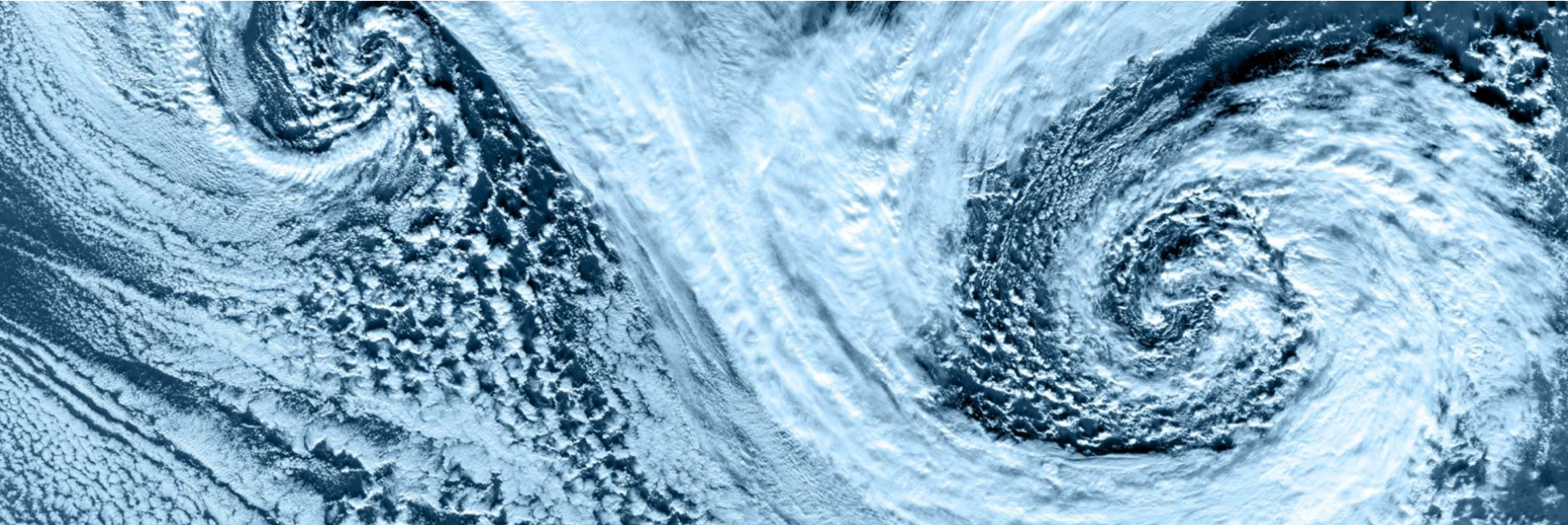


Status of the COSMO-POMPA PP

Pascal Spörri, Xavier Lapillonne



Timings

POMPA Branch

Performance Production Setup

COSMO-E Testcase

1x COSMO-E member
2 hour forecast
Version: 15th May 2017



Baseline

CPU Performance

	Double Precision	
	COSMO Fortran	COSMO C++ Dycore
Dynamics/Relaxation	280s	207s
Physics	80s	80s
Other	14s	12s
Total	374s	309s

Compute: 8x Intel Xeon E5-2690 **Sockets** (96x Haswell Cores)
I/O: 4x Intel Xeon E5-2690 **Cores** (4x Haswell Cores)

1.8x

COSMO C++ Dycore: CPU → GPU

GPU Performance

	Double Precision	Single Precision
	COSMO Fortran	COSMO C++ Dycore
Dynamics/Relaxation	98s	63s
Physics	38s	27s
Other	34s	21s
Total	169s	110s

Compute: 8x Intel Xeon E5-2690 **Cores** (8x Haswell Cores)
4x NVIDIA Tesla K80 **Cards** (8x Kepler Sockets)
I/O: 2x Intel Xeon E5-2690 **Cores** (2x Haswell Cores)

**Total
Speedup**

3.4x

CPU Double Precision (Fortran) → GPU Single Precision (OpenACC Fortran & C++ Dycore)

Status of the Merge of the POMPA features

C++ Dynamical Core

- Integrated: Works in GPU/CPU mode
- Tested daily together with COSMO technical testsuite
- Changes are tested through pull requests
- Full developer documentation distributed to SCA

Physics (OpenACC)

- **Ported schemes**
 - Soil (terra), Radiation (not Iradav), Shallow convection, sso
- **Ongoing**
 - Turbulence, Microphysics
- **Not Started yet**
 - Tiedke convection, Flake
- **Not considered in POMPA**
 - Sea-ice, Bechtold convection

Other components

- Communication: GCL library is needed for efficient GPU/GPU communication
 - No progress yet (planned after COSMO GM)
- Assimilation
 - Nudging : ongoing
 - Latent Heat Nudging : not started
- Output and “glue code” (Imorg, organize_physics...) : not started

Single Precision

- Only tested and operational (MCH and COSMO-LEPS) in the POMPA version
Dynamics and Physics
- Possibly needs to be re-evaluated for the current official version of COSMO
- Data assimilation in single precision
 - Several tests with promoting internal variables to double
 - No success \Rightarrow may not be possible without significant change in the code

Documentation

Documentation

- **Build Documentation**
 - Covers STELLA, C++ Dycore and COSMO
 - No extra build scripts needed
 - Available in cosmo/ACC/README.md
- **C++ Dynamical Core Documentation**
 - Oriented towards developers
 - Available in dycore/doc/Dycore
- **C++ Dycore Wrapper Documentation**
 - For C++ Dycore Maintainer
 - Available in dycore/doc/Wrapper
- **C++ Dycore Maintenance Guide**
 - For C++ Dycore Maintainer
 - Available in dycore/doc/DycoreMaintenanceGuide

