R004-P05
ポスター会場：11/11　AM1/AM2（9:15-12:15）

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Geomagnetically observable quasi-modes and their dissipative counterparts in a stratified layer at the top of the Earth's core

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Parts of (sub-)decadal geomagnetic fluctuations may be attributed to magnetohydrodynamic (MHD) waves propagating within a stratified layer at the top of the Earth's core (e.g., Buffett, 2014 [1]; Chulliat et al., 2015 [2]). Identifying their cause has inferred the physical properties of the stratified layer, providing insights into the thermo-chemical history of the Earth.

On such linear waves, impacts of the inhomogeneity of the background magnetic field are worth considering. Nakashima & Yoshida (2024)[3] studied horizontally two-dimensional ideal MHD waves over a rotating sphere under an inhomogeneous (non-Malkus) toroidal background field. They demonstrated that slow magnetic Rossby (MR) eigenmodes, which may cause (sub-)decadal geomagnetic variations, can disappear owing to the appearance of the Alfvén continuum. This result may imply that such MHD waves do not exist as 'true' eigenmodes within the layer.

This poster presentation discusses whether quasi-modes can exist instead of such MHD eigenmodes. Although quasi-modes strictly differ from eigenmodes, they behave as exponentially decaying oscillatory 'modes' (e.g., Schecter *et al.*, 2000[4]). I exploit the method of spectral deformation (e.g., Crawford & Hislop, 1989[5]) in a setting identical to Nakashima & Yoshida (2024)[3] to find numerically quasi-modes corresponding to slow MR eigenmodes. Here, I show that such quasi-modes exist in the system where slow MR eigenmodes cannot exist. Nevertheless, we cannot construct the profile of their eigenfunctions owing to the ill-conditioning of the analytic continuation recovering eigenfunctions (e.g., Csótó *et al.*, 1990[6]). On the other hand, I found that the branch of the eigenfrequencies of the quasi-modes is similar to that of the lowest damping mode in weakly dissipative system. Because fine internal boundary layers in a nearly ideal MHD system require the calculation with a higher truncation degree, it may be beneficial to use both results complementarily.

Although quantitative comparison with observed geomagnetic fluctuations may require extensions to the MHD shallow water system (e.g. Márquez-Artavia et al., 2017 [7]) or to three-dimensional thin shell models, the present study suggests that quasi-modes should probably also be examined in the study of MHD waves in the Earth's liquid core.

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