Geophysical Research Abstracts
Vol. 21, EGU2019-8371, 2019
EGU General Assembly 2019

Performance portability on GPU and CPU with the ICON global climate model

Valentin Clément (1), Remo Dietlicher (1), Oliver Fuhrer (2), Philippe Marti (1), Carlos Osuna (2), Will Sawyer (3), and Tobias Wicky (2)

(1) ETH Zurich, Center f. Climate Systems Modeling, Department of Environmental Systems Science , Switzerland, (2) Federal Office of Meteorology and Climatology MeteoSwiss, Switzerland, (3) CSCS Swiss National Supercomputing Center, Switzerland

In order to keep up with the fast evolution of hardware technologies, the global numerical weather prediction and climate model ICON is being adapted to run on heterogeneous GPU supercomputers.
A first GPU version based on OpenACC compiler directives is being developed to get a base line performance on such architectures. Comparison results for key components of the model using this approach on CPU and GPU will be presented. An important goal of the code adaptation effort is to achieve performance portability across architectures. This may not be achievable with compiler directives only and several approaches based on domain specific languages are considered. A Fortran based DSL, the CLAW-DSL, designed to address physical parametrization of atmospheric model for which horizontal column are independent is presented. With this approach, the physical parametrization is written in Fortran only considering the vertical dependencies, the CLAW tools then add the horizontal dimensions as necessary and generate optimized code for different target architectures. We show in this work performance of key physical parametrizations of the ICON model on CPU and GPU and present the CLAW-DSL and CLAW tools for Fortran source code. For the dynamics, a high level DSL based on the high performance library GridTools is considered and key aspects of this approach are presented.