

Sparse spectral methods for partial differential equations on spherical caps, significant and novelty

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This paper introduces a novel approach for solving partial differential equations on an important subset of the full sphere: spherical caps. The approach leads to sparse discretisations of general partial differential operators that can be efficiently solved with spectral convergence, and in the case of operators that are invariant to rotation around the pole the resulting linear systems can be constructed and solved in optimal complexity. There is a big desire for more localised approaches to solving PDEs on subsections in weather prediction and other applications, and this manuscript lays the groundwork for high order, high accuracy new numerical methods.

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