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Mean Electromotive Force for a Ring of Helical Vortices

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We study the dynamo mechanism for a flow made of a ring of stationary helical vortices in an electrically conducting media. The choice of this flow is related to the one obtained in thermal convection in a rotating shell which is also expected in the Earth's outer-core. This choice is also related to a sodium experiment, carried out in Grenoble, based on a spherical Taylor-Couette model. Applying the mean field approach and relying on the second order correlation approximation we derive the mean electromotive force (e.m.f.) produced by such a flow. We find that such a ring of helical vortices may produce, from an azimuthal mean magnetic field, an azimuthal mean e.m.f. leading to the generation of a poloidal magnetic field.

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