Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Computer Simulations and Observations of Solar Magnetic Flux Ropes and Eruptions ALEXANDER KOSOVICHEV, IRINA KITIASHVILI, Stanford University, NAGI MANSOUR, ALAN WRAY, NASA Ames Research Center — Solar observations reveal a great variety of plasma eruptions of different scales and energetics, from small-scale jets and spicules to giant coronal mass ejections. The magnetic flux ropes observed in the solar atmosphere and corona are formed in the turbulent convection zone by a dynamo process, which is poorly understood. We present 3D radiative MHD simulations of the upper convective boundary layer and the chromosphere, which capture the basic physics of magnetic self-organization and dynamics of the turbulent solar plasma, formation of magnetic flux ropes and spontaneous small-scale spicule-like eruptions. The simulations show that the key mechanism of the flux-rope formation and eruptions is in the generation of compact vortex tubes and their interaction with magnetic field. The simulation results are compared with observations from the Solar Dynamics Observatory and large ground-based telescopes.

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Date submitted: 14 Aug 2012 Electronic form version 1.4