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Status and prospects of geodynamo modeling

Numerical modeling of the geodynamo and of planetary dynamos has progressed subtantially in the past two decades. Self-consistent geodynamo models can reproduce observed properties of the geomagnetic field to a degree that sometimes elicits envy in the stellar dynamo community. This comprises the dipole-dominance and average strength of the magnetic field, some details of its the mophological structure, time-scales of secular variation and in some models also stochastic dipole reversals. These successes were achieved nonewithstanding that several model parameters are far from actual values and dynamo models have been used to infer the structure of flow in the Earth's core and to elucidate the principal mechanism of field generation. In this review talk I will give an overview of what we have learned from geodynamo models, which issues are still unresolved or controversial and what future perspectives exist for modeling of the geodynamo and for other planetary dynamos.