1078-41-49       **Natasha Flyer\*** (`flyer@ucar.edu`), 1850 Table Mesa Dr., Boulder, CO 80307. *Radial Basis Functions: Developments and applications to planetary scale flows.*

Radial basis functions (RBFs) can be seen as a major generalization of pseudospectral methods, abandoning the orthogonality of the basis functions and in return obtaining much improved simplicity and geometric flexibility. Spectral accuracy becomes now easily available also when using completely unstructured node layouts, permitting local node refinements in critical areas. Computational cost and numerical stability were initially seen as potential difficulties, but major progress has recently been made also in these areas. The first major PDE applications for which RBFs have been shown to compete very successfully against the best current numerical approaches can be found in the geosciences. Examples that we describe here include vortex roll-ups, idealized cyclogenesis, unsteady nonlinear flows described by the shallow water equations, and 3-D convection in the earth's mantle. (Received November 11, 2011)