Geophysical Research Abstracts
Vol. 19, EGU2017-5075, 2017
EGU General Assembly 2017

Lagrangian properties at the ocean submesoscales in presence of riverine outflows

Annalisa Bracco and Jun Choi
School of Earth and Atmospheric Sciences, GaTech, Atlanta, United States (abracco@gatech.edu)

A set of numerical simulations are used to characterize the impact of submesoscale circulations on surface Lagrangian statistics in the northern Gulf of Mexico over two months, February and August, representative of winter and summer. Whenever submesoscale circulations are resolved, the probability density functions (PDFs) of dynamical quantities such as vorticity and horizontal velocity divergence for Eulerian and Lagrangian fields differ, with particles preferentially mapping areas of elevated negative divergence and positive vorticity. The stronger are the submesoscale circulations the more skewed are the Lagrangian distributions and greater is the difference between Eulerian and Lagrangian PDFs. In winter Lagrangian distributions are modestly impacted by the presence of the riverine outflow, while increasing the model resolution from submesoscale permitting to submesoscale resolving has a more profound impact. In summer the presence of riverine induced buoyancy gradients is key to the development of submesoscale circulations and different Eulerian and Lagrangian PDFs.
Finite Size Lyapunov Exponents (FSLEs) are used to characterize mixing rates. Whenever submesoscale circulations are resolved and riverine outflow is included, FSLEs slopes are broadly consistent with local stirring. Simulated slopes are close to -0.5 and support a velocity field where the ageostrophic and frontogenetic components are key to mixing for scales comprised between about 5-7 times the model resolution and 100 km. The robustness of Lagrangian statistics is further discussed in terms of their spatial and temporal variability, and of the number of particles used.