Magneto-Coriolis-centrifugal convection in the Little Earth Experiment 2

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Abstract

The Little Earth Experiment 2 (LEE2) was designed to study rotating magnetoconvection, with the aim of modelling the fundamental physical processes that occur in planetary interiors. LEE2 uses sulfuric acid as the working fluid, which allows for optical access and flow visualisation using PIV. This is a key advantage over other rotating magnetoconvection experiments that use optically opaque liquid metals.
We have used LEE2 to study magneto-Coriolis-centrifugal convection, i.e. rotating convection with strong centrifugal buoyancy effects, in a slender cylinder with an aspect ratio of one-third. Here, I will show the velocimetry results based on the five horizontal PIV planes taken. I will outline the different regimes we found and how they compare with the predictions of linear theory. Specifically, I will focus on how both strong magnetic fields and centrifugal buoyancy alter the flow morphology and can enhance the momentum transport.

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