A 3-D look at the 2015 El Nino

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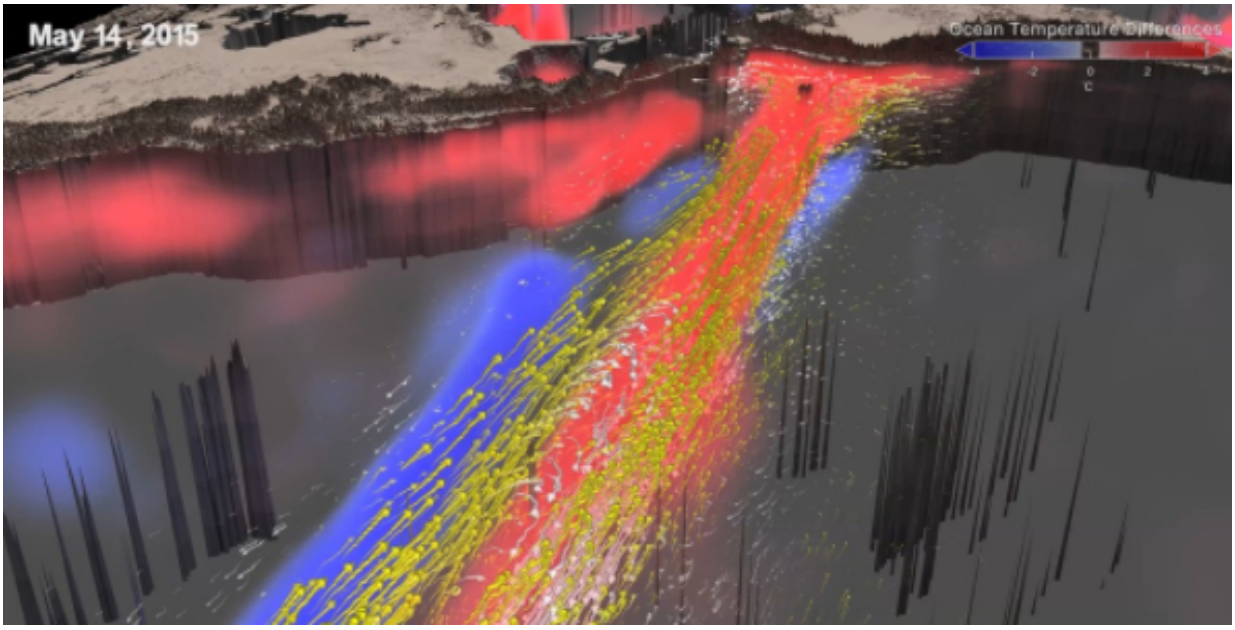

El Niño is a recurring climate pattern characterized by warmer than usual ocean temperatures in the equatorial Pacific. Two back-to-back 3-D visualizations track the changes in ocean temperatures and currents, respectively, throughout the life cycle of the 2015-2016 El Niño event, chronicling its inception in early 2015 to its dissipation by April 2016. Blue regions represent colder and red regions warmer temperatures when compared with normal conditions.

Under normal conditions, equatorial trade winds in the Pacific Ocean blow from east to west, causing warm water to pile up in the Western Pacific, while also causing an upwelling—the rise of deep, cool water to the surface—in the Eastern Pacific. During an El Niño, trade winds weaken or, as with this latest event, sometimes reverse course and blow from west to east. As a result, the warm surface water sloshes east along the equator from the Western Pacific and temporarily predominates in the Central and Eastern Pacific Ocean. At that same time, cooler water slowly migrates westward just off the equator in the Western Pacific.

The first visualization shows the 2015-2016 El Niño through changes in sea surface temperature as warmer water moves east across the Pacific Ocean. The Eastern Pacific Ocean undergoes the most warming from July 2015 to January 2016. In the west, just to the north of the equator, cooler waters hit the western boundary and reflect along the equator and then head east starting in February 2016. Just as the warming waves traveled east earlier in the video, these cool waters make their way to the central Pacific, terminating the warming event there.

Hand-in-hand with an El Niño's changing sea surface temperatures are the wind-driven ocean currents that move the waters along the equator across the Pacific Ocean. The second visualization depicts these currents, which here comprise the ocean's surface to a depth of 225 meters: Yellow arrows illustrate eastward currents and white arrows are westward currents. The El Niño-inducing westerlies—winds coming from the west that blow east—cause the eastward currents to occur in pulses. A good example of one of these pulses can be seen hitting the South American coast on May 15, 2015. By the end of February 2016 trade winds return, as evidenced by the return of westward currents and cool water along the equator, signaling the dissipation of the El Niño.

These visualizations are derived from NASA Goddard's Global Modeling and Assimilation Office, using Modern-Era Retrospective

Analysis for Research and Applications (MERRA) dataset, which comprises an optimal combination of observations and ocean and atmospheric models. For more information, see https://gmao.gsfc.nasa.gov/reanalysis/MERRA/

Provided by NASA's Goddard Space Flight Center