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EARTH SCIENCE

SPEAKERS CLUB

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The Future of Past Climates: LinkedEarth and 21st century paleoclimatology

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Paleoclimate observations are crucial to assessing current climate in the context of past variations. However, these observations often come in non-standard formats, forcing paleogeoscientists to spend a significant fraction of their time (by some accounts, up to 80%) searching for and accessing data, or converting between formats before they can do science. This considerable waste of resources hinders re-use and hence lowers the value of the datasets to scientists and society alike.

The EarthCube-supported LinkedEarth project aims to manifest a better future by creating an online platform that (1) enables the curation of a publicly-accessible database by paleoclimate experts themselves, and (2) fosters the development of community standards. In turn, these developments enable cutting-edge data-analytic tools to be built and applied to a wider array of datasets than ever possible before, supporting more rigorous assessments of past climate variability, including the role of solar variability in Holocene climate change.

The existence of 1000 and 2500-year periodicities found in reconstructions of total solar irradiance (TSI) and a number of Holocene climate records has led to the hypothesis of a causal relationship. However, attributing Holocene millennial-scale variability to solar forcing requires a mechanism by which small changes in solar irradiance can influence a global climate response. One possible amplifier within the climate system is the ocean. If this is the case, then we need to know more about where and how this may be occurring. On the other hand, the similarity in spectral peaks could be merely coincidental, and this should be made apparent by a lack of coherence in how that power and phasing are distributed in time and space.

The plausibility of the solar forcing hypothesis is assessed through a Bayesian model of the age uncertainties affecting marine sedimentary records that is propagated through spectral analysis of the climate and forcing signals at key frequencies. In this presentation, I'll show how LinkedEarth and the standardization of paleoclimate datasets to a common format can support this work by (1) allowing complex queries of the datasets, returning time series with specific criteria, and (2) enabling advanced analytical techniques using a newly-developed Python package, Pyleoclim.