Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12363, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12363
EGU General Assembly 2008

Rotating Stratified Flows

A.M Matulka (1), O.B. Mahjoub and (1,2) A. Carrillo (1)

(1) Dept. Fisica Aplicada Universitat Politecnica de Catalunya, Barcelona, Spain (anna.magdalena.matulka@upc.edu) (2) DAMTP, Cambridge University, Cambridge, U.K.

Detailled 2D Particle traking and PIV visualizations performed on a series of large scale laboratory experiments at the Coriolis Platform of the SINTEF in Trondheim have revealed several resonances which scale on the Strouhal, the Rossby and the Richardson numbers. More than 100 experiments spanned a wide range of Rossby Deformation Radii and the topological structures (Parabolic / Eliptic /Hyperbolic) of the quasibalanced stratifiedrotating flows were studied when stirring (akin to coastal mixing) occured at a side of the tank. The strong asymetry favored by the total vorticity produces a wealth of mixing patterns. With a fuller understanding of the transition processe between a two dimensional enstrophy cascade and a three dimensional energy cascade and relating intermittency to fractal dimension for several forcinngs. Promising results of better models arise when using fractal techniques to distinguish between the space fillingness of the turbulent energy dissipation as well as the enstrophy transpher. Thus it may be possible to parameterise the subgrid turbulence in terms of generalized diffusivities that take into account the topology and the selfsimilarity of the environment. In Rotating Stratified flows, the role of internal waves seems crucial in allowing a concentration of energy. Relationships between the diffusivity, the intermittency and the Fractal dimension D(i), linked to the dispersion as function of the intensity of the chemical concentration, other locally measured parameters such as the enstrophy or the gradient alignment as well as their multifractal structures may turn out to be physically relevant indicators of the environmental turbulence. Several methods of deriving eddy diffusivity maps from image information should give more realistic estimates of the spatial/temporal nonhomogeneities (and intermittencies in the Kolmogorov 62 sense obtained as spatial correlations of the turbulent dissipation, or from structure functions) and these values may be used to parameterise either sea

surface turbulence or atmospheric turbulence at a variety of scales. Different fractal dimensions are related to different levels of intermittency (and thus different spectra, which are not necessarily inertial nor in equilibrium). These techniques are helpful in providing more realistic estimates of spatial and temporal variations of the horizontal dispersion in the environment, wich reflect the influence of spectral energy distribution on local diffusivity in terms of a Generalized Richardson's Law.