Some discussion points on dynamics

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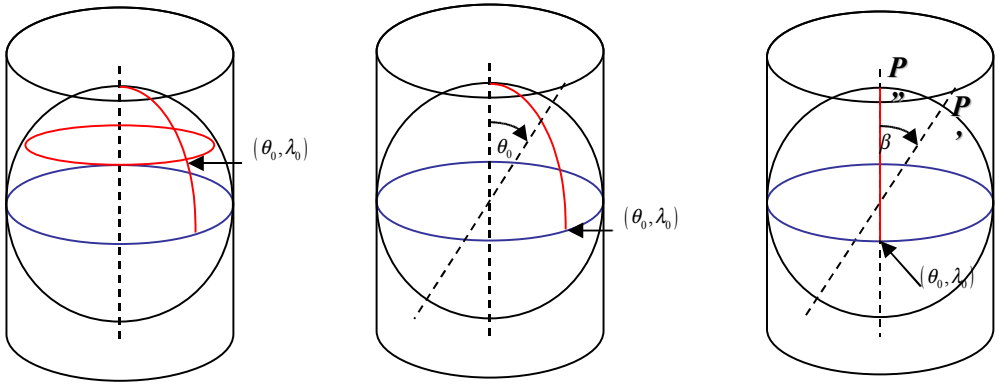
Summary

- Availability of rotated/tilted Mercator projection
  - With constant or non-constant linearized map factor for hydrostatic
  - Some problems still remaining in the non-hydrostatic
  - Projection available in “gl”
- Elimination of the extension zone in the grid-point computations and change in the boundary relaxation
- Optimum nesting strategy

GL tool

- Powerful utility related to format conversion and data manipulation on meteorological files, in particular for GRIB, FA and LFI formats.
- Mercator projection was not included among the accepted GL projections.



- Rotated Tilted Mercator inclusion implies direct and inverse calculations and vector transformation.

GL tool

Advantages of the Rotated Tilted Mercator projection:

- Rotation
  - representing big areas with small deformation.
  - focusing on any part of the sphere (polar area, extra-tropical area, tropical area) in a single formalism.
- Tilting
  - adapting projection deformations to the most convenient orientation for the area under study.
- Other
  - easy expression for its map factor.

Finished Work (I)

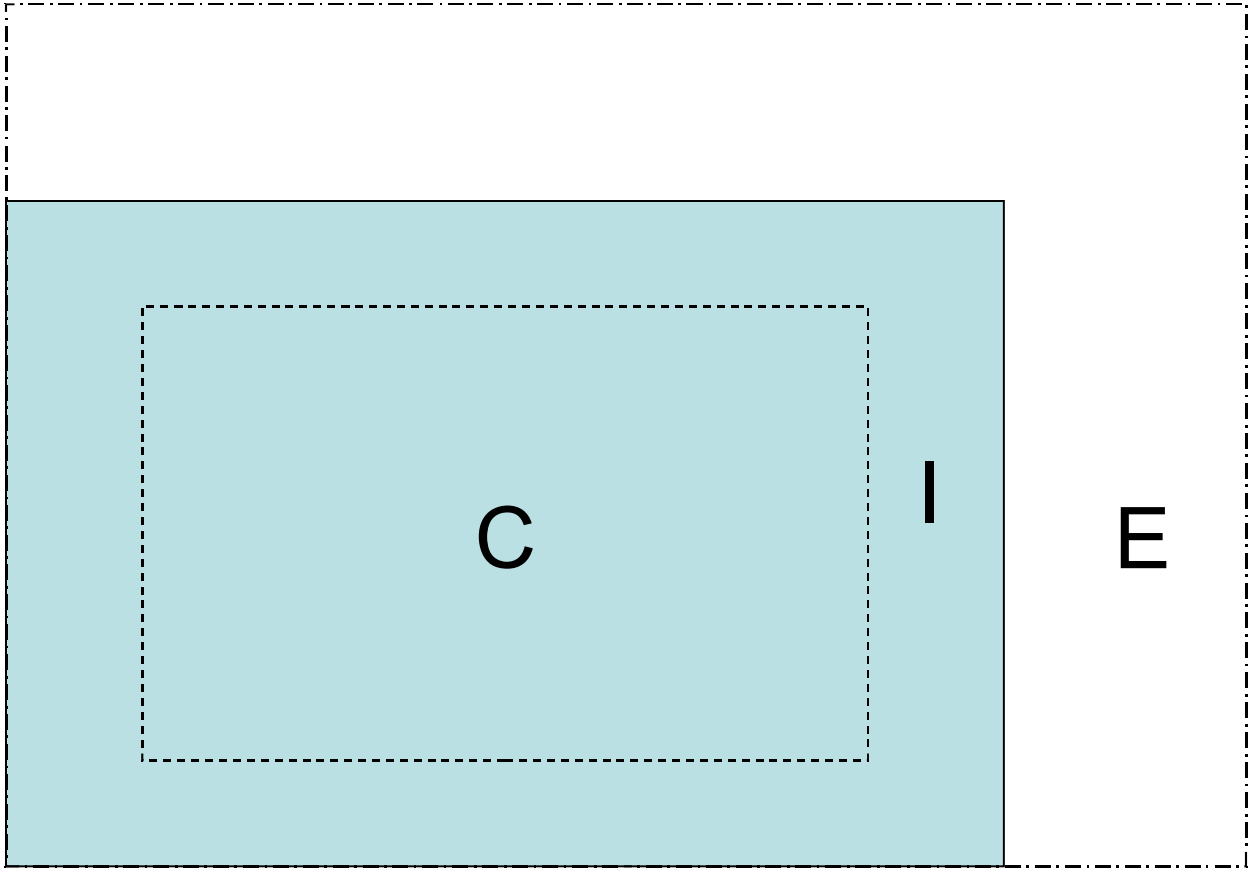
GL tool modifications introduced at the HARMONIE model in order to allow the use of the Rotated Tilted Mercator projection.

