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El Nino's 'remote control' on hurricanes in the Northeastern Pacific

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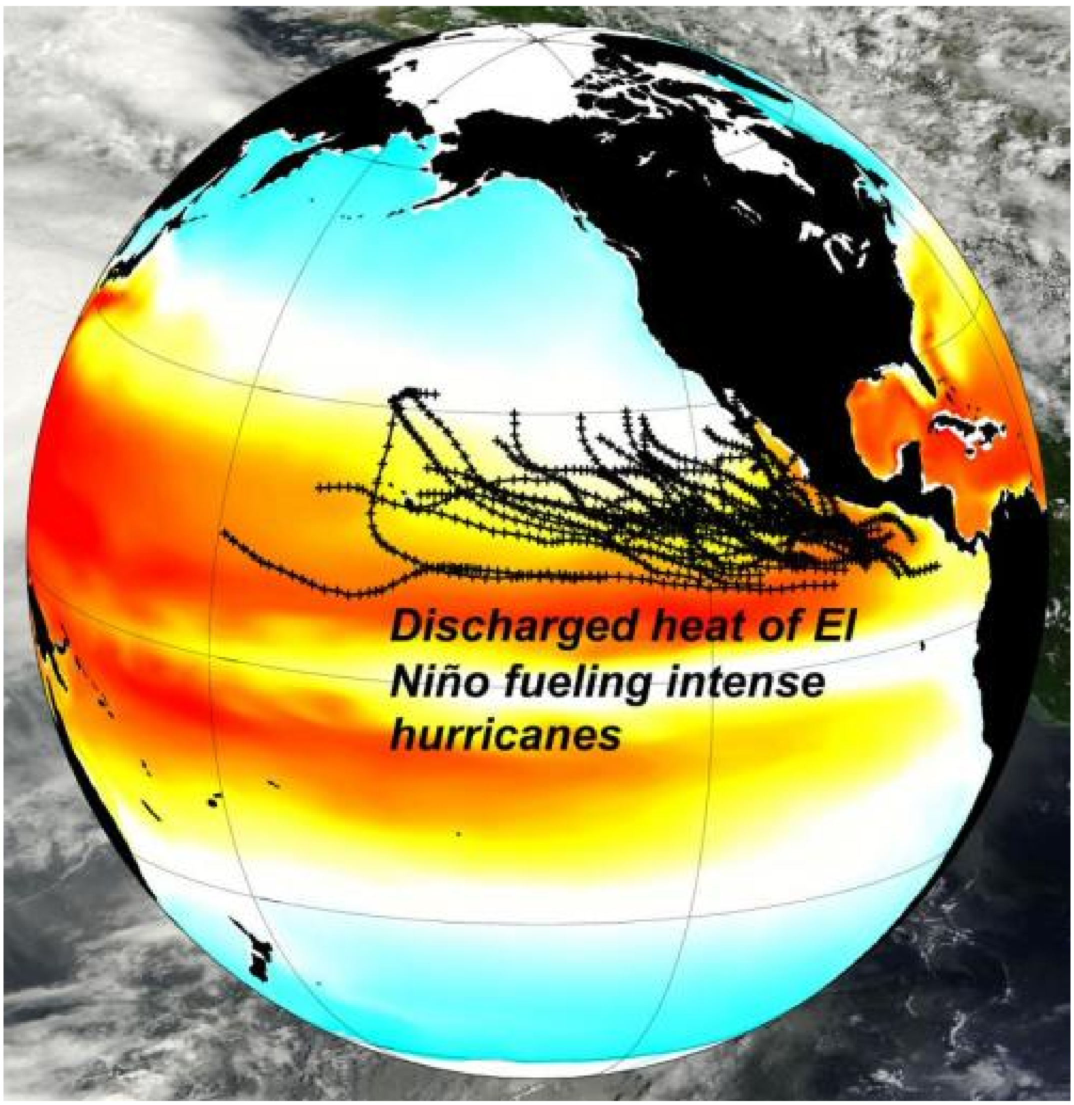

The discharge of heat, occurring in the boreal summer, followed the peak of El Niño (August-September 1998). Historical tracks of Category 3 to 5 hurricanes that developed after the peak of strong El Niños in 1991/92, 1997/98, 2008/09 and 2014 are shown in black. Credit: Jin, et al. (2014)

El Niño, the abnormal warming of sea surface temperatures in the Pacific Ocean, is a well-studied tropical climate phenomenon that occurs every few years. It has major impacts on society and Earth's climate - inducing intense droughts and floods in multiple regions of the globe. Further, scientists have observed that El Niño greatly influences the yearly variations of tropical cyclones (a general term which includes hurricanes, typhoons and cyclones) in the Pacific and Atlantic Oceans.

However, there is a mismatch in both timing and location between this climate disturbance and the Northern Hemisphere hurricane season: El Niño peaks in winter and its surface ocean warming occurs mostly along the equator, i.e. a season and region without tropical cyclone (TC) activity. This prompted scientists to investigate El Niño's influence on hurricanes via its remote ability to alter atmospheric conditions such as stability and vertical wind shear rather than the local oceanic environment.

Fei-Fei Jin and Julien Boucharel at the University of Hawai'i School of Ocean and Earth Science and Technology (SOEST) and I-I Lin at the National Taiwan University published a paper today in *Nature* that uncovers what's behind this "remote control."

Jin and colleagues uncovered an oceanic pathway that brings El Niño's heat into the Northeastern Pacific basin two or three seasons after its winter peak - right in time to directly fuel intense hurricanes in that region.

El Niño develops as the equatorial Pacific Ocean builds up a huge amount of heat underneath the surface and it turns into La Niña when this heat is discharged out of the equatorial region.

"This recharge/discharge of heat makes El Niño/La Niña evolve somewhat like a swing," said lead author of the study Jin.

Prior to Jin and colleagues' recent work, researchers had largely ignored the huge accumulation of heat occurring underneath the ocean surface during every El Niño event as a potential culprit for fueling hurricane activity.

"We did not connect the discharged heat of El Niño to the fueling of hurricanes until recently, when we noticed another line of active research in the tropical cyclone community that clearly demonstrated that a strong hurricane is able to get its energy not only from the warm surface water, but also by causing warm, deep water - up to 100 meters deep - to upwell to the surface," Jin continued.

Co-author Lin had been studying how heat beneath the ocean surface adds energy to intensify typhoons (tropical cyclones that occur in the western Pacific).

"The super Typhoon Hainan last year, for instance, reached strength way beyond normal category 5," said Lin. "This led to a proposed consideration to extend the scale to category 6, to be able to grasp more properly its intensity. The heat stored underneath the ocean surface can provide additional energy to fuel such extraordinarily intense tropical cyclones."

"The North-Eastern Pacific is a region normally without abundant subsurface heat," said Boucharel, a post-doctoral researcher at UH SOEST. "El Niño's heat discharged into this region provides conditions to generate abnormal amount of intense hurricanes that may threaten Mexico, the southwest of the US and the Hawaiian islands."

Furthermore, caution the authors, most climate models predict a slow down of the tropical atmospheric circulation as the mean global climate warms up. This will result in extra heat stored underneath the North-eastern Pacific and thus greatly increase the probability for this region to experience more frequent intense hurricanes.

Viewed more optimistically, the authors point out that their findings may provide a skillful method to anticipate the activeness of the coming hurricane season by monitoring the El Niño conditions two to three seasons ahead of potentially powerful hurricane that may result.

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