1046-65-1868 **Yuen-Yick Kwan*** (tkwan@tulane.edu) and **Jie Shen** (shen@math.purdue.edu). *A new spectral-element method in polar and spherical geometries.* Preliminary report.

When solving differential equations in a unit disk or cylinder, it is common to apply Fourier transform to the azimuthal direction to reduce the dimension of the problem. When a tensor-grid is used, the same number of Fourier modes is used in the whole disk. This may not be optimal since the function may oscillate less on a circle near the pole than on one away from the pole. To achieve uniform resolution, the number of Fourier modes used should increase as the distance from the pole increases.

Similar situation appears when solving equations on the surface of sphere, where it is common to apply the Fourier transform in the longitudinal direction. Different discretizations may be used in the latitudinal direction. Though spherical harmonics can provide uniform resolution on the sphere, the transforms involved are complicated and expensive. On the other hand, other methods may not provide uniform resolution.

We present a new method to approximate functions in the unit disk and on the surface of sphere, in which more Fourier modes are used as the distance from the pole increases. The method can provide uniform resolution and uses collocation points that are more uniformly-distributed than traditional methods. (Received September 16, 2008)