Geophysical Research Abstracts
Vol. 19, EGU2017-2768, 2017
EGU General Assembly 2017


# Dispersion of deep-sea hydrothermal vent effluents and larvae by submesoscale and tidal currents

Jonathan Gula (1), Clément Vic (2), Guillaume Roullet (1), and Florence Pradillon (3)

(1) Laboratoire d'Océanographie Physique et Spatiale (LOPS), Univ. Brest, Brest, France, (2) Department of Ocean and Earth Sciences, University of Southampton, Southampton, UK, (3) Laboratoire Environnement Profond, Ifremer, Plouzané, France

Deep-sea hydrothermal vents provide sources of geochemical materials that impact the global ocean heat and chemical budgets, and support complex biological communities. Vent effluents and larvae are dispersed and transported long distances by deep ocean currents, but these currents are largely undersampled and little is known about their variability. Submesoscale (0.1–10 km) currents are known to play an important role for the dispersion of biogeochemical materials in the ocean surface layer, but their impact for the dispersion in the deep ocean is unknown. Here, we use a series of nested regional oceanic numerical simulations with increasing resolution (from $\delta x$=6 km to $\delta x$=0.75 km) to investigate the structure and variability of deep currents over the Mid-Atlantic Ridge and their impact on the dispersion of the Lucky Strike hydrothermal vent effluents and larvae. We shed light on a submesoscale regime of oceanic turbulence over the Mid-Atlantic Ridge at 1500 m depth, with high ($\sim$0.5) Rossby numbers and kinetic energy spectra $E \propto k^{-2.4}$ ($k$ is the horizontal wavenumber) departing from classic interior quasi-geostrophy ($E \propto k^{-3}$). This regime strongly contrasts with open-ocean – i.e., far from topographic features – regimes of turbulence, close to quasi-geostrophy. Impacts of submesoscale and tidal currents on dispersion and connectivity are investigated by releasing neutrally buoyant Lagrangian particles at the Lucky Strike hydrothermal vent. Submesoscale currents are found to significantly increase both the horizontal and vertical dispersion of particles at $O$(1-10 km) and $\sim$20 d. Tidal currents and internal tides do not significantly impact the horizontal dispersion. However, they increase the vertical dispersion by a factor of 3. Thus, submesoscale and tidal currents both play a major role in the dispersion of vent effluents, consequently impacting connectivity between hydrothermal sites on the Mid-Atlantic Ridge.