want to be in the same session with Ruben Rojas DFD17-2017-003001

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Reservoir computer predictions for the Three Meter magnetic field time evolution[1] ARTUR PEREVALOV, RUBEN ROJAS, ITAMAR SHANI, BRIAN HUNT, DANIEL LATHROP, University of Maryland College Park — The source of the Earth's magnetic field is the turbulent flow of liquid metal in the outer core. Our experiments goal is to create Earth-like dynamo, to explore the mechanisms and to understand the dynamics of the magnetic and velocity fields. Since it is a complicated system, predictions of the magnetic field is a challenging problem. The experiment is a three-meter diameter outer sphere and a one-meter diameter inner sphere with the gap filled with liquid sodium. The spheres can rotate up to 4 and 14 Hz respectively, giving a Reynolds number up to $1.5 * 10^8$. Two external electromagnets apply magnetic fields, while an array of 31 external and 2 internal Hall sensors measure the resulting induced fields. We use this magnetic probe data to train a reservoir computer to predict the 3M time evolution and mimic waves in the experiment. Surprisingly accurate predictions can be made for several magnetic dipole time scales. This shows that such a complicated MHD systems behavior can be predicted.

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