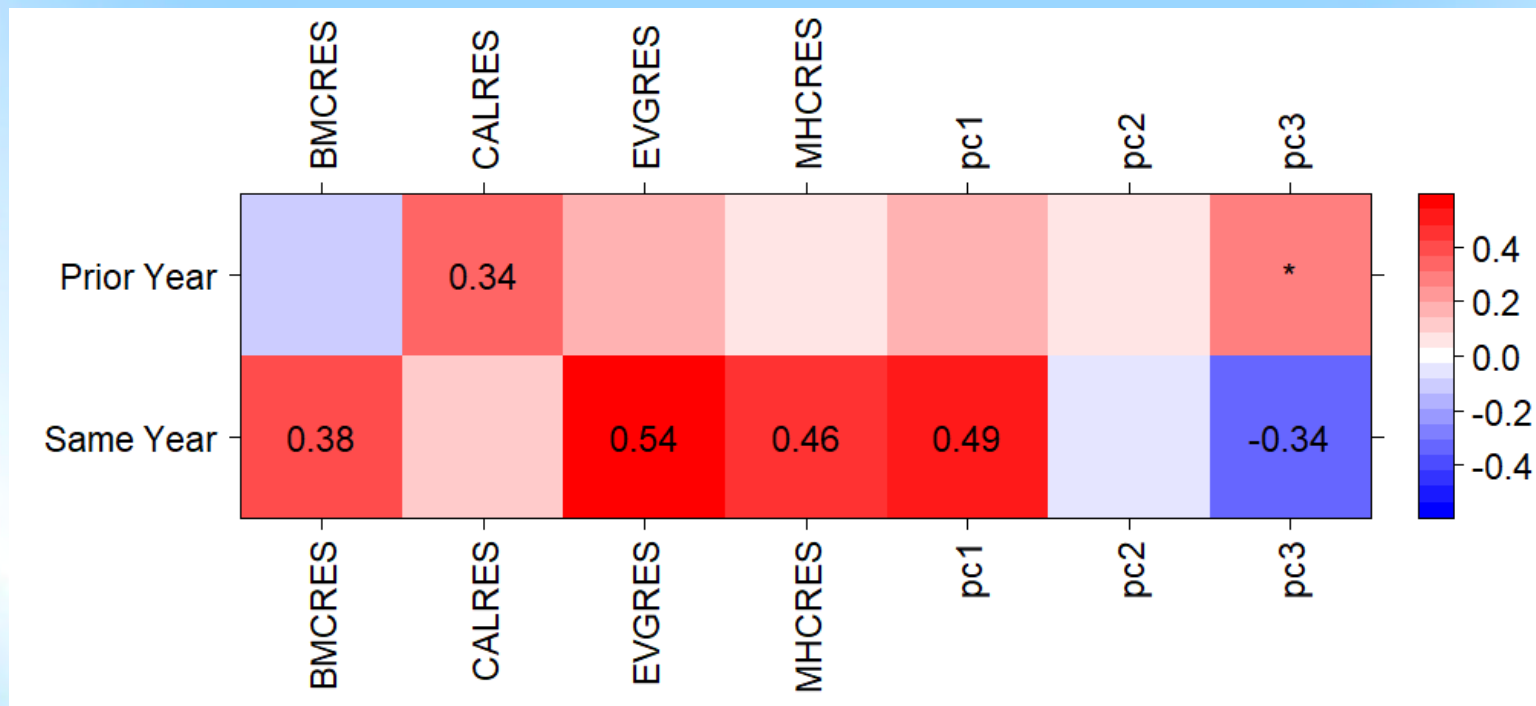
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## Sequoia 1991 Tree-Ring chronologies Correlation with Regional SWE



