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Convective dynamos in solar-type stars BENJAMIN BROWN, University of Wisconsin - Madison — During their long main-sequence lifetime, stars like our Sun have strong magnetic fields at their surfaces. Indeed, magnetism is a nearly ubiquitous feature of the F- to M-type stars, which all have convective envelopes beneath their photospheres where a plasma dynamo builds and rebuilds the global-scale fields. The surface magnetism depends most strongly on the rotation rate of the star, with young rapidly rotating stars showing significantly more magnetic activity than our Sun, but the source of this correlation remains unclear. Here we explore recent 3-D magnetohydrodynamic simulations of convectively driven dynamos in solar-type stars. These simulations are conducted with the anelastic spherical harmonic (ASH) code on modern supercomputers. These simulations of global-scale convection and dynamo action produce strikingly organized magnetic structures in the bulk of their convection zones. This is a surprise as solar dynamo theory generally holds that a tachocline of shear is required for such global-organization. Here, wreaths of magnetic field fill the convection zone and can undergo regular cycles of polarity reversal, with cyclic behavior a common feature throughout the parameter space we have explored.

Benjamin Brown
University of Wisconsin - Madison

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