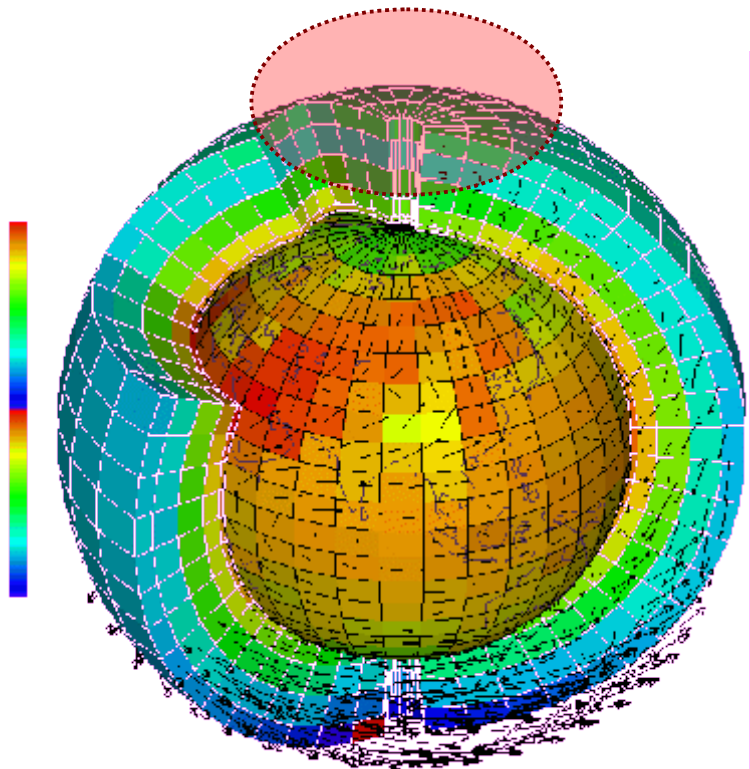


DYNAMICO

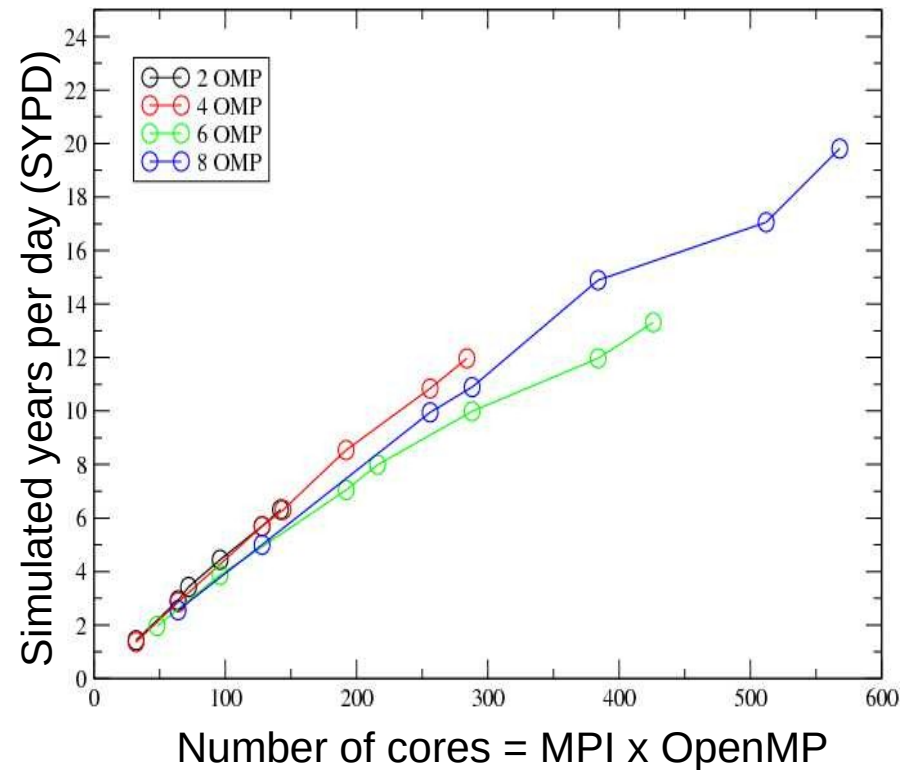
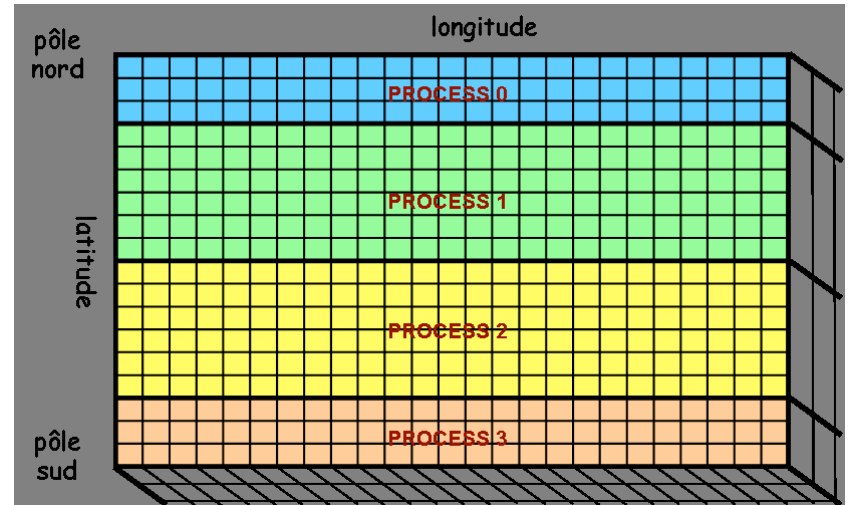
Status and outlook

