



Climate simulation and numerical weather prediction using GPUs

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After the successful development of a prototype GPU version of the atmospheric model COSMO, the COSMO Consortium has decided to bring these developments back to the official version in order to have an operational GPU-capable model for climate and weather prediction. The implementation is designed so as to avoid costly data transfer between the GPU and the CPU and achieve best performance. To this end, most parts of model are ported to GPU. Furthermore, the implementation has been specifically targeted for hardware architectures with fat nodes (nodes with multiple GPUs), which is very favourable in terms of minimizing the energy-to-solution metric. The dynamical core has been completely rewritten using a GPU-enabled domain-specific language. The rest of the model namely the physical parametrizations and the data assimilation are ported to GPU using the OpenACC compiler directives. In this contribution, we present the overall porting strategy as well as new features available on GPU in the latest version of the model in particular concerning the data assimilation. Performance and verification results obtained on several hybrid Cray systems are presented and compared against the current operational model version used at MeteoSwiss.