ICON
from a non-scientists perspective

Thomas Jahns, DKRZ

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Overview

- Status
- Perspective
- Summary

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ICON

ICON: **Ico**sahedral **n**on-hydrostatic model is a joint project of **MPI-M** and **DWD**, with the goal to develop a new generation of general circulation models (GCM) for the atmosphere and the ocean in a unified framework.

Pictures courtesy of Günther Zängl, DWD

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Status Physical modelling

- ICON is used in weather prediction at DWD
- Scalable model (grid-point only, no spherical harmonics etc)
- Finite difference discretization, lateral indirect indexing, height levels direct array references
- Icosahedral triangle grid with arbitrary refinements

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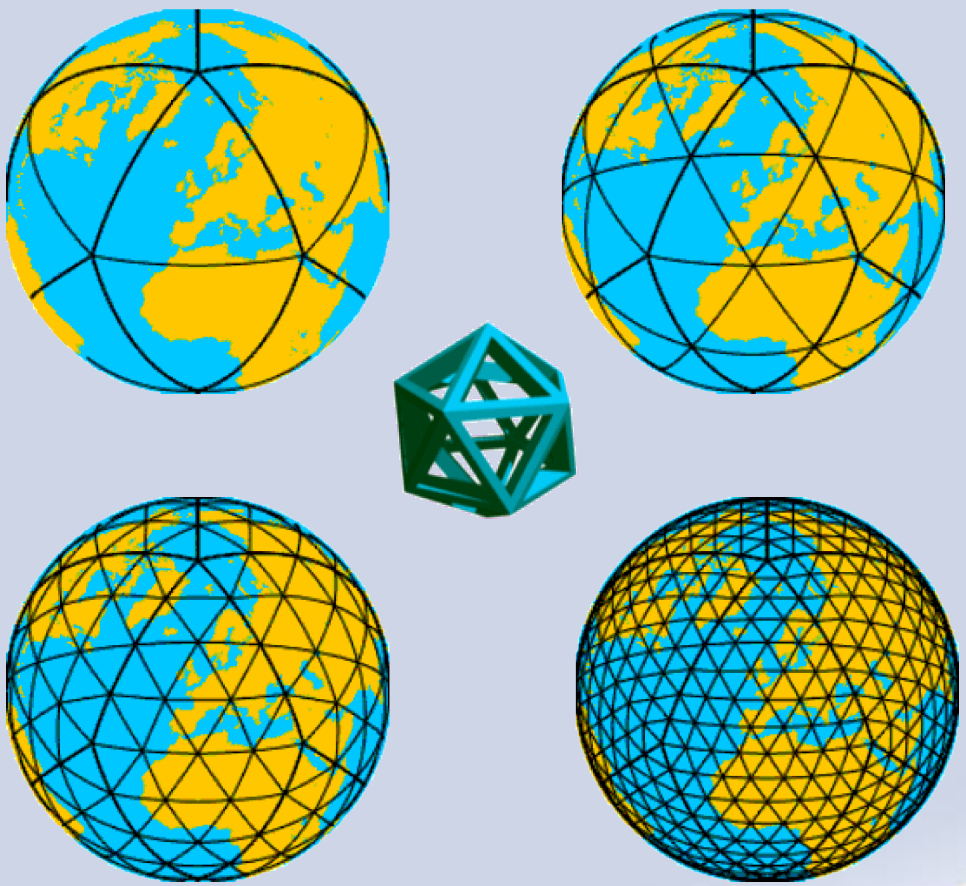
ICON grid

The ICON grid can be scaled real well:



