WGNE Computer table

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Overview

- Overview of computers in use
- Usage of computing resources: global vs. regional
- Deterministic vs. ensemble applications
- Data assimilation systems
- General trends

Overview of computers in use at WGNE members

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- Cray XC: ECMWF, UKMO, DWD, NCEP, NRL, CPTEC/INPE, KMA, HMC Russia (since very recently; formerly SGI, RSC)
- IBM: CMC, CMA, NCMRWF (India)
- Bull: MF
- Dell: NRL
- Hitachi: JMA
- Oracle: BoM

Questions for discussion

- How to homogenize the numbers on sustained/peak performance? Are they still useful? Peak perf. is not representative for our model codes, measuring sustained perf. requires reliable hardware counters
- Suggestion: Provide at least processor type, #nodes, #cores/node

Usage of computer resources: global vs. regional

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Criterion: Number of cores used for deterministic forecasts:

- regional >> global: MF, NCEP, CMC, JMA
- regional ≈ global: DWD, HMC, NRL, CPTEC/INPE, BoM
- global >> regional: UKMO, CMA, KMA, NCMRWF
- global forecasts only: ECMWF

Please send updates if not correct or outdated!

Remark:

- Partitioning of total daily resource usage cannot be inferred from WGNE table, neither for global vs. regional nor for DET vs. EPS

Question for discussion:

- Shall we include such information in the table?

Deterministic vs. ensemble applications

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Global forecasting systems

- EPS mesh size <= 2* DET mesh size: ECMWF, UKMO, MF, HMC, NRL, JMA, CMA, NCMRWF
- EPS mesh size > 2* DET mesh size: DWD, NCEP, CMC, CPTEC/INPE, KMA, BoM

Regional forecasting systems

- Same mesh size for DET and EPS: DWD, CMA
- EPS mesh size <= 2* DET mesh size: UKMO, MF
- EPS mesh size > 2* DET mesh size: CMC
- EPS for subset of model domains: HMC, NCEP, NRL, JMA, KMA, BoM

Clear trend: Importance of ensemble systems has grown in the last years

Data assimilation systems

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Global forecasting systems

- 4D-Var / Hybrid 4D-Var: ECMWF, UKMO, NCEP, NRL, KMA. NCMRWF, MF, JMA, CMA
- 4D-En-Var: CMC
- Hybrid 3D-Var / EnKF: DWD, BoM
- 3D-Var: HMC, CPTEC/INPE

Regional forecasting systems

- 4D-Var: UKMO, NRL, CMC, JMA, KMA, NCMRWF, BoM
- 4D-En-Var: CMC
- 3D-Var: MF, CPTEC/INPE, JMA
- Hybrid 3D-Var / EnKF: NCEP, CMA, BoM
- LETKF: DWD

General trends to be observed

- Growing fraction of resources spent in ensemble systems, both at a global scale and at convection-permitting scales
- This is not surprising as longer-range forecasts and convection forecasts take much benefit from ensembles (or are even meaningless without)
- NWP relies not as much on “strong scaling” as climate modeling
- Applications including aspects of atmospheric composition (e.g. pollen, mineral dust, volcanic ash) are increasing