Geophysical Research Abstracts
Vol. 20, EGU2018-13109, 2018
EGU General Assembly 2018

On the importance of wind stress location in driving Pacific Subtropical cells and tropical climate

Giorgio Graffino (1,2), Riccardo Farneti (1), and Fred Kucharski (1)

(1) International Centre for Theoretical Physics, Trieste, Italy (ggraffin@ictp.it), (2) Universita degli Studi di Trieste, Trieste, Italy

The influence of atmospheric dynamics on tropical ocean state is a typical example of ocean-atmosphere teleconnection. One way to influence tropical climate is through oceanic SubTropical Cells (STCs), shallow overturning circulation structures connecting the Equator with the subtropical regions. STCs are responsible for large mass and energy transports, and their influence on tropical climate, and consequently on global climate, is fundamental both for the mean and its variability. These circulation structures are present in all basins across the Tropics, with different properties and strengths depending on geometrical properties of each basin.
We focus here on the effect of off-equatorial winds on the Pacific STCs, which are known for their potential role on driving low-frequency Pacific variability. Using a global ocean model, we force the Pacific Ocean with idealized wind stress and wind stress curl anomaly patterns, in order to study and quantify the influence of subtropical and extratropical forcing on STCs dynamics, and, eventually, on some aspects of Pacific tropical climate. Results are compared with a control simulation, in which a climatological forcing is applied everywhere, and a set of experiments performed using equatorial wind stress anomalies.
Our simulations show an increased (reduced) meridional mass transport for positive (negative) wind stress anomalies in the subtropics and in the extratropics. The structure of the thermocline at the Equator is modified as well, where cold (warm) anomalies appear. Meridional ocean heat transport is influenced too, showing larger (smaller) values for stronger (weaker) wind stress anomalies. Instead, the equatorial wind stress patterns modify the meridional circulation only locally, and are not able to drive substantial mass and heat transports in the meridional direction.