Pictures courtesy of Günther Zängl, DWD

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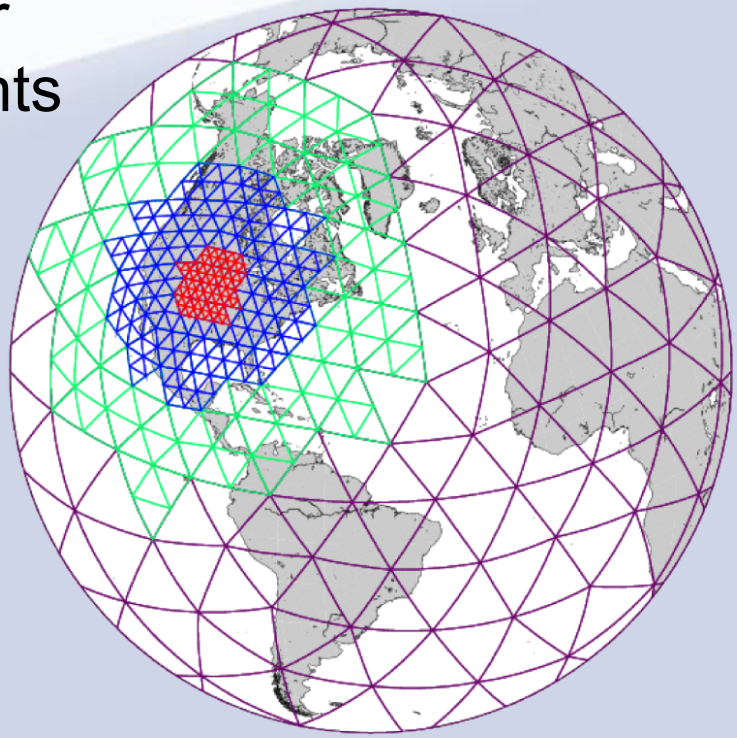
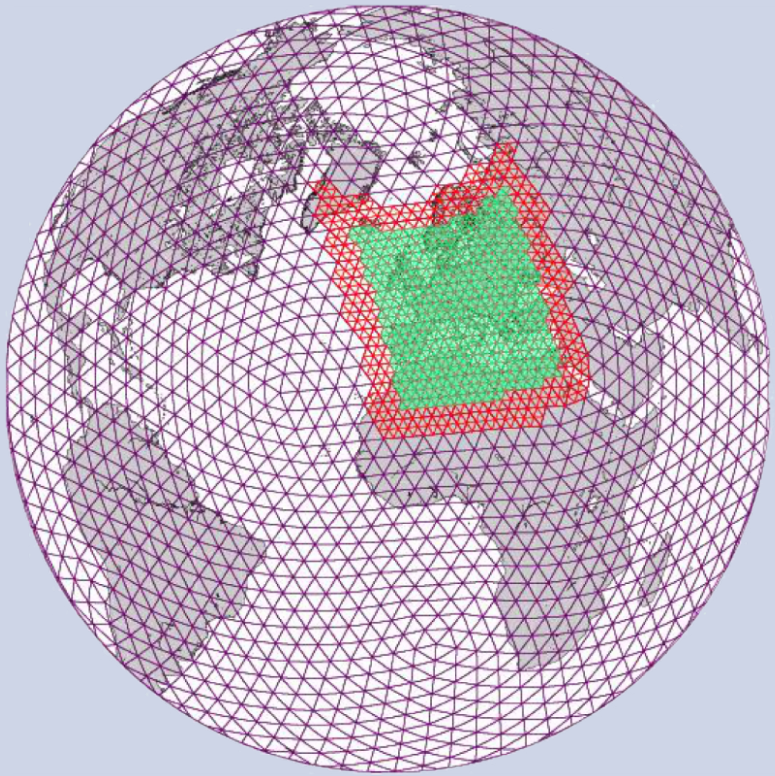
After scaling the grid, even finer refinements can be nested:



circular nests



latitude-longitude nests

Pictures courtesy of Günther Zängl, DWD

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Status coding

- Mostly Fortran (low-level I/O and model time use C, run-time control ksh)
- Data representated in nblocks*nproma scheme for OpenMP parallelization and vectorization
- Supports various architectures (x86_64, PPC, SX) and software environments
- Single output server per file, fetches data with RMA

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Physics improvements

- Fully-functional climate physics (ECHAM)
- Land/vegetation model (JSBACH/HD)
- ARTS (KIT)
- LES (HD(CP)2 project)
- various other

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Perspective Coding

- Output parallelization
- Decrease Load-imbalance
- Improve OpenMP parallelization (DWD)
- GPGPU parallelization (CSCS)

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Summary

- ICON is huge multi-model ESM package with common discretization/parallelization infrastructure from LES to climate scale
- Already runs at 10k cores scale
- Challenges ahead for 100k core and more scale

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