Geophysical Research Abstracts
Vol. 19, EGU2017-11026, 2017
EGU General Assembly 2017

Relative dispersion in the deep waters of the Gulf of Mexico

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Pair separation of in situ floats in the deep basin of the Gulf of Mexico is investigated. A set of 162 RAFOS subsurface floats at 1500 and 2500 m depth were deployed throughout the region between 2011 and 2013, with mission lengths between 6 months and 1.5 years. Several analyses of two particles statistics were performed and compared to the theoretical predictions of dispersion regimes. A comparison of the statistical dispersion between the occidental and oriental regions of the GOM was also carried out, as these regions presented highly different levels of eddy kinetic energy. The eastern and western basins differ in most of the dispersion metrics used, with the eastern region showing significantly higher growth rate in relative dispersion and larger diffusivities. Non local relative dispersion (exponential regime) is observed in both regions at small time scales (inferior to 10 days). At intermediate time scales local dispersion is supported by probability density functions. Finite scale Lyapunov exponents suggest the existence of a Richardson-like regime at intermediate scales but do not capture the exponential regime at small scales. The second order velocity structure function slope close to 2/3 is also similar to an energy cascade, with a shallower slope in the western region. Decomposition of the latter into rotational and divergent components reveals that geostrophy dominates over divergent motions at scales larger than 10 km, whereas the opposite situation may occur at smaller scales, although float position uncertainty ($\sim$6 km) does not allow to confirm this. The reason why the classical Lundgren and Richardson dispersion regimes are not encountered remains to be understood.