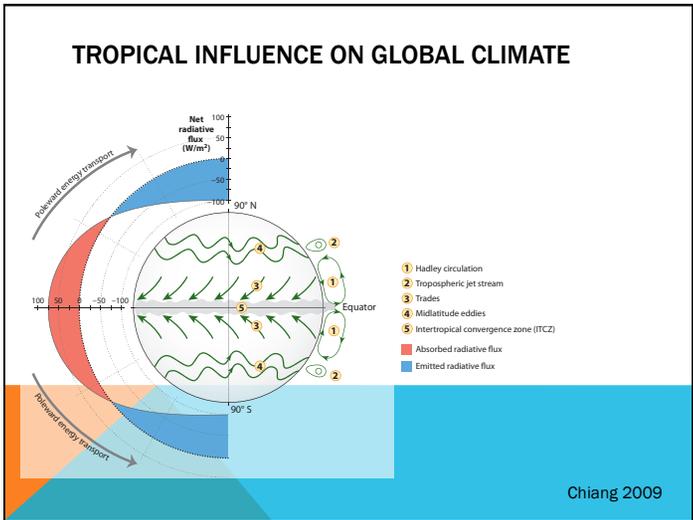


Late Quaternary Terrestrial Hydroclimate in the Indo Pacific Warm Pool

- PRESENTATION OUTLINE**
- The Tropics as a driver of global climate
 - What is the Indo Pacific Warm Pool?
 - Research questions related to Indo-Pacific paleoclimate
 - Climate events from “the global climate type section”
 - Proxy records of terrestrial climate change in Malaysia and Indonesia
 - Speleothems
 - Lake sediments
 - Mechanisms for these climate changes



WHAT IS THE INDO-PACIFIC WARM POOL (IPWP)

The largest pool of warm water on Earth!

Influence on atmosphere water vapor (most important green house gas)

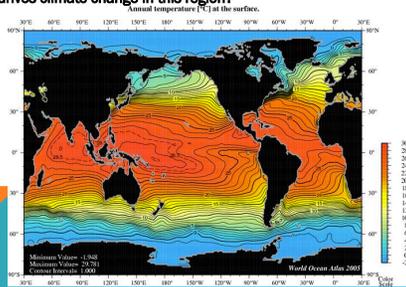
Geological evidence indicates that this region has been warm (>27 deg C) for ~12 million years (Zhang et al., 2014)

Pierrehumbert 1999

http://earthobservatory.nasa.gov/Features/WarmPool/Images/climatology_composite.jpg

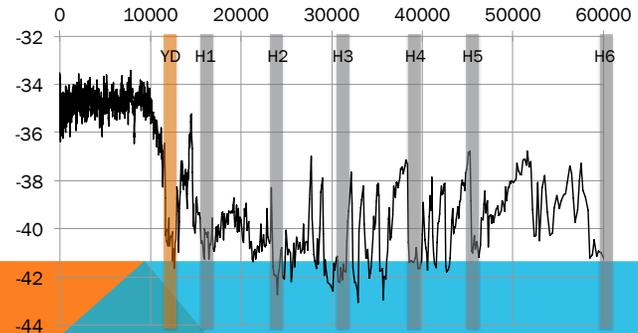
IPWP PALEOCLIMATE QUESTIONS

- What is the response of terrestrial IPWP climate to abrupt "global" climate events?
- How does Indonesian hydroclimate vary over glacial and interglacial cycles?
- How does vegetation respond to changing aridity?
- What drives climate change in this region?



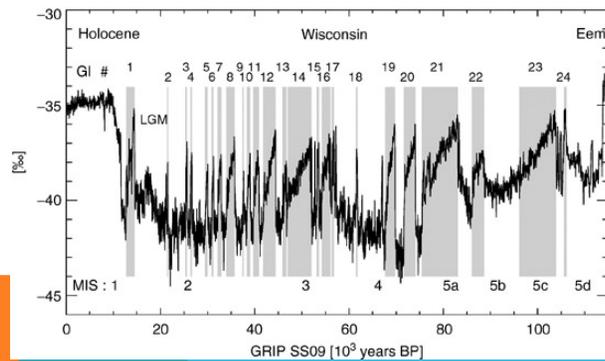
<http://www.ncdc.noaa.gov/paleo/pubs/oppo2009/woa2005.jpg>

GREENLAND ICE CORES (GLOBAL CLIMATE TYPE SECTION)



