Abstract Submitted
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Influence of large-scale zonal flows on the evolution of stellar and planetary magnetic fields[1] LUDOVIC PETITDEMANGE, Max-Planck-Institut für Astronomie MPIA, MARTIN SCHRINNER, Laboratoire de radioAstronomie (LRA-ENS) Paris, EMMANUEL DORMY, Laboratoire de radioastronomie (LRA-ENS) Paris, Institut de physique du Globe IPGP, ENS COLLABORATION — Zonal flows and magnetic field are present in various objects as accretion discs, stars and planets. Observations show a huge variety of stellar and planetary magnetic fields. Of particular interest is the understanding of cyclic field variations, as known from the sun. They are often explained by an important Ω-effect, i.e., by the stretching of field lines because of strong differential rotation. We computed the dynamo coefficients for an oscillatory dynamo model with the help of the test-field method. We argue that this model is of $\alpha^2\Omega$-type and here the Ω-effect alone is not responsible for its cyclic time variation. More general conditions which lead to dynamo waves in global direct numerical simulations are presented. Zonal flows driven by convection in planetary interiors may lead to secondary instabilities. We showed that a simple, modified version of the MagnetoRotational Instability, i.e., the MS-MRI can develop in planteray interiors. The weak shear yields an instability by its constructive interaction with the much larger rotation rate of planets. We present results from 3D simulations and show that 3D MS-MRI modes can generate wave pattern at the surface of the spherical numerical domain.

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