Abstract Submitted for the DFD17 Meeting of The American Physical Society

On the Reinterpretation of Magnetostrophic Dynamo Action¹ JON AURNOU, University of California, Los Angeles, KEITH JULIEN, University of Colorado, Boulder — The generation of planetary magnetic fields has long been argued to be the product of magnetostrophic dynamo action, in which the leading-order force balance exists between Lorentz, Coriolis, pressure and buoyancy forces. A number of recent planetary dynamo simulations claim to be operating in this purported ultimate dynamo regime. Here we will argue that the recent simulations are in leading-order quasi-geostrophic (QG) balance, with magnetostrophy occurring only in the subdominant balances. Presenting these simulations as examples of classical, leading-order magnetostrophic balance is a reinterpretation of the very definition of this regime. Our arguments imply that planetary dynamo models continue to operate in the QG dynamo regime. Whether or not magnetostrophic dynamo action can actually occur in planetary settings remains an open, unanswered question.

¹NSF Geophysics Program

Jon Aurnou University of California, Los Angeles

Date submitted: 31 Jul 2017

Electronic form version 1.4