

# SCA Report for the COSMO-Model

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## The Last Versions

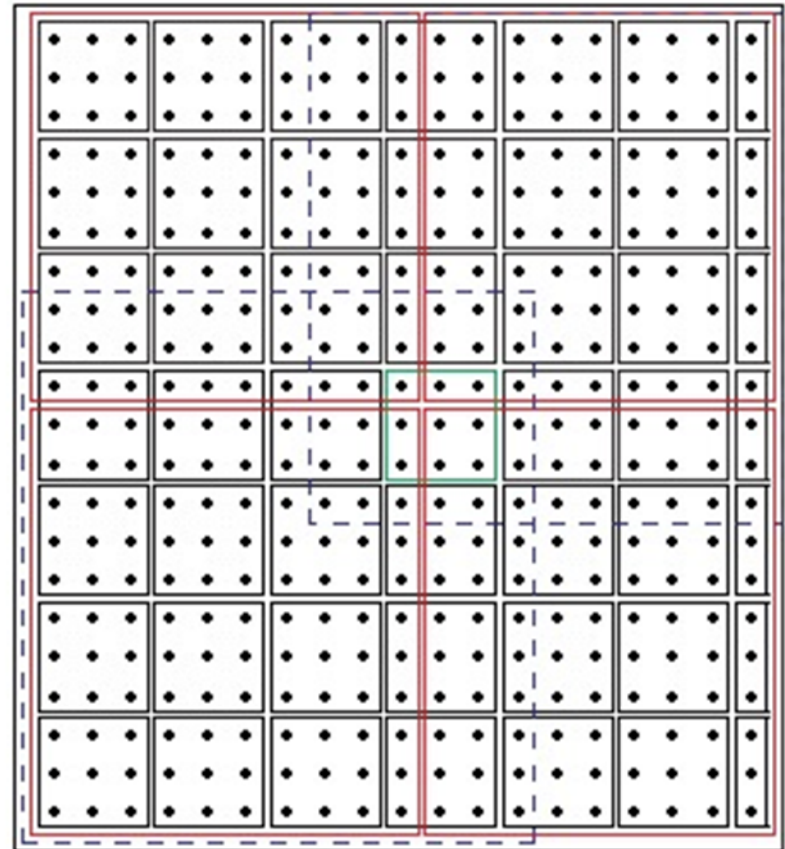
Version	Date	Contents (Highlights)	Results Changes
5.03	02.12.15	<ul style="list-style-type: none"> <li>blocked version of Ritter-Geleyn radiation</li> <li>changed calling sequence of assimilation and relaxation</li> <li>POMPA contributions</li> </ul>	no yes no
5.04	10.03.16	<ul style="list-style-type: none"> <li>removal of AOF interface in assimilation</li> <li>configurable targeted diffusion of cold pools</li> </ul>	no no
5.04a	10.05.16	<ul style="list-style-type: none"> <li>blocked version of prognostic TKE scheme</li> <li>bug fix in slope-dependent divergence damping coefficient</li> </ul>	yes yes
5.04b	16.07.16	<ul style="list-style-type: none"> <li>blocked versions of all convection modules</li> <li>new boundary condition module src_lbc.f90</li> </ul>	no yes

## Changes in COSMO-Model 5.3

- Assimilation
  - feedback files and extended reading of scatterometer and AMDAR data
  - change of calling sequence of assimilation and relaxation (POMPA)
- Dynamics
  - Redesign of 3D diffusion to improve stability
  - Implement interface to C++ dynamical core and serialization (POMPA)
  - Implement possibility to switch on/off the Euler dynamics
  - Implement possibility to switch off the tracer advection
  - several bug fixes from POMPA

## Changes in COSMO-Model 5.3 (II)

- COSMO-ICON Physics:
  - Microphysics: implement possibility to run the microphysics at the beginning of the time loop: `lgsp_first`
  - Radiation:
    - implement a blocked version of Ritter-Geleyn radiation and the corresponding interface
    - this version also supports the possibility to work on a coarser grid



## Changes in COSMO-Model 5.3 (III)

### → Technical Changes

- Modification of grib\_api implementation for centers other than DWD
- Computation of pure diabatic temperature tendencies (new output variable TTENS\_DIAB)
- Computation of Lightning Potential Index (LPI) after Lynn et al. (2010) (new output variable LPI)

## Changes in COSMO-Model 5.04

- Removal of AOF interface in the assimilation
- Configurable targeted diffusion of cold pools (`l_diff_cold_pools`)
- Simple clipping for semi-lagrange advection scheme
- Better treatment of clouds and precipitation during diabatic DFI
- Further technical changes
- GPU Management

## Changes in COSMO-Model 5.04a

- COSMO-ICON version of prognostic TKE turbulence scheme
  - The ICON version of TURBDIFF has been implemented in blocked data format, including a major reorganization of the code (subroutines turbdiff and turbtran in extra modules, introduced a utility module for turbulence).
  - Now there is an option to compute vertical diffusion after the turbulence scheme (instead of doing it after the dynamics).
  - Another option of computing vertical diffusion after all physical parameterizations still has to be implemented (most probably 5.04d).
  - New Namelist variable: `itype_vdif`
  - This scheme is still under testing and not yet the default scheme.
  - Some already existing namelist variables will change their default value, once this scheme will become the default scheme.



## Changes in COSMO-Model 5.04a (II)

### → Dynamics

- Bug fix in the slope-dependent divergence damping coefficient: A missing metric correction term has been inserted in the subroutine `init_div_damping_coeff`.
- The effect is an increase of the divergence damping coefficient in the middle troposphere over steep terrain and a further reduction directly over mountains.
- This Bugfix will improve numerical stability in steep terrain.
- Due to this change the range of values for the namelist variable `divdamp_slope` changes from `[20.0...100.0]` to `[0.1...3.0]` with a new default value of `1.0`

## Changes in COSMO-Model 5.04b

- Implementation of convection schemes in blocked data format
  - Tiedtke- and shallow convection from the COSMO-Model
  - Tiedtke-Bechtold from IFS (ICON-Version)
  - A new optional closure type (after Boeing) has been implemented for shallow convection
- Implementation of a new boundary condition module `src_lbc.f90`
  - Contains subroutines to set special boundary conditions (`lbc_value`, `lbc_copy`, `lbc_zerograd`, `lbc_interpolate`, `lbc_tendency`, `lbc_compute_tendency`)
  - Calling these routines has been implemented only in the dynamics up to now.

## Further Plans for COSMO-Model 5.05

- COSMO-ICON Physics
  - ICON surface schemes (TERRA, FLAKE, SEAICE) and TERRA-URB (5.04c)
  - TURBDIFF: additional changes for calling vertical diffusion at the end of the physics and for staggered variable position (5.04d)
- Technical changes related to KENDA
- Implementation of a GPS slant delay operator
- Stochastic PBL perturbation

**And now we have a lot to document!!**



Thank you  
very much  
for your  
attention