CONSORTIUM FOR SMALL SCALE MODELING

COSMO

Deutscher Wetterdienst

Wetter und Klima aus einer Hand

DWD

SCA Reports for the

COSMO-Model and INT2LM

Ulrich Schättler, Daniel Rieger

Source Code Administrators

Contents

- Versions implemented since September 2017
- INT2LM 2.05
- Documentation
- GRIB 2
- Plans for the next versions
- Future

Versions Implemented since September 2017

Version	Date	Contents (Highlights)	Results Changes
5.04f	01.09.17	• additional modifications to COSMO-ICON physics (new namelists, bug fixes, GPU version of TERRA)	yes
		• Possibility to reproduce behaviour of old turbulence scheme (not TERRA!)	yes
		• changes in data assimilation	eventually
		• new diagnostic output to highlight convective cell tracks (for ESSL testbed)	no
		• changes in handling statistically processed fields (min, max, avg, sums)	no
		• possibility to use RTTOV12	SynSat

Please read more about the changes in the Release Notes for the different versions.

Version	Date	Contents (Highlights)	Results Changes
5.04g	13.11.17	• Reproducing behaviour of old physics • Updated TERRA to latest ICON version • GPU port for Tiedtke scheme • Modified computation of HPBL • Modifications to SPPT	yes yes no HPBL lsppt=.T.

Version	Date	Contents (Highlights)	Results Changes
5.04h	15.12.17	• Data assimilation: processing of AMV • Dynamics: halo treatment of tt_lheat • Physics: lshallowconv_only for Tiedtke-Bechtold • GPU port of Turbulence	if used yes no no

Version	Date	Contents (Highlights)	Results Changes
5.05	23.02.18	• Porting additional parts to GPU • GCL communication library for GPU • Optimization of global communication in latent heat nudging • New option for targeted cold pool diffusion	no no no if used

02.08.18: Implemented a bug fix in turb_transfer.f90 in patch version 5.05_1

INT2LM 2.05

Next slides from Daniel Rieger, INT2LM SCA

The release INT2LM 2.05 was distributed recently!

- Most changes were already presented last year by Uli Blahak:
  - Option to only process COSMO external parameters
  - Kinne and CAMS aerosol fields (T2RC2)
  - New methods of adapting vertical profile to new orography
  - Profiles of w blended to “terrain-following” values
  - Hydrostatically balanced pressure computed instead of interpolated
  - Bugfixes for T_SO

Changes in the meantime (part of 2.05)

- **UUID check of vertical grid**
  ICONSUB is now able to properly set uuidOfHGrid and also uuidOfVGrid. For the vertical grid, small modifications were necessary. UUIDs should be checked in the future!
- **ecCodes**
  Modifications for eccodes to get a proper interpretation of indicatorOfUnitOfTimeRange and stepUnits.

Changes in the meantime (part of 2.05)

- **ICON-ART mineral dust**
  Interpolation of additional dust fields (ncdf or grb2) to be used to calculate optical properties in COSMO (part of T2RC2).
- **Bugfixes**
  - **Combination of GME and GRIB1**
    A character length was inconsistent between int2lm and libgribdwd.

Results of NWP Test Suite: 5.03 vs 5.05

- Following the analysis of the relative performance of the two model versions: 5.03 (operational version) and 5.05 (test version of a specific TURBDIFF configuration), the newer version of the model, on the whole, outperforms its predecessor, while in some cases performance is worsen. For parameters as precipitation and for all parameters on high atmospheric levels, no significant impact on performance was identified.
- Single Precision version: some issues with cloud cover and 2m temperature. Whoever wants to use SP, has to test on his own.
- See detailed report of the NWP Test Suite Team
- STC approved the new version in July

COSMO-Model 5.05_1 is the new Reference Version

Distribution of new INT2LM and COSMO

- 11.07.: Information on new version to the consortium
- 08.08.: Information on the patch version 5.05_1 to the consortium
- 08.08.: Information on new versions (INT2LM, COSMO) to all other partners

- September: provision of ICON test data sets for all partners, because of changes in data distribution (see next slide).

- October: Implement changes in operational data delivery: All licences should have installed INT2LM 2.05 by then!

