The warm water volume, a better predictor of La Niña than of El Niño amplitude

Yann Planton (1), Éric Guilyardi (1,2), Matthieu Lengaigne (1,3), and Jérôme Vialard (1)

(1) LOCEAN-IPSL, CNRS-IRD-MNHN-Sorbonne Université, Paris, France (yann.planton@gmail.com), (2) NCAS-Climate, University of Reading, UK, (3) Indo-French Cell for Water Sciences, IISc-NIO-IITM–IRD Joint International Laboratory, CSIR-NIO, Goa, India

El Niño – Southern Oscillation (ENSO) is the dominant mode of interannual climate variability, with large environmental impacts at the global scale. With anomalous warming of up to 4°C in the eastern equatorial Pacific, extreme El Niño events, such as in late 1982, 1997 and 2015, involve a complete re-organization of tropical convection with outsized societal impacts relative to moderate El Niño events. Despite an improved understanding of ENSO dynamics over the past decades, predicting the amplitude of ENSO events remains a challenge, especially at long lead-times. In line with the recharge / discharge oscillator theory, we show that the equatorial heat content averaged over the western Pacific is a robust oceanic precursor of ENSO events at lead-times longer than 8 months in both observations and pre-industrial simulations from the Coupled Model Intercomparison Project Phase 5 (CMIP5). Both datasets also reveal that this index is a better precursor of La Niña amplitude than of El Niño amplitude. This asymmetry could be related to a stronger influence of atmospheric noise during El Niño than during La Niña.