

SCA Reports for the COSMO-Model and INT2LM

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Versions Implemented since September 2018

Version	Date	Contents (Highlights)	Results Changes
5.05a	13.07.18	- Bug fix in turb_transfer (see 5.05_1) - Porting additional COSMO parts to GPU (output, diagnostics) - Bott advection scheme with deformational correction method (BOTTDCC2) - Changes for Radar Forward Operator EMVORADO	yes no no if used no

Version	Date	Contents (Highlights)	Results Changes
5.05b	14.12.18	- Finalize port to GPU (LHN, Nudging, climate mode, FLake) - Writing radar composites to restart files	no no

Version	Date	Contents (Highlights)	Results Changes
5.06	27.02.19	- Running in single precision (fixes in TERRA; interfaces to RTTOV) - Implementation of mire parameterization - Modifications to GNSS STD operator - New features for Latent Heat Nudging - New wind gust tuning - Implementation of lockfile mechanism	no if used if used if used if used no

Version	Date	Contents (Highlights)	Results Changes
5.06a	21.05.19	• Implementation of skin temperature formulation in TERRA • Modifications to turbulence scheme due to unification with ICON	if used no

Version	Date	Contents (Highlights)	Results Changes
5.06b	to be expected 20.09.19	• Implementation of radar forward operator • Revised cloud radiation coupling (T^2RC^2) • GPU optimizations (CLAW for graupel scheme; asynchronous copy to and from block structure; moved GPU transfer in lgetai (data assimilation)) • Running COSMO-LEPS in GRIB 2 (new local section 28) • Interpolation to z-levels above ground • output of wind speed and direction on model-, z- and p-levels • Additional packing for GRIB 2 fields (grid_ccsds, grid_jpeg, grid_png)	no no no no no no

Version	Date	Contents (Highlights)	Results Changes
5.06b	20.09.19	- Option to write restart files in NetCDF - Spectral Nudging (CLM): possibility of grid nudging (ongoing work) Data Assimilation (new observation types: tower, temphirs; Superobbing of high-resolution profiles; and many more) - Soil and surface schemes: alignment with ICON	no no yes (nudging; Feedback Files) slightly

From my "St. Petersburg Notes"

- Restart (also for CLM)
 - There were problems with restarts at ETH. Therefore CLM should test the restart functionality of COSMO 5.0x very early (before release of 6.0)
 - This can be done now
- Documentation (for GPU; GRIDTOOLS)
 - how to include in COSMO Documents: still has to be done
 - first level support is own SysAdmin
 - Laptops are not supported
- TERRA standalone: no actions yet
 - has to be updated to blocked data structure
 - should have an interface to ICON

INT2LM 2.06

Version	Date	Contents (Highlights)	Results Changes
2.06	24.05.19	• New external parameter fields for slope of orography (S_ORO) and skin conductivity (SKC) • Refactoring lockfile mechanism • Interpolation of hhl_in to hhl_gl (instead of recomputing) • Deactivate computation of control geopotential (with lcontrol_fi=.FALSE.) • Introduced NetCDF4 as optional output format (ylm_form_write = 'nc-4')	no no slightly no no

Version	Date	Contents (Highlights)	Results Changes
2.06a	coming soon	• Running COSMO-LEPS in GRIB 2 • Modifications for MESSy	no no

Distribution of new INT2LM and COSMO

- The new versions have not yet been distributed!
- A first (not yet complete) report from the NWP Test Suite has been provided last Thursday (Sept. 5th)
- Impact of COSMO 5.06 seems to be neutral in double precision.
- Comparing double and single precision, only in few cases differences were noticeable.
- But no results from precipitation so far.

Nevertheless:

- Good indication, that COSMO 5.06 can be accepted as new official version.

Changes in Data Distribution

- ➔ ftp-server [feu3@ftp-incoming.dwd.de](ftp://feu3@ftp-incoming.dwd.de) has been switched off lately because of security reasons
- ➔ New server is now in place: [cosmo@data.dwd.de](ftp://cosmo@data.dwd.de)
- ➔ Information (and password) will be given to all users when distributing the new COSMO and INT2LM versions
 - ➔ `sftp -P 2424 cosmo@data.dwd.de` or
 - ➔ `sftp -oPort=2424 cosmo@data.dwd.de`
 - ➔ <https://data.dwd.de>
- ➔ Note that the port 2424 is crucial!

