El Nino and the end of the global warming hiatus

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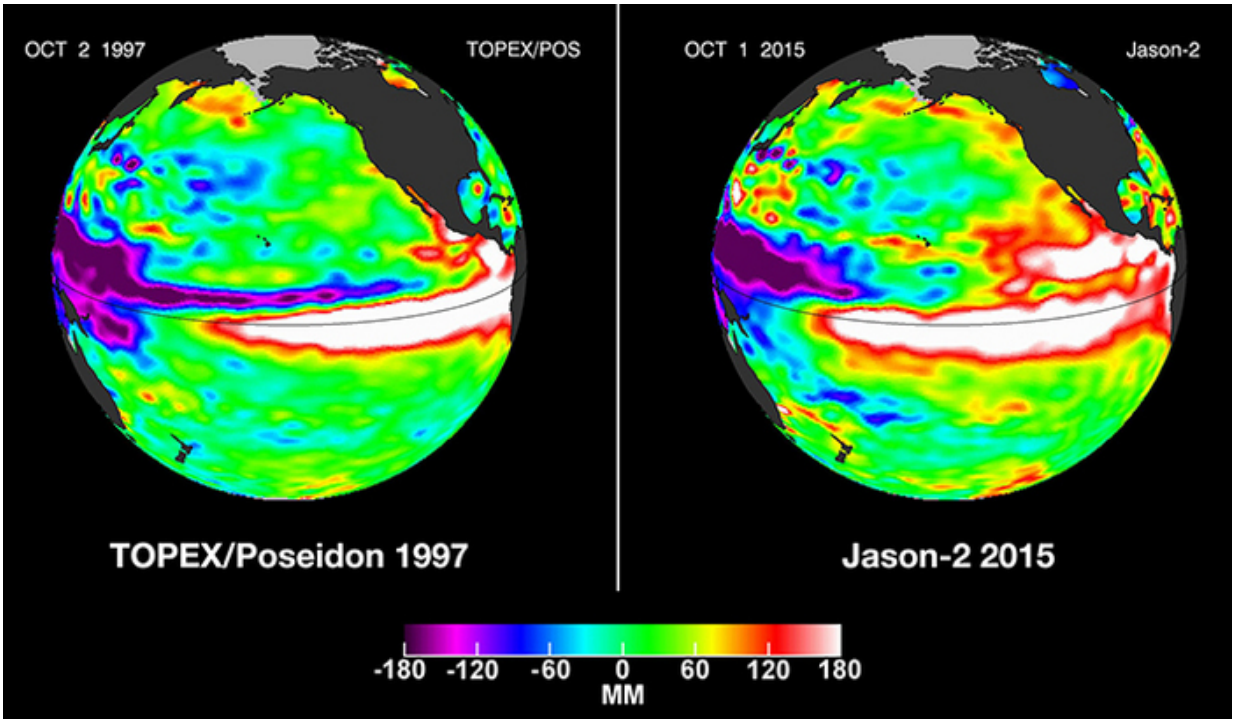

Pacific Ocean sea surface height anomalies during the 1997-98 El Nino (left) are compared with 2015 Pacific conditions (right). The 1997 data are from the NASA/CNES Topex/Poseidon mission; the 2015 data are from the NASA/CNES/NOAA/EUMETSAT Jason-2 mission. Credit: NASA/JPL-Caltech

A new climate model developed by Yale scientists puts the "global warming hiatus" into a broader historical context and offers a new

method for predicting global mean temperature.

Research by professor Alexey Fedorov and graduate student Shineng Hu indicates that weak El Niño activity from 1998 until 2013, rather than a pause in long-term global warming, was the root cause for slower rates of increased surface temperature. The research, published in the journal *Geophysical Research Letters*, also finds that volcanic activity played only a minor role.

"Our main conclusion is that global warming never went away, as one might imply from the term 'global warming hiatus,'" said Fedorov, who has conducted extensive research on the oceans' role in climate. "The warming can be masked by inter-annual and decadal natural climate variability, but then it comes back with a vengeance."

El Niño events contribute to year-to-year variations in global mean temperature by modulating the heat that is released from tropical oceans into the atmosphere, the researchers noted. That is, El Niño warms the atmosphere, while the cold phase of the phenomenon, La Niña, cools the atmosphere.

Multiple strong El Niño events occurred in the 1980s and 1990s. This was followed by much weaker El Niño activity, which lasted until 2014.

"The recent rapid rise in global temperature mainly resulted from the prolonged 2014-2016 El Niño conditions in the tropics that reached an extreme magnitude in the winter of 2015," said Hu, who is the first author of the study. "The corresponding heat release into the atmosphere , together with the ongoing background global warming trend, made 2014, 2015, and 2016 the three consecutive warmest years of the instrumental record so far."

Hu and Fedorov constructed a simple model of global mean surface

temperature (GMST) that incorporates greenhouse gas emissions, El Niño-Southern Oscillation data, and stratospheric sulfate aerosols produced by volcanic eruptions. The model closely mirrors GMST changes since 1880, including the so-called global warming hiatus and the more recent temperature rise.

"From a practical perspective, our method, when combined with El Niño prediction, allows us to predict next-year global mean temperature," Fedorov said. "Accordingly, 2017 will remain among the hottest years of the observational record, perhaps just a notch colder than 2016 or 2015."

More information: Shineng Hu et al. The extreme El Niño of 2015-2016 and the end of global warming hiatus, *Geophysical Research Letters* (2017). DOI: 10.1002/2017GL072908

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