Hemming, 2004
GISP2; Grootes and Stuiver, 1997

DANSGAARD-OESCHGER EVENTS



Mogensen 2009

SPELEOTHEMS



http://www.nature.com/scitable/content/ne0000/ne0000/ne0000/ne0000/44518638/1_2.jpg

SPELEOTHEMS AS PALEORECORDS

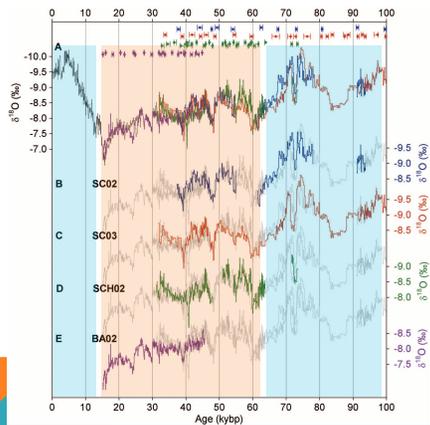
- Usually found in caves in carbonate bedrock
- Can produce high resolution records
 - Fast sample preparation time
- Dated with $^{230}\text{Th}/^{234}\text{U}$
- Recorder of precipitation source and amount ($\delta^{18}\text{O}$)
- Can be used to reconstruct past vegetation types ($\delta^{13}\text{C}$ less common usage)



Fleitmann et al., 2008

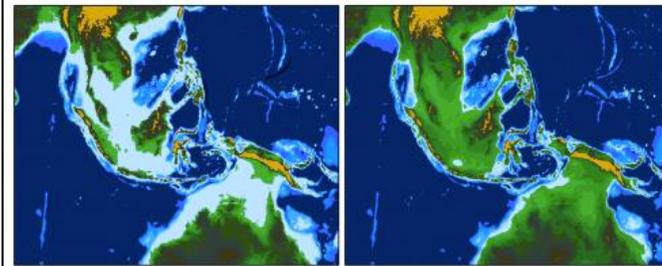
<http://www.ansto.gov.au/ResearchHub/IER/Research/IsotopesinClimate/AtmosphericandOceanic/climateandrainfall/index.htm>

GUNUNG BADU NATIONAL PARK

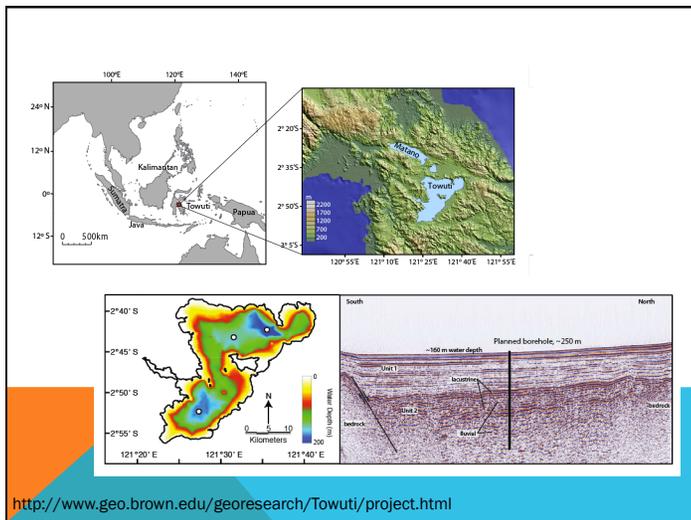
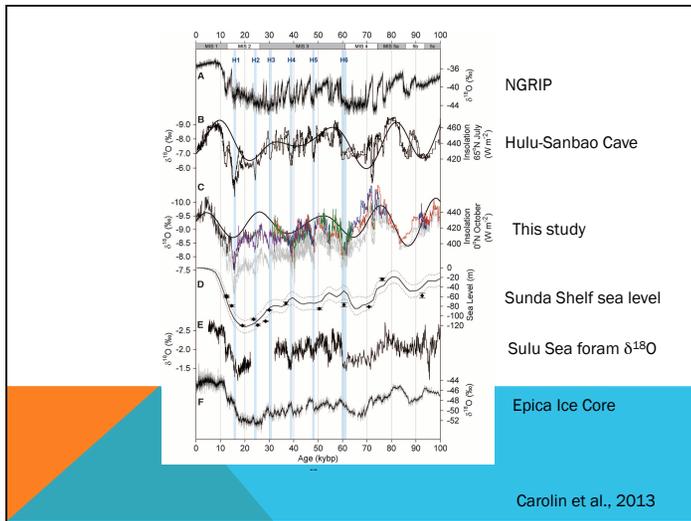


