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Cross-Helicity Generation and Structure Formation in β-plane MHD Turbulence ROBIN HEINONEN, MAYA KATZ, PATRICK DIAMOND, University of California San Diego — We study turbulence in the solar tachocline using the 2-D magnetohydrodynamic equations in the β-plane approximation. Cross-helicity conservation in this system is explicitly broken by the β term. We use an analytical closure to study the nonlinear cross-helicity dynamics and relate the generation of finite cross-helicity to the induced electric field. Furthermore, we use a method based on deep supervised learning, previously introduced to study the Hasegawa-Wakatani system, to infer from numerical simulation a mean-field model for the turbulence dynamics. We use the inferred model to study structure formation in the limit of weak mean toroidal magnetic field. (In the presence of a stronger field, the fluctuations Alfvénize and zonal structures are destroyed.) Results are presented and compared to analytical calculations.

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