Abstract Submitted
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Comparing simulations of rising flux tubes through the solar convection zone with observations of active region properties: constraining the dynamo field strength[1] MARIA WEBER, NCAR/High Altitude Observatory & Colorado State University, YUHONG FAN, MARK MIESCH, NCAR/High Altitude Observatory — We use a thin flux tube model in a rotating spherical shell of turbulent convective flows to study how active region scale flux tubes rise buoyantly from the bottom of the convection zone to near the solar surface. We investigate toroidal flux tubes originating at the base of the convection zone with field strengths ranging from 15 kG to 100 kG at initial latitudes ranging from 1 degree to 40 degrees with a total flux of 10^{20} Mx to 10^{22} Mx. With the influence of a convective velocity field, rise times are reduced (from years to months) for all fluxes, and loops are able to emerge at low latitudes even for large flux. We examine geometric and magnetic field asymmetries between the leading and following legs of the emerging loops, and the tilt angle of the emerging flux tube as a function of the latitude in order to identify the observed Joy's Law trend of solar active regions. By comparing our flux tube simulation results with observations of solar active regions, we attempt to constrain the magnetic field generated by the solar dynamo at the base of the convection zone.

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