Karlsruher Institut für Technologie

Fakultät für Physik

Physikalisches Kolloquium

Martin Visbeck, GEOMAR Kiel

»Mixing in the Tropical Oceans – Results from Tracer Release Experiments in the Atlantic and Pacific«

Einführung: A. Fink

Tropical Ocean play an important role in the climate system. They also support large fisheries and are expected to change in the future. A specific phenomena of interest are large regions below the ocean surface at a depth of 50-500m with very low dissolved oxygen in the ocean. In those regions ecosystem functions switch and sometimes very different life forms are found. These Oxygen Minimum Zones have shown to expand in the last 50 years and are arguably key regions were ocean de-oxygenation matters to the marine biogeochemistry and ecology.

Over the last 10 year a large team of scientist in Kiel has explored many aspects around those oxygen minimum zones, from climate, chemistry to ecosystems. Our group has amongst other works conducted three Tracer Release Experiments to study the mixing and spreading of these regions. Two in the Tropical North Atlantic and one in the Tropical South Pacific. Tracer release experiments are a very precise approach to determine the spreading of water molecules in all three dimensions. They are technically challenging, require significant amounts of ship time, but provide a very unique view of the ocean.

For the Guinea dome Upwelling Tracer Release Experiment (GUTRE ,2008) 92 kg of SF5CF3 were injected at 8°N, 23°W in the upper part of the oxygen minimum zone (OMZ). Three surveys measured the tracer distribution 7, 20 and 30 months later. The experiment was designed to estimate the time-mean diapycnal mixing rate at the upper boundary of the OMZ and was 1.19 ± 0.18 × 10-5 m2 s-1 (Banyte et al., 2012). For the second Oxygen Supply Tracer Release Experiment (OSTRE, 2012) 88.5 kg of CF3SF5 (tracer) were released in the center of the oxygen minimum zone at 10° 30' N and 21° W at the depth of the lowest oxygen values. Three surveys measured the tracer distribution approximately 7, 15 and 29 months later and found the vertical diffusivity at the center of the OMZ to be insignificantly smaller with 1.06 ± 0.22 × 10-5 m2 s-1 in the OMZ core (Köllner et al., 2016). The horizontal spreading of the tracer was compared to a tracer release in a high resolution ocean circulation model and showed some rather striking similarities. Estimation of the strength of zonally alternating jets that ventilate the OMZ from the western part of the basin will be presented using a simple jet dispersion model.

The Peruvian OMZ System Tracer Release Experiment (POSTRE) was intended to investigate the benthic–pelagic coupling with a tracer release experiment in the Peruvian Margin. At three location near the sea floor (12°S, 14°S and 15°S) at a water depth of 250m a total of 75kg SF5CF3 were injected. The tracer distribution was surveyed extensively in March 2017 and the first results highlighting, mixing and advective pathways from the recent data will be discussed in the context of regional ocean model simulations.

What we have found and how that impacts the ocean minimum zones will be discussed.

Freitag, 24.05.2019, 15:45 Uhr,

KIT, Campus Süd,
Otto-Lehmann-Hörsaal, Physik-Flachbau (Geb. 30.22).
Anschließend Nachsitzung.

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