

Physics Department Seminar

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Tracking Buoyant Magnetic Loops in a 3D Stellar Dynamo Simulation



The magnetic activity observed in Sun-like stars can strongly impact the potential habitability of Earth-like planets, just as our Sun's magnetic activity impacts the Earth's atmosphere and magnetosphere. This project models the generation of stellar magnetism through convective

dynamo action and how magnetic fields can bundle together into loops and rise from the deep interior to the surface of the star as sunspots. The rise of magnetic loops has been modeled using the thin flux tube (TFT) approximation and, more recently, using full 3D magnetohydrodynamics (MHD) simulations. Analysis tools were developed to compare the results of 3D MHD models with TFTs. Some preliminary results have suggested that TFT models underestimate the coupling between rising magnetic structures with the surrounding convective flows, suggesting that further refinement may be necessary to better resolve the results between the two models.