Thomas Dubos
École Polytechnique, LMD/IPSL

*with F. Hourdin, A. Traore, M. Tort, E. Millour, A. Spiga & co (LMD/IPSL),
J. Gattas (IPSL), Y. Meurdesoif, A. Caubel, S. Fromang, J. Servonnat, M. Kageyama, P.
Braconnot (LSCE/IPSL), ...*



LMD-Z lon-lat core



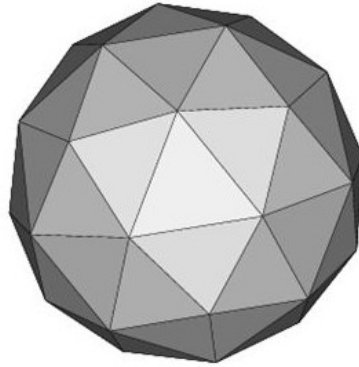
Scaling of LMDZ (dynamics + physics + CMIP6 I/O)
at resolution 144x143 (LR) on ADA (Intel Sandy
Bridge ES4650)

Mesh partitioning for parallel computing

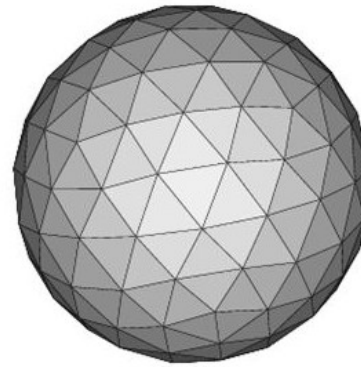
nbp=1



nbp=2



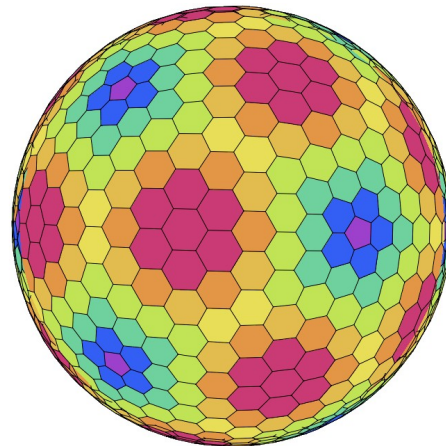
nbp=4



Icosahedral-triangular mesh
 $10 \cdot nbp^2 + 2$ vertices

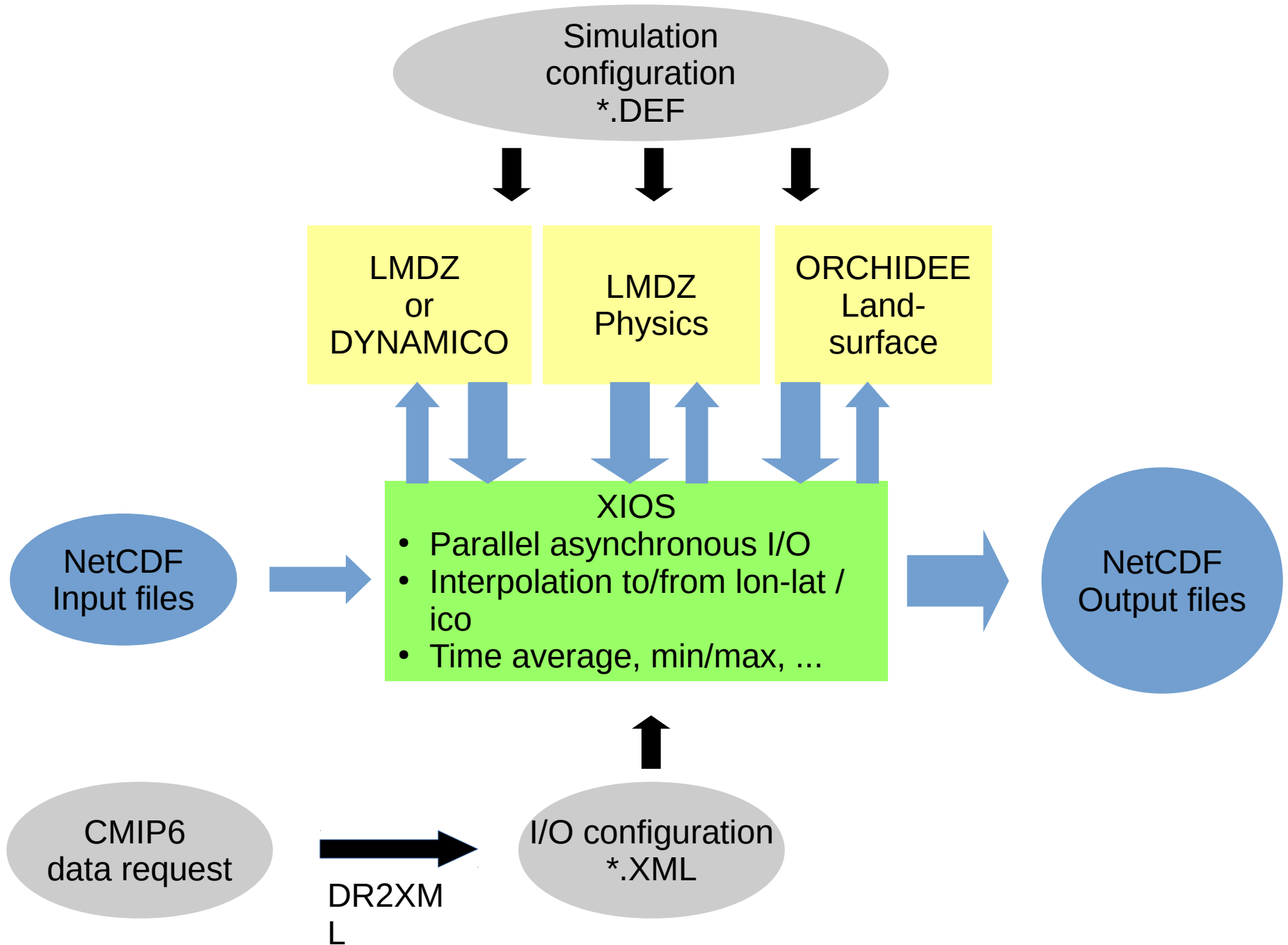
Voronoi
dual

Icosahedral-hexagonal mesh
 $10 \cdot nbp^2 + 2$ cells



- Easy to partition into $10 \times nsplit^2$ domains
- About $(nbp/nsplit)^2$ cells per domain = MPI process
- $Nbp/nsplit > 10$ for performance
- Ex : 25km $\sim 10^6$ cells $\sim 10\ 000$ MPI processes

