CLIMATE CHANGE AND EXTREME EL NINO EVENTS: HOW WELL DO WE KNOW WHAT TO EXPECT?

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ABSTRACT:

The El Nino/Southern Oscillation (ENSO) is the major driver of year-to-year climate variability worldwide. ENSO is known to be highly sensitive to many aspects of mean climate, including changes to the horizontal and vertical structure of the ocean; yet even state-of-the-art climate models remain evenly split on whether ENSO will become stronger or weaker as a result of anthropogenic climate change. This has led many people to focus instead on precipitation-based measures of the "extremeness" of an El Nino event; increases to atmospheric moisture content and associated precipitation extremes are more consistent than variations in sea surface temperature (SST) itself, so projections of 'extreme El Nino' events defined using precipitation-based metrics are thought to be more robust. However, analyses of multiple ensembles of climate models show that even when using precipitation-based definitions, inter-model differences in projected SST variability still contribute significantly to changes to extreme El Nino occurrence frequency. However, not all hope is lost when it comes to creating more consistent multi-model extreme El Nino projections: biases in simulated mean SST over the historical period are systematically related to projected future changes in extreme El Nino. This arises from effects of SST on cloud shortwave radiative feedbacks, which favor an overly "El Nino like" mean state. In other words, projections of future increases to extreme El Nino may be overestimated - and it may be possible to derive observationally-based constraints on climate models to help us narrow the spread in future projections.

BIOGRAPHY:

Sam Stevenson is an assistant professor in the Bren School of Environmental Science & Management. Her research focus is on coupled tropical climate variability, its responses to past and future climate change, and the implications for extreme events around the world. Sam did her PhD at the University of Colorado at Boulder, graduating in 2011. She then went to the University of Hawaii at Manoa for a postdoc, followed by a return to Boulder as a project scientist at the National Center for Atmospheric Research. She has been at UCSB since fall 2017.