Changes in Data Distribution

DWD sends global ICON data to NMHS to be used as initial and boundary conditions for high-resolution regional forecasts. To make this data usable for ICON-LAM, some changes have to be applied **mid of October 2018**.

- ➔ Several additional 2D fields in the igfff0000000000 file, one additional 3D field W_SO_ICE
- ➔ UUID of the horizontal ICON grid is added to the data. For old data you can turn off the check (lcheck_uuidOfHGrid = .FALSE.). However, it is recommended to check the UUID!
- ➔ HHL will be stored inside the igfff0000000000 ensuring consistency. This requires an adaption of yin_hhl in int2lm!
- ➔ Vertical velocity will be cropped to 71 levels in the future. This is consistent with other variables

Make sure to prepare for the changes!

Documentation

Update of Documentation

- Part I: Dynamics and Numerics: Update by Michael Baldauf
- Part IV: Implemenation Documentation: No actions; still have plans to write: Implementation Specific Details of the COSMO-Model
- Part V: Preprocessing: Update by Uli Blahak / Daniel Rieger
- Part VI: Postprocessing: No actions; still have plans to write: Model Output and Data Formats for I/O
- Part VII: User Guide: Update by COSMO SCA

GRIB 2

Start Your Migration to GRIB 2 NOW

- DWD uses GRIB 2 for about 4 years now. ICON only uses GRIB 2.
- All necessary actions have been taken to enable all COSMO partners to also migrate to GRIB 2.
- Be aware: biggest problem is migration of postprocessing to GRIB 2!
- For information on how to go on, see:

  http://www.cosmo-model.org/content/model/documentation/grib/default.htm
- Additional information and documentation can be found within these pages (ok, some of them are not finished yet, but will be soon)
- The latest WMO Manual on Codes does not contain GRIB 1 any more.
- Definition of GRIB 3 is on its way!

Plans for the Next Versions

Latest Developments

Version	Date	Contents (Highlights)	Results Changes
5.05a	22.06.18	• Dynamics: 2nd order Bott scheme together with deformational correction method	if used
		• Porting additional parts to GPU: diagnostics, output	no
		• Changes to prepare implementation of Radar Forward Operator	no

21.07.18: Implemented the bug fix in turb_transfer.f90 in patch version 5.05a_1

DWD only, not yet distributed to COSMO

Versions 5.06 and Beyond

Version 5.06 (February 2019)

- ➔ POMPA: Port of Assimilation and LHN (already in 2018) 5.05b
- ➔ Radar forward operator (EMVORADO) (hopefully, in 2018) 5.05c
  - ➔ still needs some technical clean up and documentation
  - ➔ tests at DWD are ongoing
- ➔ Higher order horizontal discretizations (by end of 2018) 5.05d
  - ➔ already available; see plans by WG 2

Version 6.0 (December 2019 at latest)

- ➔ Urban module: tests in PT AEVUS are ongoing (see updated PT plan)
- ➔ Mire parameterization (optional)
- ➔ Unification with CLM Version (work in progress)

