

## **FIELD MODELLING FROM SCALAR-ONLY DATA FROM DIFFERENT HEIGHTS**

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The Swarm mission promises some years of high-quality vector global vector data from multiple satellites. In this context, it may seem contrary to be considering the old problem of perpendicular error or Backus effect – the limitations of field modelling from scalar-only data. However, post-Swarm, it is important to consider what possible missions may be available. It is well known that field models constructed from intensity data alone suffer from problems of non-uniqueness, closely related to the formal non-uniqueness of the Backus series – a potential magnetic field everywhere perpendicular to a dipole field, and therefore having a very limited effect on the magnetic intensity. This theorem applies to magnetic measurements taken on a spherical surface, and the condition for formal non-uniqueness does not apply if measurements are available through a spherical shell. Here, we use scalar data from CHAMP and Ørsted to examine whether two satellites at different heights allow production of useful field models: does the data at a second height sufficiently resolve the Backus series associated with the lower height? To what extent would two or more satellites measuring total intensity be an effective solution to the future monitoring of variations in the core magnetic field, allowing the possibility of such monitoring in future at lower cost and technical complexity than current missions?

Magnetic field modelling

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