A Spectral-Element Model of Mantle Convection

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We describe results for modeling mantle convection using the spectral-element method[1]. The spectral-element method combines the geometrical flexibility of the FEM and the high accuracy (exponential convergence) of spectral methods. We model the mantle as a highand as an infinite Prandtl (Pr) number fluid and obtain unsteady solutions for varying Rayleigh (Ra) numbers. Results for rectangular and for fully spherical geometries are described, relevant to the Earth's mantle. Parallel computation results are presented for PC clusters, as well as larger systems such as the SGI 3000.

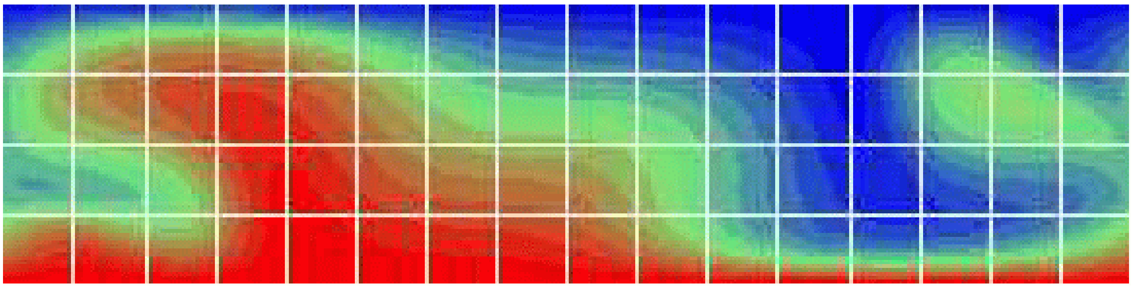

Fig. 1. Infinite Pr mantle convection in rectangular geometry with Ra = 10^4. Also shown are element boundaries.

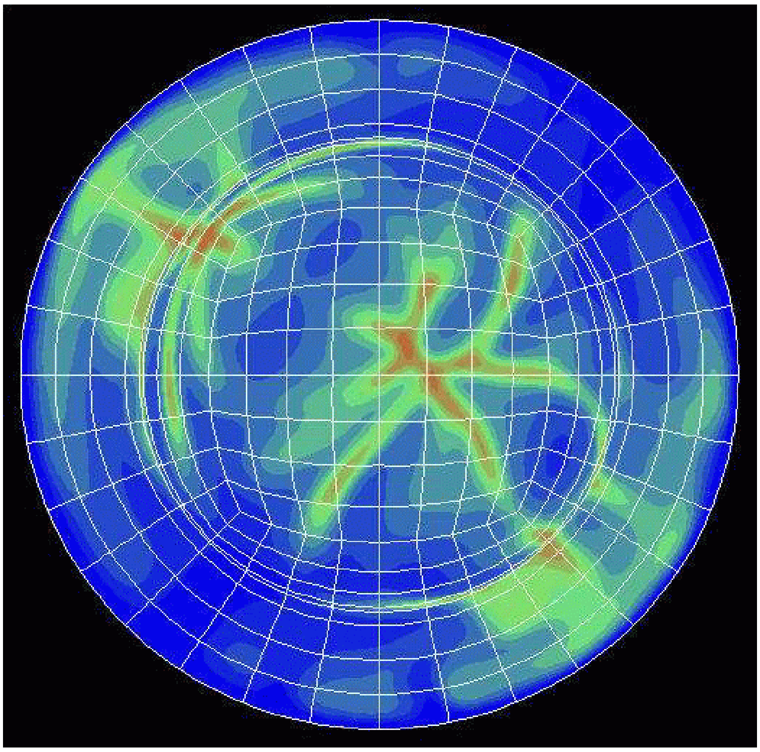

Fig. 2. Pr = 10 spherical case. Temperature field at constant-radius, and simultaneously a cross-sectional view. Also shown are element boundaries for N = 8 3D elements.

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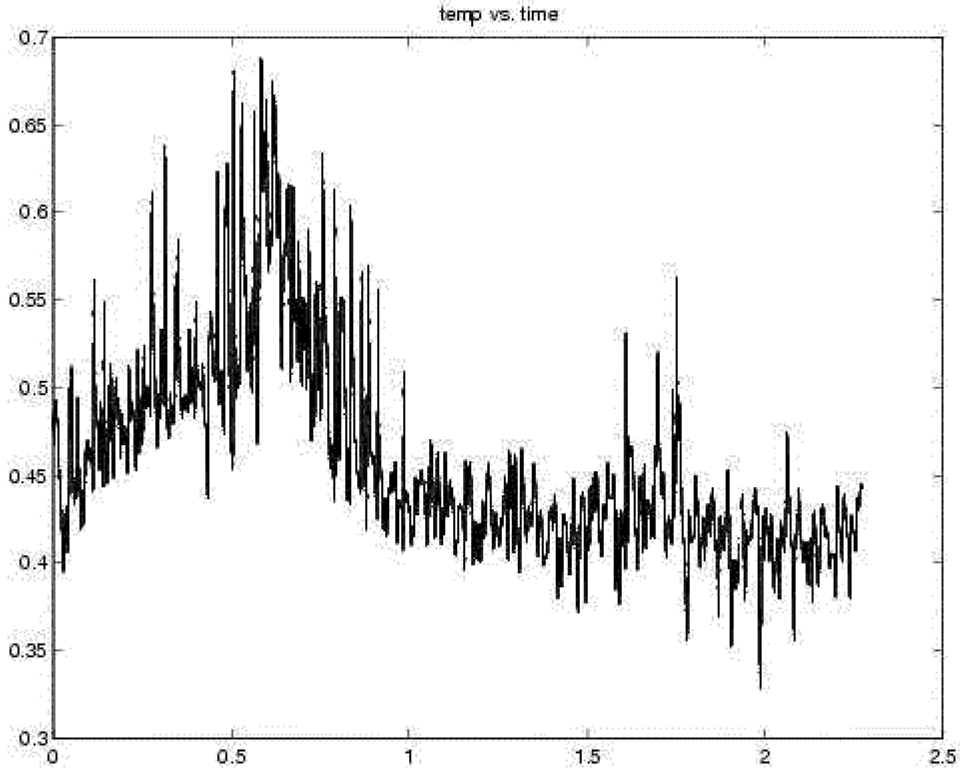

Fig. 3. Temperature evolution for case displayed in figure [?].

Acknowledgments

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References

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