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Numerical investigation of the dynamo bifurcation VINCENT MORIN, MAE, UCSD, EMMANUEL DORMY, ENS, IPGP, CNRS — The dynamo effect is the process by which the magnetic field of the Earth is generated. In the presence of a small initial magnetic field, convective motion in the fluid outer core produce currents and thus a magnetic field which can reinforce the initial field and sustain it against ohmic diffusion. There is also a feedback of the magnetic field on the flow which limits its growth. Our direct numerical approach consisted in solving the equations for the velocity field, the magnetic field and the temperature in a rapidly rotating spherical shell. We focused our study on the dynamo bifurcation. This dynamo bifurcation corresponds to the transition from a system with a decaying magnetic field to a system with a self-sustain magnetic field by an increase of the control parameter. Even though in this region of the parameter space the problem might appear more tractable, we observed a great variety of behaviors for the magnetic field, with for example metastable solutions or a magnetic field enhancing or limiting the convective motions. We also observed that the nature of the dynamo bifurcation can be strongly affected by a small change in the parameters.

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