A dynamo code using generalised compact radial finite-differences

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Generalised compact finite-difference methods generate high-order, low bandwidth schemes useful for the implicit evaluation of linear-differential operators acting on a scalar field. Such approximations are built by taking a linear combination of the operator acting on the field, as well as the field itself, on some computational stencil, and equating Taylor coefficients, as in regular finite-difference methods. Such methods are useful in fluid dynamics and dynamo problems, which require the implicit evaluation of high-order linear differential operators, as well as differential operators with mixed space-time derivatives. Results from simulations of the spherical benchmark models of Marti \& Jackson, using spherical harmonic representations for angular dependence, finite-differences in radius and, a semi-implicit multi-step Gear method combined with compact finite-difference methods for time-stepping, are presented to test the accuracy and feasibility of these methods for dynamo simulations.