GEOL 437 Global Climate Change
3/15/18: Discussion of Meko et al (2007); Introduction to EdGCM (HW7)

- Mid semester course evaluations – response
- Discussion of Meko et al (2007) – reading focus questions
- Introduction to EdGCM and HW7 worktime
  - HW7 due 3/29/18 at start of class
Tree ring data: the archive

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Tree ring data: the archive

Tree ring data: observations

Tree ring data: chronology development

Source: LTRR/UA, Extending a chronology based on living trees further back in time through crossdating; image from Woodhouse and Bauer, NOAA Paleoclimatology, Paleo Slide Set: Tree Rings: Ancient Chronicles of Environmental Change, www.ncdc.noaa.gov/paleo/slides/slideset/18/18_357_slide.html
Generalized sensor model

\[ R(t) = A(t) + C(t) + \delta E(t) + \delta D(t) + \varepsilon(t) \]
Example: paleoclimate from tree ring width data

Southern Colorado Plateau paleoclimate reconstructions from Salzer and Kipfmueller (2005)
Summary

- Trees are an important growing-season, annual-resolution paleoclimatic archive, with a sensor that can be used to develop reconstructions of moisture and/or temperature.

- Principal strengths are in replication depth and dating precision. Principal uncertainties are in the interpretation of tree-ring data for paleoclimate reconstruction, because of a low signal:noise ratio, multiple possible climate and non climatic influences on growth fluctuations.

- Next:
  - Discussion of Meko et al. (2007)
GEOL 437 Global Climate Change
3/13/18: Introduction to Paleoclimatology

Key Concepts

- Atmospheric general circulation model (AGCM)
- Radiative forcing
- Experimental simulation
- Control simulation
Meet EdGCM (HW 5-10; term projects)

EdGCM – under the hood

EdGCM: 8 x 10 degree resolution = 7776 atmospheric grid cells
temporal resolution = 15 min (96 steps/day, ~2880/month)

EdGCM – under the hood

Schematic illustration of the physical components of the climate system represented at each model grid cell (from Hansen et al., 1990)

What are climate models good for?
What are climate models good for?

- Conceptual frameworks: Climate sensitivity, feedback diagnostics
- Hypothesis generation, validation/hindcast, and prediction/forecast
- Understanding paleoclimates: last century, last millennium, LGM, Pliocene, Snowball Earth

Scenario B ("Business As Usual") prediction, 2017: ~ 1.1°C
Observations (1960-2017): ~ 0.9°C;

Notes and figures courtesy G.A. Schmidt, “What good are climate models?”, lecture given at Lamont-Doherty Earth Observatory, 4/20/2007, pers. comm. 2/28/09 global mean annual T, giss.nasa.gov/gistemp/graphs/, acc 3/12/18
What are climate models *not* good for?
What are climate models *not* good for?

- Results not observed in other models or in observations
- Results lacking clear physical mechanisms
- Regional, single grid point, or subgrid-scale dependencies
- Small net effects from complex balances between competing effects

Notes courtesy G.A. Schmidt, “What good are climate models?”, lecture given at Lamont-Doherty Earth Observatory, 4/20/2007; pers. comm., 2/28/09 (incl. Doonesbury cartoon used to make a different point)