# Climate signal in giant sequoia tree rings

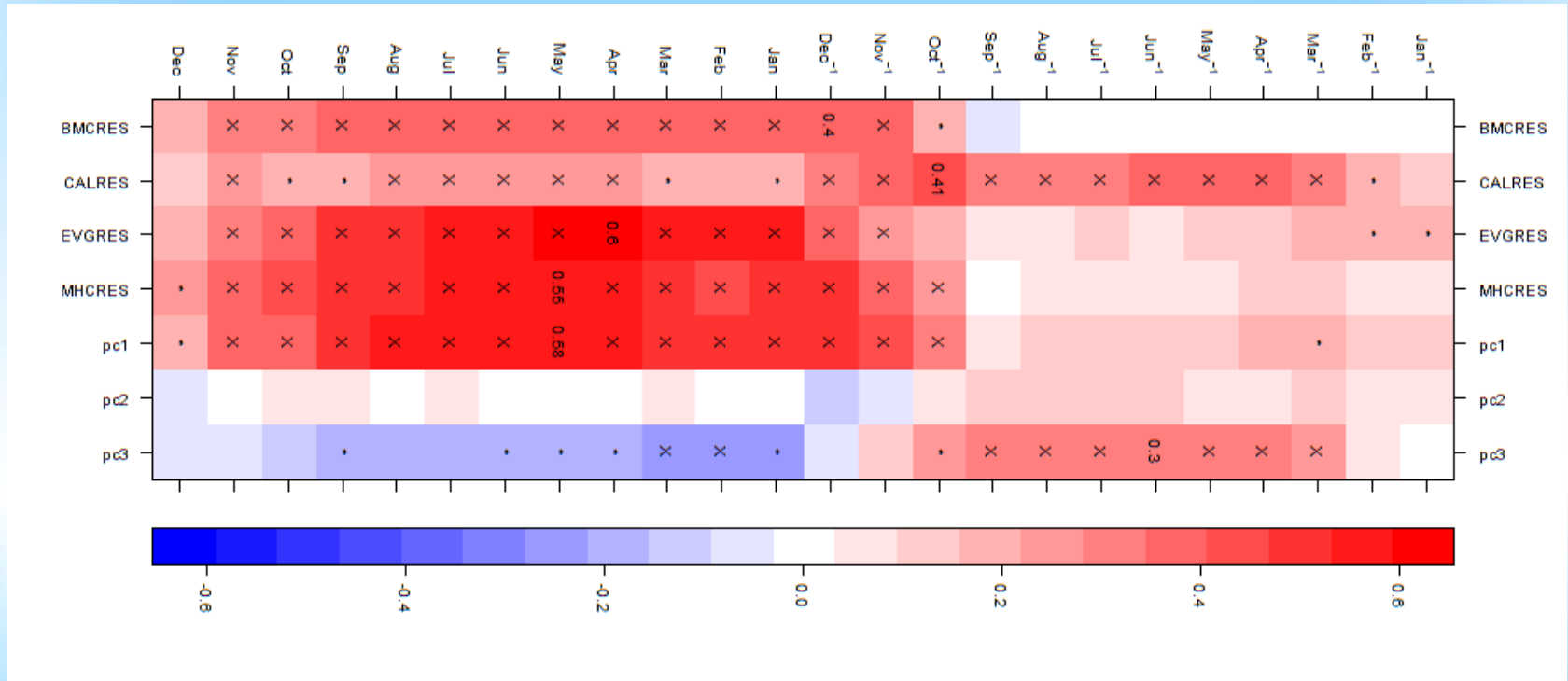
## Sequoia 2011 & 2012 Tree-Ring Chronologies Correlations with Regional SWE





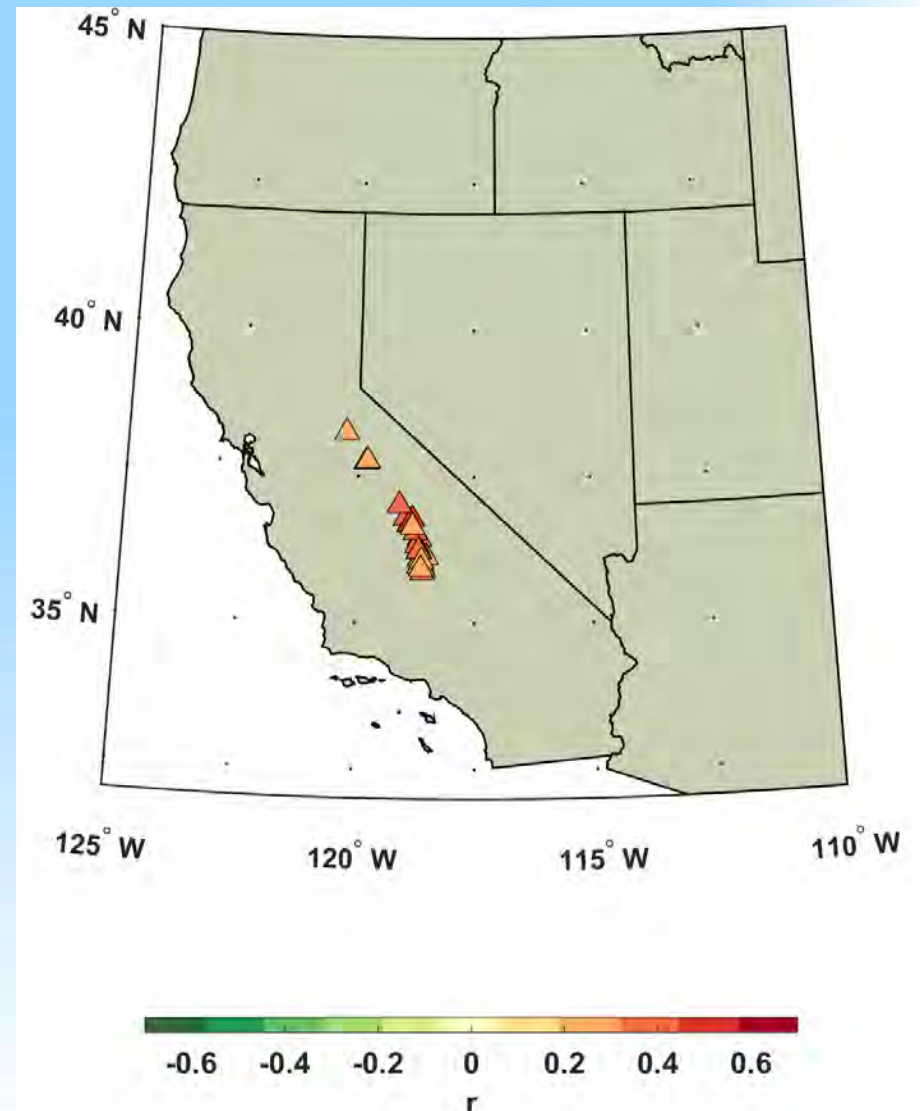
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## Sequoia 2011 & 2012 Tree-Ring Chronologies Correlations with California Division 5 PDSI



