Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Comparison of Two-Dimensional Turbulence on the Surface of a Sphere with Two-Dimensional Turbulence on a Plane LEILA AZADANI, ANNE STAPLES, Virginia Tech — Although there are not two-dimensional turbulent flows in nature, there are many applications in which the fluid motion can be described by two-dimensional models. For example large-scale geophysical flows in the atmosphere and ocean can be accurately represented by two-dimensional turbulence models. The combined effects of geometry, stratification and rotation restricts the flow motion in the vertical direction and makes these flows almost two-dimensional. While Cartesian coordinates are usually used to perform these computations, spherical coordinates are more natural and account for the Earth's curvature. Computations of two-dimensional turbulent flows in Cartesian and spherical geometries yield different results. The energy transfer mechanism, the rate of enstrophy transfer to higher wave numbers and the behavior of coherent structures in spherical coordinates are different from those in Cartesian coordinates. Here, we compare two-dimensional turbulence on a plane with two-dimensional turbulence on the surface of a sphere is spectral space and explain the differences in Cartesian and spherical geometries.

Leila Azadani
Virginia Tech

Date submitted: 01 Aug 2014 Electronic form version 1.4