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Update of status on merging POMPA developments into 5.X

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Strategy

- **Goal: Version 5.x with POMPA developments in trunk until December 2014**
- **Guideline:** COSMO Coding Standards
- **Path:** WG chairs → SMC → SCA → Trunk
- Many changes to the code!
- Keeping in sync with repository head is an effort!
- We should bring changes back step-by-step
- In order to make this happen…
  We are dependent on code owners, SCA, WG chairs and SMC for their time and support!
- Thanks to Uli (block, microph) and Christoph (assimilation)!

Overview

- C++ Dycore
- Changes and bugfixes in Fortran dycore
- Static memory allocations
- **Block module**
- **Bl**ock physics
- Serialization
- **Single precision**
- New communication interfaces
- New BC module
- Changes in BCs inside and after dynamics
- Code refactorings
- OpenACC directives
- Tracking and copying of boundary fields
- Re-ordering of microphysics
- Re-ordering of assimilation / relaxation
- Change of application domain in relaxation
- **NetCDF I/O**
- …

Dycore status

- C++ dycore validates against v5.0 Fortran reference
- New FW solver ported (not all options, see talk MB)
- Still several missing / untested features

```
l2tls = .false.
lsemi_imp = .true.
irunge_kutta /= 1
irk_order /= 3
iadv_order /= 3,5
itheta_adv /= 0
itype_bbc_w /= 2
lspecnudge = .true.
yscalar_advect /= 'BOTT2*'
yvert_adv /= 'impl'
```

```
itype_spubc /= 1
lradlbc = .true.
ldiabf_lh = .true.
lw_freeslip = .false.
lmetr = .false.
lcori_deep = .true.
ladv_deep = .true.
intcr_max > 1
itype_lbc_qrsg /= 1
itype_hdiff /= 2
```

- Priorities? Unnecessary?

C++ Dycore

- C++ dynamical core is compiled into a **library** (libDycore.a)
- New compiler macros
  - **CPP_DYCORE** – activate C++ dynamical core
  - **GCL_COMM** – activate GCL communication (requires C++ dycore)
- New namelist switch **lcpp_dycore** to activate C++ dynamical core (replaces RK dycore)
- Branch implemented in organize_dynamics.f90 (for the 'compute' action)
- Interface to C++ dycore in source file src_cpp_dycore.f90
- "Slim" interface into current code
- C++ dycore has to be "in sync" with Fortran part

src_cpp_dycore.f90

- Interface
  - cpp_dycore_init() – initialize the C++ dycore
  - cpp_dycore_compute() – do one timestep
  - cpp_dycore_swap_pointers() – timelevel swapping

- Uses iso_c_binding for Fortran/C interoperability

dycorewrapper_init_setup()
dycorewrapper_finalize_setup()
dycorewrapper_decomposition_check()
dycorewrapper_check()
dycorewrapper_finalize()

dycorewrapper_set_field()
dycorewrapper_add_tracer()
dycorewrapper_addtracerfield()
dycorewrapper_set_param()

dycorewrapper_copy_initial_bdfields()
dycorewrapper_copyin_prognosticfields()
dycorewrapper_copyout_prognosticfields()
dycorewrapper_swapandcopy_bdfields()

dycorewrapper_do_dycorestep()
dycorewrapper_swap_fields()

dycorewrapper_reset_meters()
dycorewrapper_print_meters()

Physical parametrizations

- Unified ICON / COSMO physics library was a project dependency
- Significant amount of (unplanned) work invested (block interface, restructuring, porting on old versions)
- **Important to continue working closely together and coordinating efforts**

Physical parametrizations

Scheme	C-1	Status	Delivery	Code origin
microphysics - hydci_pp (ice scheme) - hydci_pp_gr (graupel) - other schemes	 x 	 done done not started		 ICON ICON
sub grid scale oro. (SSO)		only in 4.19		COSMO 4.19
radiation	x	on-going	18/09/2014	COSMO 5.1
turbulence	x	done	5/09/2014	COSMO 4.19
soil model - terra_multlay	 x	 done		 COSMO 4.19
convection - conv_tiedtke - conv_shallow	 x	 only in 4.19 done		 COSMO 4.19 COSMO 5.0
seaice		not started		
flake	x	not started		

Coding standards

- Coding standards require adaption / extension
- C++ code
  - Coding conventions of Fortran don’t apply (e.g. naming)
  - Integrate POMPA project coding conventions?
- OpenACC / GPU
  - Changes for good practices
- Conflicting interests
  - Performance on CPUs / GPUs / other hardware
  - Memory usage vs. efficiency
  - TAG discussion

Discussion

- Timeline for unified ICON / COSMO parametrizations compatible with 12.2014 for GPU version?
- Coordination with ICON?
- What are the plans for 5.2?
- Conflicts with other developments?
- Priorities of other COSMO partners?
- Is December 2014 realistic to get these developments in?

Thank you!