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Next generation ICON NWP forecasting system on NVIDIA GPUs at MeteoSwiss

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In 2016 MeteoSwiss became the first national weather service to deploy in operations a NWP model forecast on GPUs. After five years and 2 generations of HPC systems based on NVIDIA GPUs, MeteoSwiss is preparing the transition from the regional NWP COSMO model to a new generation NWP forecasting system based on the ICON model. The new high resolution ICON based forecasting system will be deployed in the Alps HPC system infrastructure at CSCS in 2023. During the past years of developments, MeteoSwiss has prepared this transition porting the ICON model to GPUs and optimizing it to replace the COSMO model. In comparison to COSMO, not only ICON is composed by a larger code base but it exhibits a larger complexity in its structure and computational patterns, as for example those derived from the use of the icosahedral grid. In this work we will show the challenges of running NWP models operationally on GPUs and the technologies used for enabling the ICON model on GPU, with a combination of OpenACC and a new generation of high-level python DSL designed for the dynamical core of ICON. Finally we will present an outlook on developments at MeteoSwiss for future HPC system architectures.

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