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GungHo: Designing a next generation dynamical core for weather & climate prediction

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To meet the challenges posed by future developments of supercomputers the Met Offices' Unified Model for climate and weather prediction is being redesigned with the aim of achieving improved scalability and portability whilst remaining at least as accurate as the current model. The new model is named LFRic after Lewis Fry Richardson.

The dynamical core of this new model, Gungho, uses explicit finite-volume type discretizations for the transport of fields coupled with an iterated-implicit, mixed finite-element discretization for all other terms. This gives a stable & accurate method whilst maintaining many of the mimetic and conservation properties of the underlying equations on arbitrary quasi-uniform meshes. The Gungho dynamical core is then coupled to the existing sub-grid physical parameterizations used in the current Unified Model to form an atmospheric model suitable for weather and climate prediction.

To remain agnostic to future programming paradigms a separation of concerns approach, along with a novel automatic code generation (PSyclone) of the parallel layer, is used. This allows script based automatic optimisation of the entire model code and the ability to adapt the model to different parallelisation strategies

This talk details the formulation and design used in Gungho and demonstrates its performance across a variety of benchmarks

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Session Classification: Moderator: Michail Diamantakis (ECMWF)