Project Proposal for FOSSEE CFD

Project Name- Atmosphere in a differentially heated rotating annulus: Baroclinic waves

Abstract:

Geophysical process especially general atmospheric circulation is responsible for maintaining the thermal equilibrium between the hot equator and cold polar region. The temperature difference between equator and pole drives the general atmospheric circulation. To study general atmospheric circulation in atmosphere is very difficult as multiple process occurs together. So, we can study it in a rotating annular cylindrical setup as given in literature. It is generally known as differentially heated rotating annulus. In this setup, outer wall is heated, representing equator, and inner cylindrical wall is cooled, representing polar region. Baroclinic waves are present in atmosphere, which are generally responsible for transferring heat and momentum in atmosphere. The study of these baroclinic waves can we done with this setup.

Methodology:

OpenFOAM version 4.1 will be used for simulation purpose. Solver used will be buoyantBoussinesqPimpleFoam with Coriolis force added in the momentum equation. So as to add background rotation in the simulation. For meshing Ansys ICEM CFD will be used and for post processing Tecplot will be used.