Super El Ninos: It takes two to tango

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A University of Aizu team has identified two distinct Indo-Pacific processes shaping the unique features and extraordinary ferocity of super El Ninos. A systematic analysis of these processes and their interactions will improve forecasts of the elusive super El Ninos, the researchers claim.

In 1972, one of the most powerful El Ninos hitherto observed set off economic shock waves when it utterly devastated the Peruvian anchovy fishing industry and drove global food production per capita and global food reserves to their lowest level since the end of World War II. With the arrival of the powerful El Ninos of 1982 and 1997, scientists felt the need for a new term 'super El Nino' to describe these extraordinarily strong El Nino events.

"Until recently, scientists believed that climate and weather processes operating within the Pacific Ocean could explain the occurrence of super El Ninos. The infamously failed prediction of a super El Nino event in 2014 had its root in these assumptions," says Saji Hameed from the University of Aizu, who led the study.

To unveil the mechanisms of super El Ninos, Hameed and his colleagues conducted computational simulations that recreated selected Pacific Ocean processes involved in the generation of El Ninos. To their surprise, they discovered a mechanism embedded within the Pacific Ocean, which prevented sea surface temperatures in the far-eastern Pacific rising too far above normal.

"Extremely warm sea surface temperatures are a notable feature of the super El Ninos that occurred in 1972, 1982, and 1997. The fact that Pacific Ocean processes responsible for generating regular El Ninos could not explain this key signature of super El Ninos came as a big shock," says Dachao Jin, co-author of the study.

Noting that the years of super El Ninos co-occurred with Indian Ocean Dipole events (a phenomenon similar to El Nino, but generated by processes inherent to the Indian Ocean), the researchers explored possible mechanisms linking both phenomena. They found that while Pacific processes are needed to initiate El Ninos, it was the extra energy generated by the Indian Ocean Dipole, and transferred to the Pacific through atmospheric pathways, which eventually transformed the El Nino into a super El Nino event.

"A model for super El Ninos' was published in *Nature Communications*.

More information: Saji N. Hameed et al. A model for super El Niños, *Nature Communications* (2018). DOI: 10.1038/s41467-018-04803-7

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