COSMO-ICON Physics

Scheme	COSMO	ICON
Microphysics	prognostic water vapour, cloud water, ice, rain, snow, graupel (Doms, 2004; Seifert, 2010)	
Radiation	Ritter-Geleyn δ two-stream	RRTM
Cloud Cover		Köhler
Subgrid scale orography	Lott and Miller (1997)	
Turbulence	prognostic TKE scheme (Raschendorfer)	
Surface Schemes	TERRA (Heise and Schrodin, 2002) FLake (Mironov) Sealce (Mironov)	
Convection	Tiedtke or shallow	Tiedtke-Bechtold
	Tiedtke-Bechtold (optional)	

2 years ago:

Technically modified COSMO code will be brought back to ICON (Q4/2017)

Status (in terms of source code)

Scheme	COSMO	ICON
Microphysics	gscp_hydor gscp_kessler gscp_cloudice gscp_graupel	gscp_kessler gscp_cloudice gscp_graupel
Subgrid scale orography	sso_lottmiller	mo_sso_cosmo mo_sso_ifs
Turbulence	turb_[data diffusion transfer utilities vertdiff]	
Surface Schemes	sfc_terra_data, sfc_terra_init, sfc_terra sfc_flake_data, sfc_flake, sfc_seaice	
Convection (Tiedtke-Bechtold)	conv_[many files]	mo_cu[many files]

We aim at:

Scheme	COSMO	ICON
Microphysics	gscp_hydor	
	gscp_kessler, gscp_cloudice, gscp_graupel	
Subgrid scale orography	sso_lottmiller	
		mo_sso_ifs
Turbulence	turb_[data diffusion transfer utilities vertdiff]	
Surface Schemes	sfc_terra_data, sfc_terra_init, sfc_terra sfc_flake_data, sfc_flake, sfc_seaice	
Convection (Tiedtke-Bechtold)	conv_[many files]	

Status of COSMO-ICON Physics

- 2 years ago: Technically modified COSMO code will be brought back to ICON (Q4/2017)
- What has been unified up to now:
 - Turbulence Scheme (Q1/2019): had to fight with a Cray compiler bug
 - Soil and surface schemes: TERRA, FLake, Sealce (last Monday)!
- What we will try in Q4/2019:
 - Microphysics
 - SSO scheme
 - Tiedtke-Bechtold

Status of COSMO-ICON Physics II

Advantages of this unification:

- GPU code is brought to ICON
- Developers have the same modules in COSMO and ICON

Note:

- There still are (will be) small differences between COSMO and ICON (you can view with a "diff")
- A further unification and/or synchronization is NOT planned.
- Code can diverge now, when developments within ICON are going on

Documentation

Update of Documentation

- ➔ Part IV: Implementation Documentation: No actions; still have plans to write:
[Implementation Specific Details of the COSMO-Model](#)
- ➔ Part V: Preprocessing: Update for 2.06
- ➔ Part VI: Postprocessing: A first draft is available on the web:
[Model Output and Data Formats for I/O](#)
- ➔ Part VII: User Guide: Update for 5.06a

GRIB 2

Do we really need GRIB 2

- ➔ YES! ICON only works with GRIB 2
- ➔ All necessary actions have been taken to enable COSMO partners also to migrate to GRIB 2:
 - ➔ DWD definition.edzw-files are available for other centers through linking.
 - ➔ Latest version available: eccodes 2.12.5
- ➔ For more information see:
<http://www.cosmo-model.org/content/model/documentation/grib/default.htm>
- ➔ See Dörte's presentation this afternoon!

Plans for the Next Versions

	Jul	Aug	Sep	Oct	Nov	Dec
Cloud Rad						
Radar Forw. Operator						
Ground water runoff						
Higher order schemes						
GPU: Tiedtke-Becht.						
TERRA-URB						
COSMO-EULAG						
GRIDTOOLS						
Restart with NetCDF						
SAINT (*)						
CLM (*)						
MESSy (*)						

(*) Some Comments

→ SAINT:

- First implementation is using a TERRA version modified by Matthias Raschendorfer for implicit treatment of heat conduction equation
- This version has been updated lately by Matthias for treatment of multi snow levels
- Pitfall: Do not know when Matthias version of TERRA will be implemented operationally

→ CLM: Unification has started:

- Restart Files in NetCDF: already implemented
- Discussions about additional diagnostics started (new GRIB fields, but also new "leveltypes")
- Several bug fixes and technical modifications already implemented earlier

→ MESSy: there will also be an update from the MESSy Community



Thank you
very much
for your
attention!