On the formulation of Lagrangian stochastic models for geophysical turbulent flows

A. Maurizi and F. Tampieri

ISAC-CNR

Since Thomson (J. Fluid Mech., 1987) it is known that the formulation of Lagrangian stochastic models must satisfy the so-called well mixed condition (WMC). This produces coupling between turbulent fluctuations and mean shear. It is a common practice however, to use simplified models in geophysical flow modelling in which such a coupling is neglected.

The impact of such assumptions is evaluated and some results are found for simplified steady, non-homogeneous flows.

It is shown that the simplified formulation does not cope with WMC and presents accumulation of tracer particles in some regions of the flow.

The turbulence-shear coupling in a linear two-dimensional shear flow is studied to understand the dispersion mechanism for the two formulations. Although in a linear shear flow the difference is almost negligible, if one consider decomposing the shear into strain and rotation components, in can be shown that contribution to dispersion is different for the two components

The above results can be used for the interpretation of simulation results for different initial release conditions in a simplified model for surface flow in an enclosed basin. Regions with different balance between strain and rotation produce different behaviour that is consistent with theoretical results for a plain shear.