

## A magnetic probe into Earth's core and deep-mantle dynamics

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It is widely recognized that Earth's core dynamics is an important research subject in understanding the past, present and future states of our planet, firstly because the metallic core is a vast domain accounting for one thirds of Earth's mass and plays a significant role in thermal history, and secondly because it dynamically generates the main geomagnetic field that has historically been observed for several hundred years and geologically recorded in rocks since more than a billion years ago. This review attempts to cover this subject with an attention to general questions: how geomagnetic-field data can be used to advance the deep-Earth science, and what theoretical progresses have been made and could be made. I will deal with some of the following particular topics: (1) various driving sources of convection, such as thermal and compositional buoyancy and inertial forcing (e.g., luni-solar precession); (2) a dynamo without a solid inner core; (3) a dynamo that operates in a part (e.g., an inner part) of the outer core; (4) sensitivity of the geomagnetic field structure (e.g., dipolarity), intensity, and time variations (e.g., reversal frequency) to the above mentioned various parameters.