Atmosphere-only configurations



Atmosphere-only configurations

HighResMIP Tier 1 : Atmosphere-only historical 1950-2016

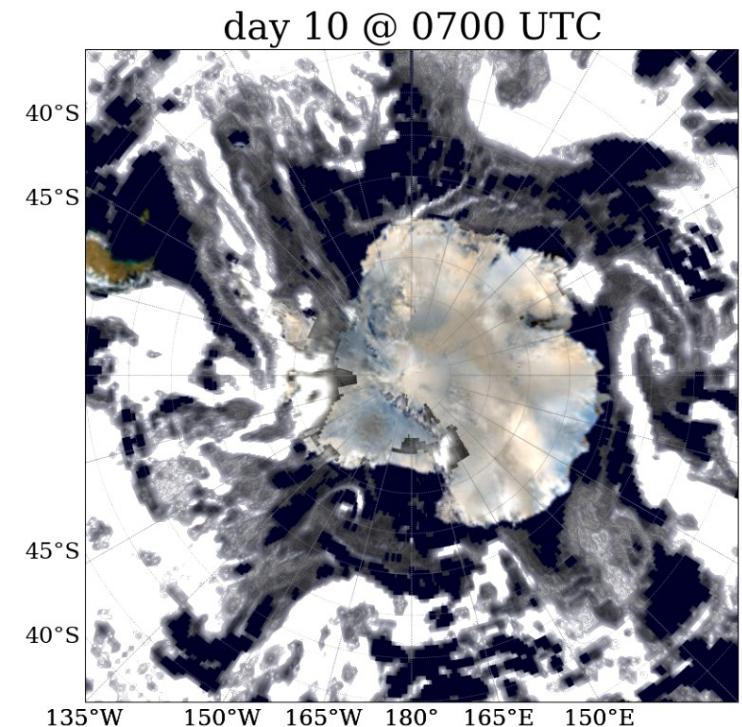
- IPSL-CM6-LR 144x142 (~200 km at mid-lat)
- **IPSL-CM7A-LR 10x40² (~200 km)**
- IPSL-CM6-HR 512x360 (~50 km at mid-lat)
- **IPSL-CM7A-HR 10x160² (~50 km)**
- **IPSL-CM7A-VHR 10x320² (~25 km) *ongoing***

Status

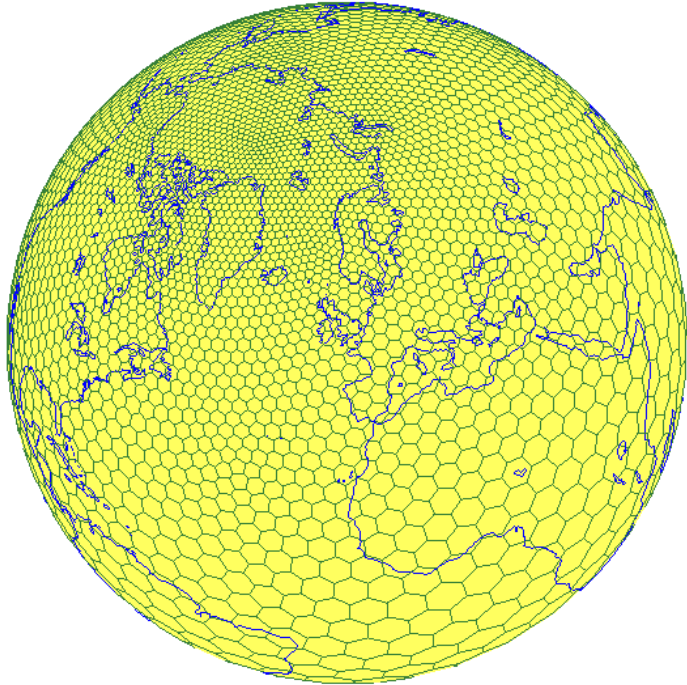
- Exist as ModIPSL configurations
- Output available on Irene
- Not yet published on ESGF
- Validation ?
=> critical eyes welcome

