NWP ICON - Test Suite

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COSMO GM 2022 Athens, 12-16/09 /2022

Old configuration (Reading)

Continuous run (with 5-daily restarts) for two one-month periods: July + December 2017

Domain covers Mediterranean sea and most Europe

"Coarse" run (6.6 km):

IC: atmosphere by IFS, soil by Icon-global;

BC: 3 hourly IFS analysis and forecast

"Fine" run (2.5 km):

1-way nesting in coarse; SST and Sea Ice daily updated from IFS analysis

One test performed, with Icon version 2.6.1

Old configuration (Reading)

Coarse domain : 6.6 km (R3B8); W = -10.9, S = 28.3, E = 37.5, N = 59.7 (310k cells) dtime=60", 65 levels (50 for comparison with Cosmo test suite)

Fine domain : 2.5 km (R2B10); W = -9.8, S = 28.9, E = 36.4, N = 59.1 (2M cells) dtime=24", 65 levels (40 for comparison with Cosmo test suite)





Coarse domain

Fine domain

New configuration (Bologna)

Changes to Icon test suite on Atos

- Coarse run (6.5 km) will no longer be performed (direct nesting of Icon in IFS)
- The runs with a reduced number of vertical levels will no longer be performed
- IC: atmosphere + SST by IFS, soil by Icon-global (as in the coarse run in old conf.)
- Output only on unstructured grid
- Should we make a test to check the impact of the direct nesting of ICON in IFS?
- Is the integration domain sufficient for Israel?
- (SE corner at 36.4E, 28.9S; Israel is about 75-100 km from Icon boundary region)
- Should the test periods be more recent or more extended (eg. adding spring / fall months)?

Implementation on Atos

Benchmark run completed (Icon version 2.6.5):

- 5.5 days forecast at 2.5 km resolution
- with 576 processes: 9h23' (Icon log), 115.6k SBU
- total resources for one experiment (2 months, only "fine" resolution"): 1.3M SBU

On Reading Cray: 2 months, coarse+fine resolution, 432 processes, 1.2M SBU A direct comparison is not possible, but performance on Atos seems <u>slightly worse</u> than on Reading Cray. May further optimisation be possible?

Resources requested with present configuration for each experiment: 1.5M SBU, 1.5 Tb

Future experiments:

- How many experiments are expected per year?
- When should the first experiment be performed?

Ecflow suite has not yet been tested on Atos!

Benchmark on Atos: compiler options

MODULES='prgenv/intel intel/2021.4.0 intel-mpi/2021.4.0 hdf5/1.10.6 netcdf4/4.7.4 intel-mkl/19.0.5 Ecmwf-toolbox/2021.12.0.0'

BLAS_LAPACK_LDFLAGS='-lmkl_gf_lp64 -lmkl_sequential -lmkl_core'

CC='mpiicc' FC='mpiifort' CFLAGS='-gdwarf-4 -03 -qno-opt-dynamic-align -ftz -march=native -fp-model=precise' ICON_FCFLAGS='-02 -assume realloc_lhs -ftz -fp-model=precise' EXTRA_CONFIG='--enable-grib2 --enable-mixed-precision --enable-openmp --enable-dace --enable-ecrad --disable-jsbach --disable-ocean -enable-emvorado' ICON_ECRAD_FCFLAGS="-D_ECRAD_LITTLE_ENDIAN"

Benchmark on Atos: namelist and job

Dtime = 24 Nproma = 8 num io procs = 1

- #SBATCH --qos=tp
- **#**SBATCH --ntasks=576
- #SBATCH --cpus-per-task=1
- #SBATCH --hint=nomultithread
- #SBATCH --contiguous
- #SBATCH --mem-bind=local
- **#**SBATCH --export=STHOST=ws2
- #SBATCH -account=cosmo