Carolin et al., 2013

SUNDA SHELF DURING LGM



Partin et al., 2007; DeNezio et al., 2011
Pedro DiNezio & phys.org

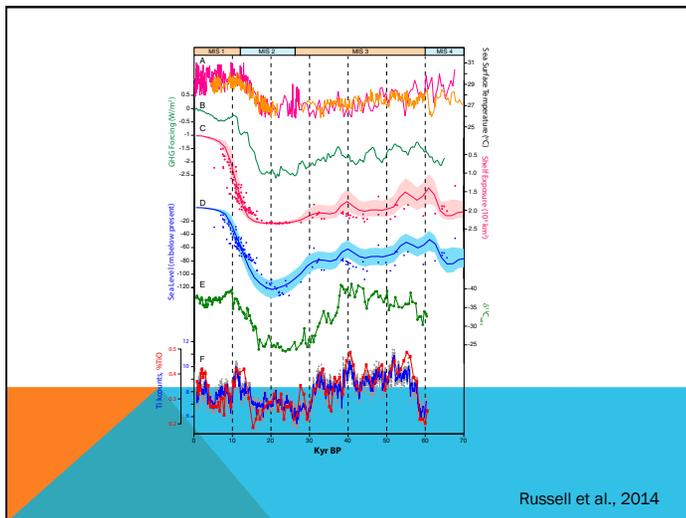
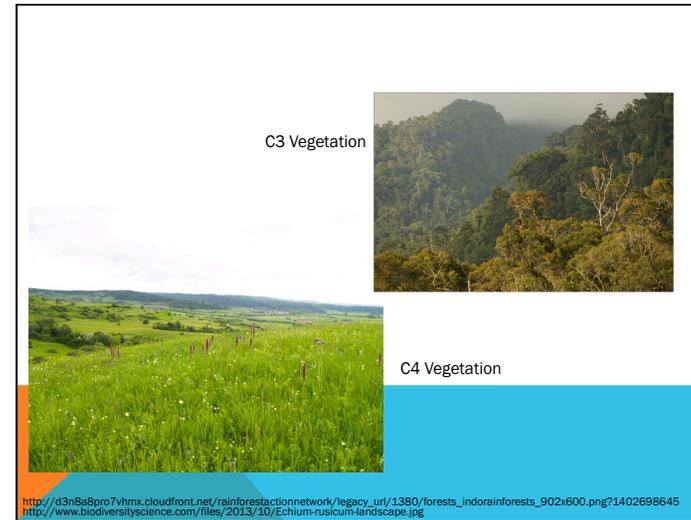
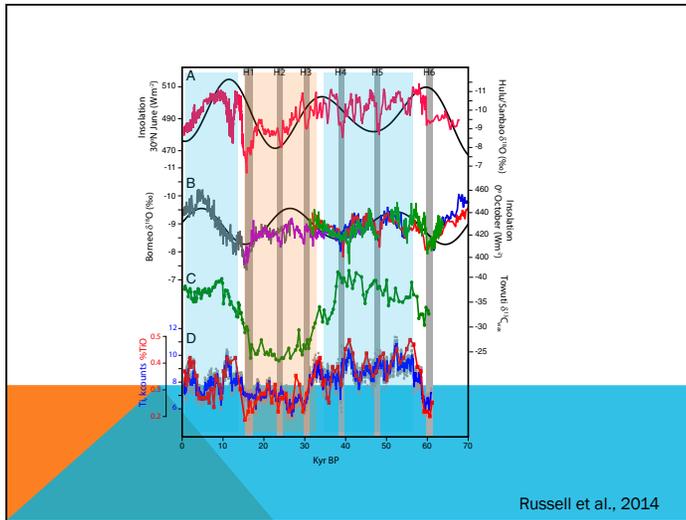


LEAF WAX ^{13}C

- Analysis of long chain n-alkanes.
- Used to distinguish between C3 and C4 plants.
 - C4 plants fractionate CO_2 less
- Sample preparation time and cost of analysis leads to low resolution records

METALS

- Data collected using core scanning XRF
- Metal concentration influenced by runoff from watershed.
 - Greater concentrations of metals in sediment = more precipitation



CONCLUSIONS

- **What is the response of IPWP climate to abrupt "global" climate events?**
 - H events lead to decreases in rainfall
 - No response to D/O events?
- **How does IPWP hydroclimate vary over glacial and interglacial cycles?**
 - Maximum aridity corresponds to intense worldwide glacial activity
- **How does vegetation respond to changing aridity?**
 - C4 plants dominate during the dry periods of the record,
- **What drives climate change in this region?**
 - It appears to be a combination of insolation and glacial processes