Evolutions

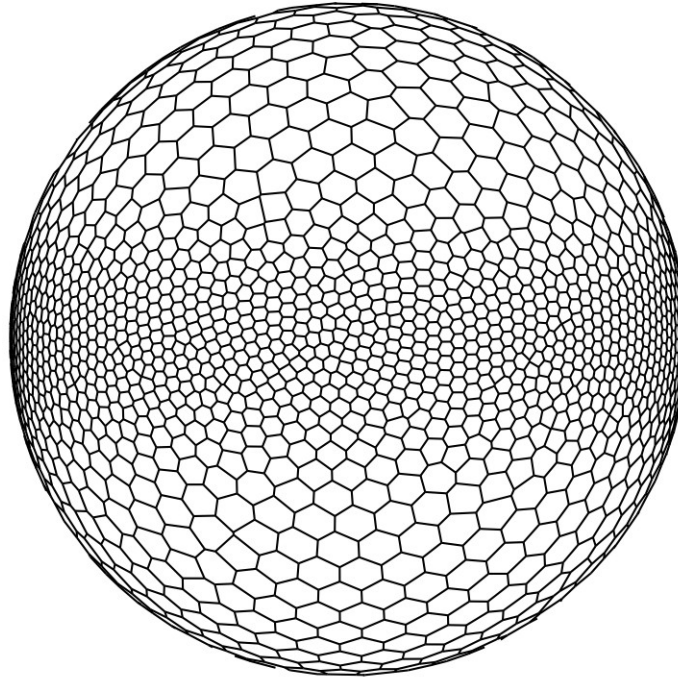
- Zoom
- Regional configurations
- Isotopes



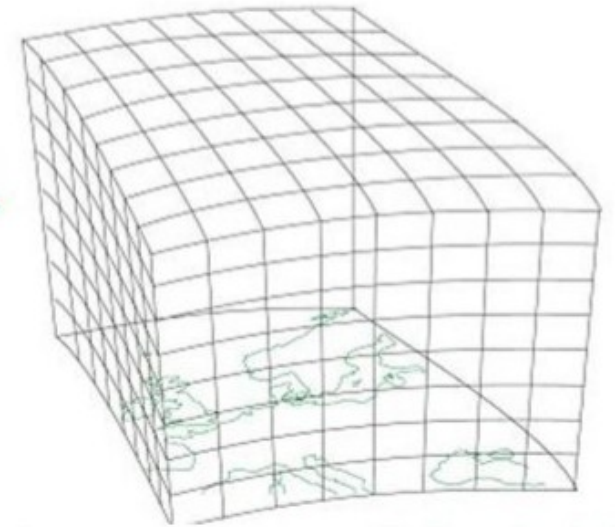
Towards regional configurations with DYNAMICO



Zoom (Schmidt transform)



Zoom (unstructured mesh)



Limited area (LAM)

Status : many pieces of the puzzle there, nothing operational yet

Work could start now with the Schmidt transform (some tuning of dissipation needed)

Atmosphere-ocean coupled configurations

Status

- 03/11/2020 : IPSLCM7_work
- ICOLMDZOR + NEMO v3₆
- no routing yet
- LR (nbp40) + ORCA1

Evolutions

- Routing
- DYNAMICO > 100 SYPD on Irene
=> paleo

ESIWACE2

- Target simulation :
 - Atm ~ 10 km
 - Ocean 1/12° (NEMO12)
 - Short (~30 jours)
 - I/O : 3-hourly u,v,w,T,p ...
- Intermediate configurations
 - QUEST-like ?...
 - ...

Atmosphere-only : evolutions from IPSLCM7A

- *Isotopes*
- *Zoom*
- Regional ...

Coupled : evolutions from IPSLCM7_work

- *Routing*
- CMIP-like
- Paleo (LR/VLR)
- High-resolution : leverage ESIWACE2 ?

Associate evolutions with scientific goals and validation