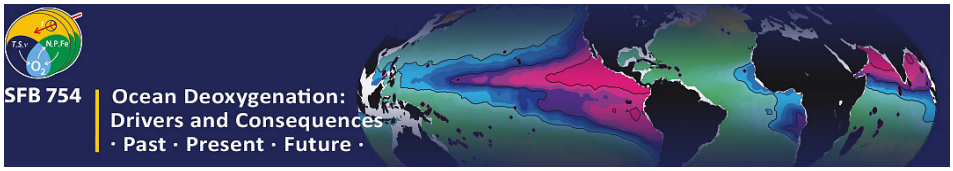

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Impact of mesoscale eddies on water mass and oxygen distribution in the eastern tropical South Pacific

The influence of mesoscale eddies on the flow field and the water masses, especially the oxygen distribution of the eastern tropical South Pacific is investigated from a mooring, float and satellite data set. Three different types of eddies, one mode water (MWE), two anticyclonic (ACE1/2) and one cyclonic eddy (CE), are identified and followed in detail with satellite data on their westward transition with velocities of 3.2 to 6.0 cm/s from their generation region, the shelf of the Peruvian and Chilean upwelling regime, across the Stratus Ocean Reference Station (ORS) (~20°S, 85°W) to their decaying region far west in the oligotrophic open ocean. Velocity, hydrographic, and oxygen measurements at the mooring show the impact of eddies on the weak flow region of the eastern tropical South Pacific. Strong anomalies are related to the passage of eddies and are not associated to a seasonal signal in the open ocean. The mass transport of the observed eddies across 85°W is between 1.1 and 1.8 Sv. The eddy type dependent available heat, salt and oxygen anomalies are 8.1x1018 J (ACE), 1.0x1018 J (MWE), -8.9x1018 J (CE) for heat, 25.2x1010 kg (ACE2), -3.1x1010 kg (MWE), -41.5x1010 kg (CE) for salt and -3.6x1016 µmol (ACE2), -3.5x1016 µmol (MWE), -6.5x1016 µmol (CE) for oxygen showing an imbalance between anticyclones and cyclones especially for salt transports probably due to seasonal variability of water mass properties in the formation region of the eddies. Heat, salt and oxygen fluxes out of the coastal region across the ORS region in the oligotrophic open South Pacific are estimated based on these eddy anomalies and on eddy statistics (gained out of 23 years of satellite data). Furthermore, four profiling floats were trapped in the ACE2 during its westward propagation between the formation region and the open ocean showing a weakening of the anomalies of the water mass properties transported within the eddy pointing towards mixing processes with the surrounding waters between the seasonal thermocline and the eddy core during the first half of their lifetime.

Position

Postdoc

Affiliation

GEOMAR - Helmholtz Centre for Ocean Research Kiel

Email Address

rczeschel@geomar.de

Are you a SFB 754 / Future Ocean member?

Yes

Primary author(s) : Dr CZESCHEL, Rena (GEOMAR-Helmholtz Centre for Ocean Research Kiel); Dr SCHÜTTE, Florian (GEOMAR - Helmholtz Centre for Ocean Research Kiel); Dr WELLER, Robert (Woods Hole Oceanographic Institution (WHOI)); Dr STRAMMA, Lothar (GEOMAR - Helmholtz Centre for Ocean Research Kiel)

Presenter(s) : Dr CZESCHEL, Rena (GEOMAR-Helmholtz Centre for Ocean Research Kiel)

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