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Performance Study of Climate and Weather Models: Towards a More Efficiently Operational IFS

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The enhancement of numerical codes is given a lot of attention around Europe. Weather and climate models are improving the accuracy of their operational simulations with some factors such as the reduction of parametrization or the increase of grid resolution. However, this accuracy improvement will need more computational resources through a new generation of supercomputers and HPC techniques. To take advantage of this new generation, firstly, performance analysis could help to know in detail the computational behavior of the models and the information obtained could be used to introduce optimizations. Secondly, new ways of optimization are presented, including dynamic load balancing and the improvement of the tyoical paradigms use to take advantage of the MPI and OpenMP implementations of our models.

The optimizations will improve the energy efficiency of the models when thousands of resources are used for their parallel execution and reducing the final execution time of the operational models which are launched everyday to obtain predictions. In this study, we present results for the operational configuration used by the ECMWF for weather predictions, using the last stable version of IFS. We present our methodology and analysis results to know more about the computational behavior of IFS. Additionally, we present different options about how to improve the functionality and performance of some of the bottlenecks found.

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