Outcome of Session 4: Dynamics

- Dynamical core development

  M. Hortal (on behalf of Simarro): VFE NH
  M. Hortal (in behalf of I. Martines): Map factor

- Lateral boundaries treatment

  P. Termonia: Quo vadis LBCs

- advection / horizontal diffusion

  F. Váňa: New interpolator for SL(HD)

Outcome of Session 4: Dynamics / Core development

VFE (Hirlam stream):

- Analysis of various systems of equations (SHB stable)
- full elimination feasible with “simple” constraints (with T,w,Φ,u,v,ln(pi_s) prog. variables)
- First 2D test positive with linear model tool (linear regime tested with moving hill)
- But non-linear model is unstable (very first result)

Outcome of Session 4: Dynamics / Core development

Map factor (Mercator projection):

- Now: maximum value considered but this can lead to instabilities for large horizontal domains
- New: m represented by first few fourier components in linear system of HY dynamics
- impact visible in fields in the upper part of the domain
- To be done: coding for NH

Outcome of Session 4: Dynamics / LBCs

- sampling problem of LBCs
  - Monitoring information loss with time filter – MCUF field in your files.
  - BER (boundary error restart)
- Doppler effect
  - shifts the relevant met. frequencies into gravity waves domain
  - scale selective low-pass filter (cut off frequency depends on wave number)
  - in high resolution model DFI could easily filter out the signal that was just assimilated
- Improvement of existing coupling scheme
  - Boyd's solution – symmetric domain, E zone filled with information from large scale fields
- Probabilistic treatment of LBCs
  - Experiences from previous R&D on LBCs suggests the switch of strategy to error monitoring and to use it in probabilistic manner (similar as model errors)
  - MCUF provides a way to estimate the error at the boundaries. This can be used to perturb fields near the boundaries in ensemble kind of way.

Outcome of Session 4: Dynamics / Interpolators

- New set of interpolators proposed
  - general 4 points cubic interpolators defined with reasonable properties
- Model implementation
  - only 2nd order accurate ones with one degree of freedom – any interpolator is a weighted average of Lagrangian cubic polynomial and quadratic interpolators (weights SLHDKMIN and SLHDKMAX, smaller weight - less diffusivity)
- Laplacian smoother can applied before SL interpolations (SLHDMIN = SLHDMAX, smoother weights SLHDEPSV, SLHDEPSH)
- All implemeted in TL/AD (CY35T2)
- SLHD implies 2-3% additional costs regardless the number of diffused variables
- Natural entry point for 3D turbulence