Generating Buoyant Magnetic Loops in Solar-like Dynamos

2 kG

30 kG

0.92

0.82

The ASH Mob

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And more...

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- Rotating MHD convection in full spherical shells
- Large-eddy simulation with subgrid-scale model

- Simplified physics
- Simulations cover 0.72 to 0.97 R⊙ (no tachocline or near-surface shear layer)

Modeling with ASH

Dynamos at $3\Omega_{\odot}$



Brown, Brun, Miesch, & Toomre 2010

Magnetic Wreaths





0.96 R $_{\odot}$

$\textbf{0.72}~\textbf{R}\odot$



"Synoptic Map"







Conclusion

Convective dynamo simulations of buoyant magnetic loops are showing that:

- Convection plays a key role in the flux emergence process, possibly setting the size of active regions
- Statistical trends such as Hale's Polarity Law, Joy's Law, etc. can be established in the deep interior
- Emergent flux can be largely generated by rapid, small-scale turbulent processes

