Geophysical Research Abstracts
Vol. 20, EGU2018-8559, 2018
EGU General Assembly 2018

Unprecedented 2015/16 Indo-Pacific heat transfer speeds up Tropical Pacific heat recharge

Michael Mayer (1), Magdalena A. Balmaseda (1), and Leopold Haimberger (2)
(1) ECMWF, United Kingdom (michael.mayer@ecmwf.int), (2) University of Vienna

The 2015/16 El Nino event exhibited peak sea surface temperature (SST) anomalies similar to the record-breaking 1997/98 event. Here we employ atmosphere and ocean reanalyses in conjunction with satellite data to compare anomalous energy flows through the climate system during these two El Ninos.
We show that despite its extreme surface characteristics, there was no longer lasting cooling of tropical (30S-30N) Pacific subsurface waters associated with the 2015/16 El Nino. In fact, tropical Pacific upper ocean heat content (OHC) at the end of 2016 was higher than at the beginning of 2015 by about 9.6±1.7 ZJ, which is in stark contrast to statistical expectation and previous big El Nino events like that in 1997/98 (-11.5±2.9 ZJ OHC loss). The main reason for this surprising result is the unprecedented reduction of Indonesian Throughflow (ITF) volume (-20%) and associated heat transport (-25%) during 2015/16. Although weakening of the ITF is typical for El Nino events, the amount of heat retained in the Pacific by reduced ocean energy export was exceptional during 2015/16 and explains 74% of the found difference in OHC changes. The reduction of the ITF transports was related to the observed strong warming of the eastern Indian Ocean in recent years, associated with both global warming and the negative phase of the Pacific Decadal Oscillation (PDO). This enhanced anomalous sea level gradients across the Indo-Pacific Warm Pool. Increased absorption of solar radiation consistent with positive SST anomalies prevailing in the eastern subtropical Pacific was a secondary effect damping the OHC discharge. The tropical Pacific thus remains in a recharged state characteristic of the positive PDO phase which explains the weak and short-lived La Nina conditions in 2016/17. These results indicate that realistic representation of the Indo-Pacific energy transfer is pivotal for advancing seasonal-to-decadal forecasting capabilities and climate projections.