Reproducing the Photospheric Magnetic Field Evolution during the Rise of Cycle 24 with Flux Transport by Supergranules

David Hathaway, NASA Marshall Space Flight Center

Lisa Upton, The University of Alabama in Huntsville

We simulate the transport of magnetic flux in the Sun’s photosphere by an evolving pattern of cellular horizontal flows (supergranules). Characteristics of the simulated flow pattern can match observed characteristics including the velocity power spectrum, cell lifetimes, and cell motions in longitude and latitude. Simulations using an average, and north-south symmetric, meridional motion of the cellular pattern produce polar magnetic fields that are too weak in the North and too strong in the South. Simulations using cellular patterns with meridional motions that evolve with the observed changes in strength and north-south asymmetry will be analyzed to see if they reproduce the polar field evolution observed during the rise of Cycle 24.