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Interactive comment on "On the sensitivity of 3-D thermal convection codes to numerical discretization: a model intercomparison" *by* P.-A. Arrial et al.

Anonymous Referee #1

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The authors have provided a comparison between two numerical techniques, demonstrating differences in stability behaviour with respect to different initial conditions and Rayleigh number. These are interesting & important results highlighting how dynamics are influenced by choice of discretisation.

While touched upon in section 4, I felt that more could have been said about how resolution influenced simulation results relative to Rayleigh number. Perhaps a spherical harmonic power spectrum would be revealing, especially for more convective simulations where discretisation choice will more strongly impart on dynamics. For the dodecahedron initial condition, it does appear that the simulations tend towards different stable solutions regardless of resolution. This is perhaps owing to different stability

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behaviour for various modes (initially appearing as noise). It might be interesting to see if the CitcomS simulation can be persuaded towards the tetrahedron solution by seeding the simulation with some small amount of the required mode.

Many possible avenues for further investigation, though from my perspective the significance of different order FEM elements and alternate meshes would be interesting, as would comparison with other community codes to see if some behaviour consensus was observed.

Some very minor corrections:

Section 6, Line 16: As mentioned earlier in your report, CitcomS is a finite element code, not finite volume.

Figure 5: label within images states \delta=0.08 (citcom) & \delta = 0.09 (RBF), while dialog states that both have \delta=0.09

Figure 12: The labelling listed in the dialog seems inconsistent with the images.

Interactive comment on Geosci. Model Dev. Discuss., 7, 2033, 2014.