4. Numerical Simulation of Stably Stratified Flows over Topography

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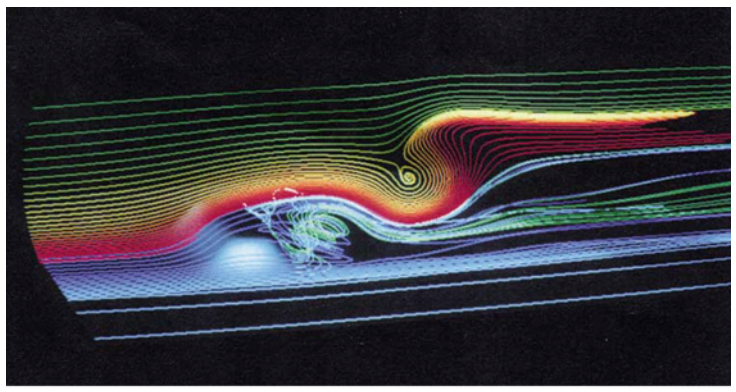
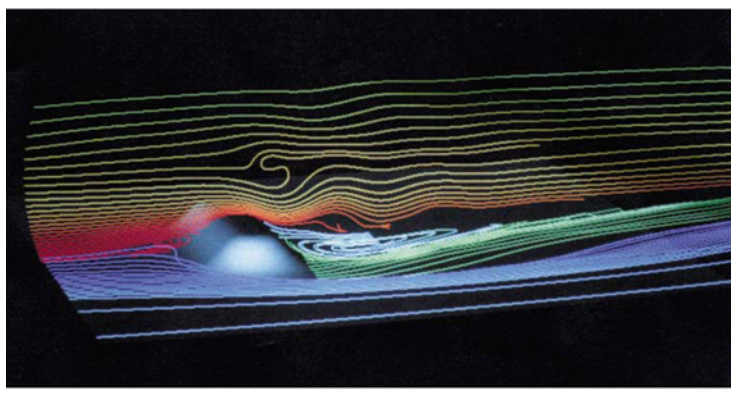
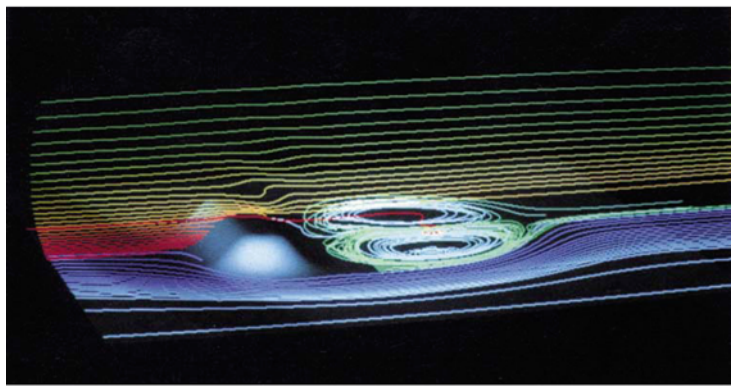


(a) Non-stratified flow (Fr=∞)



(b) Stratified flow (Fr=0.45)



(c) Stably stratified flow (Fr=0.2)
Instaneous streamlines

These figures show the numerical results of stably stratified flows over three-dimensional bell-shaped ridge at a Reynolds number Re=10,000 under various Froude numbers. The numerical model is based on a DNS using a Multi-Directional Finite-Difference Method (MDFDM). A coherent structure of eddies in the lee of the ridge is confirmed at a Froude number Fr=∞ (non-stratified flow). For the cases of Fr=0.45 and 0.2, the flow field around the ridge is dramatically altered by addition of stable stratification. At a Froude number Fr=0.45, a rotor is induced aloft of the ridge. At a Froude number Fr=0.2, most fluids rather go around the sides of the ridge horizontally than go over the top of it.