A finite-volume icosahedral shallow water model

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In recent years, a new type of icosahedral geodesic spherical grid consists of hexagon grid points with 12 pentagons is used for discretization of geophysical fluid dynamic equations for grid-point global models. The icosahedral grid provides a quasi-uniform coverage of the sphere and allows hierarchical refinements of grid spacing. We develop an icosahedral shallow water model formulated on a local projected Cartesian coordinate. The model is solved with a piecewise-linear finite volume spatial and the 3rd order Adam-Bashforth time differencing schemes. Small variations in icosahedral grid spacing tend to generate relatively large noises clustered around the 12 pentagon points. These inhomogeneous grid spacing errors are reduced with the spring dynamic approach that alleviates grid tensions existed in the standard icosahedral grid. The spring dynamic optimized grid greatly reduces the noise clustered problem around the pentagon points. The icosahedral shallow-water model is evaluated with the standard tests of Williamson et. al.(1992) for shallow water models on the sphere. The results from these standard test cases as well as recent development into the three-dimensional model with full physics will be reported in the conference.