



## ICON opportunities at the Research Center Jülich

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Since 2013, the Simulation Laboratories “Climate Science” and “Terrestrial Systems” at the Jülich Supercomputing Centre (JSC) are building up expertise for porting and tuning of different ICON (ICOsahedral Nonhydrostatic) model applications on the Jülich supercomputers, namely JUQUEEN and JURECA. During the High Definition Clouds and Precipitation for advancing Climate Prediction (HD(CP)<sup>2</sup>) project we were able to scale efficiently the LEM configuration of ICON to the order of 10<sup>5</sup> cores and even for simulations using the entire JUQUEEN machine (458,752 cores). Currently, we run regularly the ICON model with two nested grids of 624 m and 312 m horizontal resolution over Germany for selected days as defined in the HD(CP)<sup>2</sup> project and support model evaluation.

During the last two years we successfully installed several ICON versions on our general purpose cluster JURECA, deploying 1872 compute nodes comprising two Intel Xeon E5-2680 v3 Haswell CPUs each and 45,216 physical cores in total. This includes the ICON-A with MESSy interface for upcoming chemistry-climate applications and the ICON-LEM coupled to the Terrestrial Systems Modeling Platform (TerrSysMP, a fully coupled regional SVA modelling system currently consisting of COSMO-CLM-ParFlow coupled with OASIS3).

In November 2017, JURECA has been extended by a booster module consisting of 1640 nodes each equipped with one Intel Xeon Phi “Knights Landing” 7250-F CPU. Currently we are testing the efficiency of ICON on the KNL architecture and will provide porting and tuning hints for ICON users on such vector CPUs.

The successor of JUQUEEN will be build up in Jülich during the year 2018, beginning with the first module of the system, together with the IT company Atos and the software company ParTec. The new module will be based on Atos’ Bull Sequana architecture and equipped with the Intel<sup>®</sup> Xeon<sup>®</sup> Processors scalable Family (Skylake SP). It is planned to be installed in the first half of 2018. The new system is to be operated as a European and national high-performance computer within the framework of PRACE and the Gauss Centre for Supercomputing (GCS). ICON has been part of the benchmark suite for the new system and is expected to scale satisfactorily on the upcoming machine. At a later stage, a partition exclusively dedicated to Earth System Models will be added to the system, which will foster exascale applications in Earth System Science, with a particular focus on ICON.

The Simulation Laboratories “Climate Science” and “Terrestrial Systems” within JSC are willing to support any ICON developments and applications which escalate ICON to a full Earth System model, including coupler interfaces like MESSy or OASIS-MCT and encourage ICON usage on current and future Jülich supercomputers.