Geophysical Research Abstracts
Vol. 12, EGU2010-419, 2010
EGU General Assembly 2010

Stratified flows past a strip: numeric and laboratory study

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The goal of the study is to describe a fine flow structure formation in a continuously stratified fluid past uniformly moving strip basing on analytical and numerical analysis of set of fundamental governing equations. Mathematical modeling is based on the set of fundamental governing equations including continuity, Navier-Stokes, transport of substances and the state equation with standard no-slip and no-flux boundary conditions for given particular geometry of the problem. Effects of difference in boundary conditions for strip moving along the solid plane and in a free space and non-linearity are investigated. Analytical analysis reveals set of regular and singular disturbed components describing internal waves, wake and upstream disturbances if a wide ranges of flow parameters. Calculated flow patterns are compared with laboratory visualization performed by sensitive and high resolution instruments, markers and conductivity sensors. Fitting conditions for analytical, numerical and experimental results are defined. Formation of transverse streaky structures on obstacles and inside the wake and their transformation firstly into sequence of clusters and then into vortex systems is observed. Extrapolation on environmental conditions is discussed.