Further (Technical) Issues

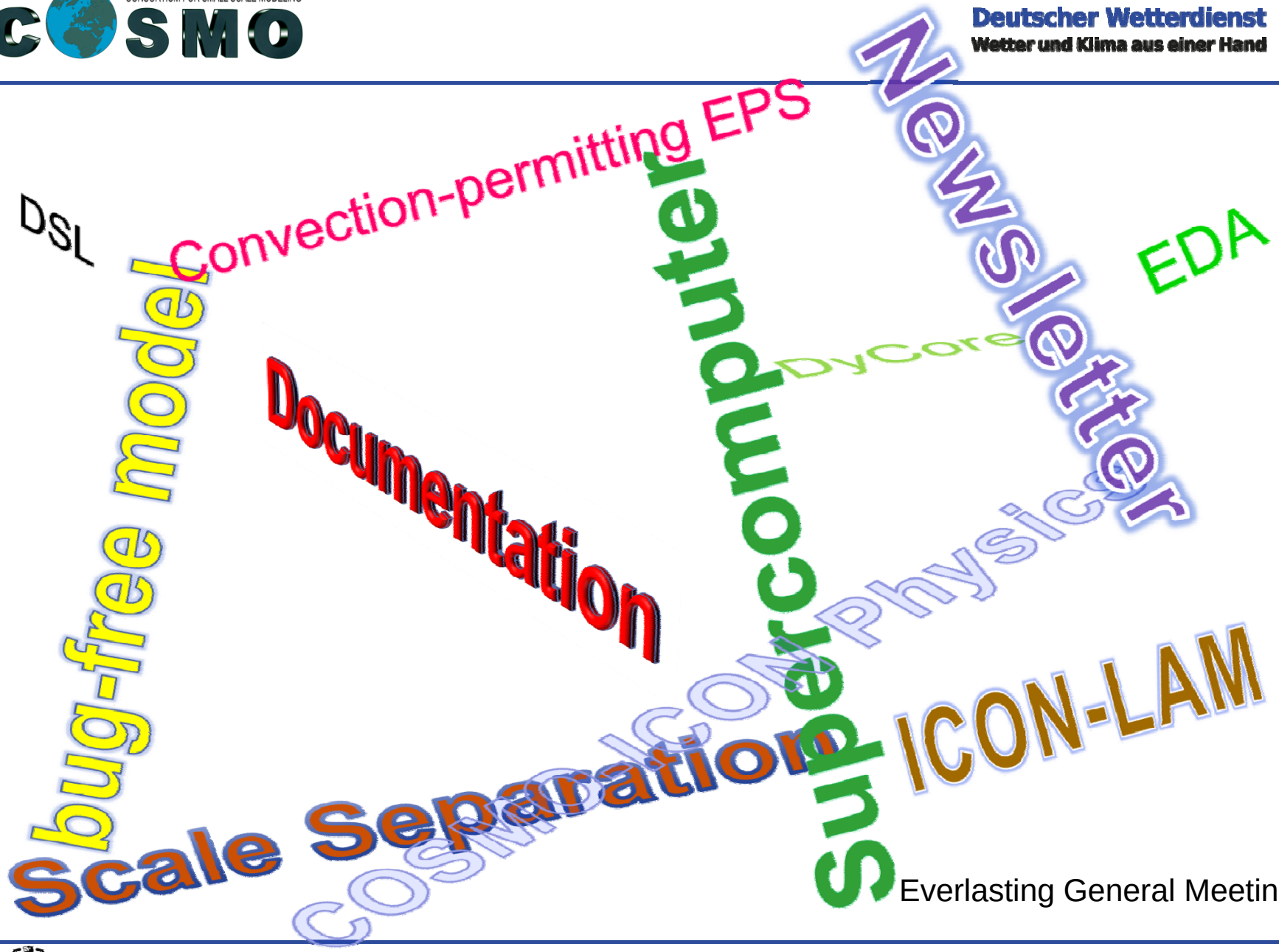
- COSMO-EULAG: Code and documentation available since last Friday, still have to take a look. Timeline for implementation will be discussed by SMC.
- Removal of coarse radiation grid (perhaps 5.06, work in progress)
- Optimization of copy-in / copy-out (perhaps 5.06)
- Use of CLAW directives to optimize physical parameterizations for GPU
- GPU Port for Tiedtke-Bechtold convection (whenever ready)

Codes on GITHUB

- INT2LM
  - From November 2017 on, a local Git repository at DWD was used to administrate the INT2LM source code.
  - With the help of Pascal, Katie and Xavier a remote Git repository was set up within COSMO-ORG on GitHub in February 2018 (Thanks!).
  - Since then INT2LM development takes place on GitHub
- COSMO
  - Since some years COSMO is administrated on GITHUB within a ETH domain
  - Will be moved to COSMO-ORG now.
  - COSMO developers are invited to sign up at GITHUB

Future

COSMO Folks in the Quest of the Promised…


DSL
Convection-permitting EPS
Newsletter
bug-free model
supercomputer
EDA
DyCore
Documentation
Physics
COSMO
Scale Separation
ICON-LAM
Everlasting General Meeting


Thank you
very much
for your
attention!