2009 Fall Meeting
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HR: 0946h
AN: **SM41C-08**
TI: Scale-Dependent Alignment of Velocity and Magnetic Fluctuations in Anisotropic MHD Turbulence
AU: **Ng, C**
EM: *chung-sang.ng@gi.alaska.edu*
AF: *Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK, United States*
AU: **Bhattacharjee, A**
EM: *amitava.bhattacharjee@unh.edu*
AF: *Center for Integrated Computation and Analysis of Reconnection and Turbulence (CICART), and Center for Magnetic Self-Organization (CMSO), University of New Hampshire, Durham, NH, United States*
AU: **Bigot, B**
EM: *barbara@artemis.sr.unh.edu*
AF: *Center for Integrated Computation and Analysis of Reconnection and Turbulence (CICART), and Center for Magnetic Self-Organization (CMSO), University of New Hampshire, Durham, NH, United States*
AU: **Ponty, Y**
EM: *Yannick.Ponty@oca.eu*
AF: *Observatoire de la Cote d'Azur, Nice, France*
AB: The tendency of alignment between velocity and magnetic field fluctuations in MHD turbulence has been a subject of great interest theoretically [Grappin et al. 1983, Matthaeus et al. 1983, Pouquet et al. 1988] as well as observationally over many years. There has been recent theoretical interest in the effect of scale-dependent alignment of velocity and magnetic fluctuations in 3D anisotropic MHD turbulence with a large-scale magnetic field [Boldyrev 2005, 2006]. This theory predicts that the angle θ between the velocity and magnetic fluctuation vectors has a scaling of $\theta \propto \lambda^{1/4}$, where λ is the spatial scale of the fluctuations. There have also been simulations on 3D forced MHD turbulence that supports this prediction [Mason et al. 2006, 2007]. In this paper, we demonstrate that the feature of scale-dependent alignment and the scaling of $\theta \propto \lambda^{1/4}$ also occurs in 2D within a range of time interval and spatial scales, despite the fact that Boldyrev's phenomenological theory appears to rely on physical mechanisms operative in fully 3D turbulence in the presence of a strong external field. High-resolution pseudo-spectral simulations and scaling analysis, based on pseudo-Alfven waves in 2D, will be presented. These findings suggests that the phenomenon of scale-dependent alignment may be a more universal feature of MHD turbulence than has been thought recently, independent of dimensionality, whether the turbulence is balanced

or imbalanced. Implications for solar wind turbulence observations will be discussed. This work is supported by DOE and NASA.
DE: [2752] MAGNETOSPHERIC PHYSICS / MHD waves and instabilities
DE: [4490] NONLINEAR GEOPHYSICS / Turbulence
DE: [7524] SOLAR PHYSICS, ASTROPHYSICS, AND ASTRONOMY / Magnetic fields
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