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Dynamos in terrestrial exoplanets and their possible detection [*Invited*]

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Abstract

Recent astronomical observations indicate approximately 12% of extrasolar planets are of Earth to Super-Earth size (1-2 Earth radii) [Borucki et al. (2011)]. Here we explore the energetic state of Earth-like exoplanets favorable for dynamo action in the core. Strong magnetic fields are maintained in rapidly cooling liquid iron cores, which requires efficient heat transfer through the mantle but that the core remain at least partially liquid [Driscoll and Olson (2011)]. Numerical dynamo models indicate that strong dipole fields are possible with a particular combination of convective forcing and rotation, but occur over a large range of parameters [Driscoll and Olson (2009)]. Solar wind electrons interacting with planetary magnetic fields are known to generate cyclotron radio emission [Zarka (2007)]. We apply radiometric scaling laws to estimate the cyclotron emission from strong terrestrial exo-dynamos and propose mechanisms that may allow for their detection in the future.

References

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