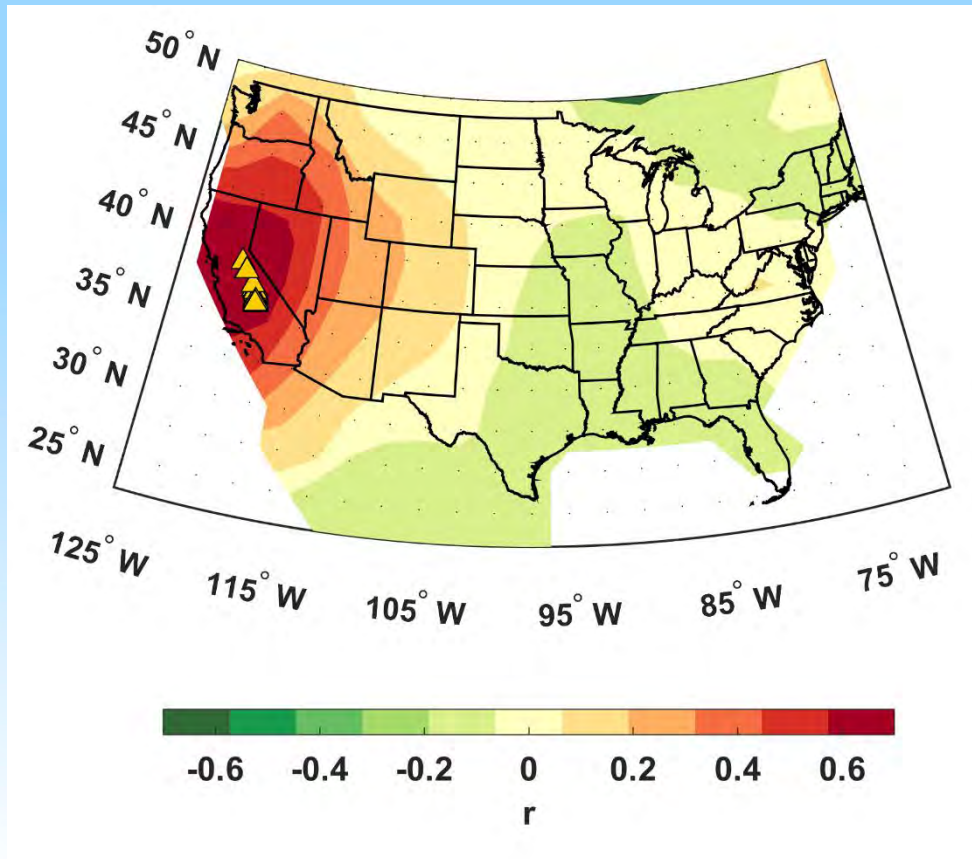
# Climate signal in giant sequoia tree rings

**Sequoia 1991 Tree-Ring  
Chronologies Correlations with  
the Nearest JJA NADA  
Reconstructed PDSI**



# Climate signal in giant sequoia tree rings

Principal component analysis on the sequoia network reveals distinct spatial patterns associated with JJA NADA PDSI



Strong correlation near region of tree-ring sites.

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## Conclusion

- Significant positive correlation with October-April precipitation and negative correlation with previous September.
- A negative correlation between the tree-ring chronologies and April and June temperature.





# Climate signal in giant sequoia tree rings

## Conclusion

- Positive correlation with the current annual SWE. Deep snowpack favors growth.
- A significant positive correlation between the tree-ring chronologies and June-August North American Drought Atlas



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## Conclusion

- Updating the chronologies to the present will add 28 years of information about the relationship between tree growth and climate
- How is current drought reflected in growth?



A large, circular cross-section of a tree trunk is displayed in a museum setting. The wood shows clear growth rings and some cracking. A rectangular piece of paper with handwritten text and diagrams is taped to the upper right portion of the trunk. The trunk is supported by a black metal frame. In the background, there are large windows with horizontal wooden slats, and a view of a landscape with trees and a body of water.

**Thank you**