Abstract Submitted
for the NWS05 Meeting of
The American Physical Society

Solar dynamo and the effects of magnetic diffusivity[1] E.J. ZITA, NIGHT SONG[2], Evergreen State College, ERIC MCDONALD, MAUSUMI DIKPATI, HAO/NCAR — We are closer to understanding how the Sun's magnetic field flips polarity every 11 years. Dikpati's kinematic dynamo model shows that in addition to the two familiar Babcock-Leighton effects (convection and differential rotation), a third mechanism is required. Meridional circulation was discovered by helioseismology, and its inclusion enables our model to accurately reproduce major features of the solar cycle. However, fundamental questions about the solar dynamo remain unanswered. How does magnetic reconnection release magnetic energy and change topology? How do magnetic fields diffuse in the convection zone, where the solar dynamo operates? How do resistivity and turbulence in the solar plasma determine the magnetic diffusivity? We explore some of these questions with our kinematic dynamo model. Our simulations show how meridional circulation carries evolving magnetic flux up from the base of the convection zone at the equator, poleward along the surface, and back down inside the Sun. Our tests give new clues about how magnetic diffusivity varies across the convection zone, and can lead to improved predictions of future solar cycles.

[1]Supported by NASA's Sun-Earth Connection Program NRA 00-OSS-01 SEC, Living With a Star Program W-10107, and Theory Program W-10175
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Date submitted: 28 Mar 2005 Electronic form version 1.4