- ECMWF computer. **Trunk version – Revision 36h1**
- Rotated Tilted Mercator projection at HARMONIE domain definition:
  - LON0 → tilting (degrees)
  - LAT0 → meaningless variable
  - export LLRTM = .TRUE.
- Rotated Tilted Mercator projection at HARMONIE scripts and namelists:
  - Climate → NEMGEO → LMRT = $LLMRT

HARMONIE can run with both Rotated Tilted Mercator constant and variable map factor.

No GRIB coding is available at the moment as the Rotated Tilted Mercator projection is not a WMO standard.

Zones in the model



Present situation

- Computation on NGPTOT_CAP points which includes part of the extension zone
  - Some useless computations, mainly with large extension zone (large extension zone is beneficial for data assimilation)
  - Biperiodization done in many places (some of them useless)
  - Archiving larger sizes of grid-point fields

Proposed changes

- Meaning of NGPTOT changed to include only points in the C+I zone
- Writing out grid-point fields including only C+I zones (saving of space in archive)
- Change in the Davies relaxation LBC application

Davies relaxation

Helmholtz equation coming from the semi-implicit time-stepping scheme

$$\left(I+\Delta tB\right)X^{+}=R$$

Inclusion of the LBC relaxation

$$\left(I+\Delta tB\right)X^{+}=\alpha R+\underbrace{\left(I+\Delta tB\right)\left(1-\alpha\right)X_{H}^{+}}$$

Zero at the border of the C+I zone
->biperiodization is merely padding with 0's

Optimal nesting strategy

- Starting point ECMWF forecast (~16 km resol)
  - Preliminary experiments (no data assimilation)
    - Hydrostatic HARMONIE with ALADIN physics, 8 km resol
    - Hydrostatic HARMONIE with ALARO physics, 8 km resol
    - Hydrostatic HARMONIE with ECMWF physics, 8 km resol
  - Estimate which is best at this resolution
  - Double nested experiments
    - HARMONIE 2.5 km nested on the chosen preliminary exp.
    - HARMONIE 2.5 km nested on HIRLAM 8 km resol.
  - Single nested experiment
    - HARMONIE 2.5 km nested on 16 km ECMWF forecast

Chosen area for 8 km resolution

IBERIA_8KM)
TSTEP=300
NLON=648
NLAT=648
LONC=-5.0
LON0=-5.0
LAT0=40.0
GSIZE=8000.
BDNLON=680
BDNLAT=680

Period: December 2009

Experiments including data assimilation

- Using the best physics for the intermediate model
  - Performing data assimilation both upper air and surface at both the intermediate and the fine resolutions