Available here: <https://wiki.c2sm.ethz.ch/COSMO/CXXDynamicalCore>









C++ Dycore Training Course

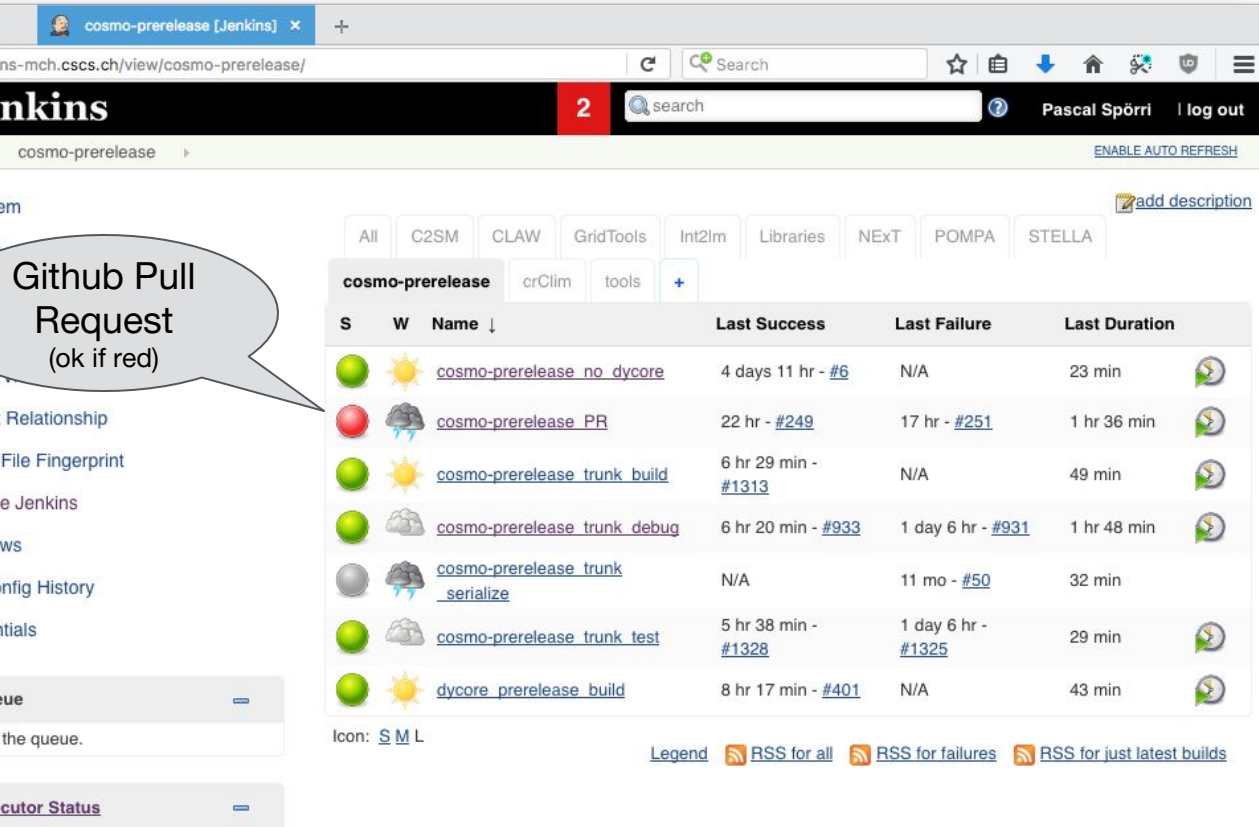
- Held in Langen, Germany as part of the COSMO/CLM/ART - Training Course
- March 27 - April 04, 2017
- 16 Participants (21 registered)
- Topics:
 - General setup of the code, testing
 - Configuration and compilation
 - Hands-on session on the DWD Cray
 - GPUs/Accelerators how and why
 - STELLA introduction
 - Extracting an intermediate computation

Material available here: <https://wiki.c2sm.ethz.ch/COSMO/CXXDynamicalCore>

Working Mode

Daily Testing

Configuration Matrix		cpu	gpu
kesch	float		
	double		
kesch-pgi	float		
	double		



cosmo-prerelease [Jenkins] x

ns-mch.cscs.ch/view/cosmo-prerelease/

Search

2

search

Pascal Spörri | log out















cosmo-prerelease

ENABLE AUTO REFRESH




add description

All C2SM CLAW GridTools Int2lm Libraries NEXT POMPA STELLA

cosmo-prerelease crClim tools

S	W	Name ↓	Last Success	Last Failure	Last Duration
		cosmo-prerelease_no_dycore	4 days 11 hr - #6	N/A	23 min
		cosmo-prerelease_PR	22 hr - #249	17 hr - #251	1 hr 36 min
		cosmo-prerelease_trunk_build	6 hr 29 min - #1313	N/A	49 min
		cosmo-prerelease_trunk_debug	6 hr 20 min - #933	1 day 6 hr - #931	1 hr 48 min
		cosmo-prerelease_trunk_serialize	N/A	11 mo - #50	32 min
		cosmo-prerelease_trunk_test	5 hr 38 min - #1328	1 day 6 hr - #1325	29 min
		dycore_prerelease_build	8 hr 17 min - #401	N/A	43 min

Icon: [S](#) [M](#) [L](#)

Legend  RSS for all  RSS for failures  RSS for just latest builds

Github Pull Request (ok if red)

Relationship

File Fingerprint

e Jenkins

ws

nfing History

tials

ue

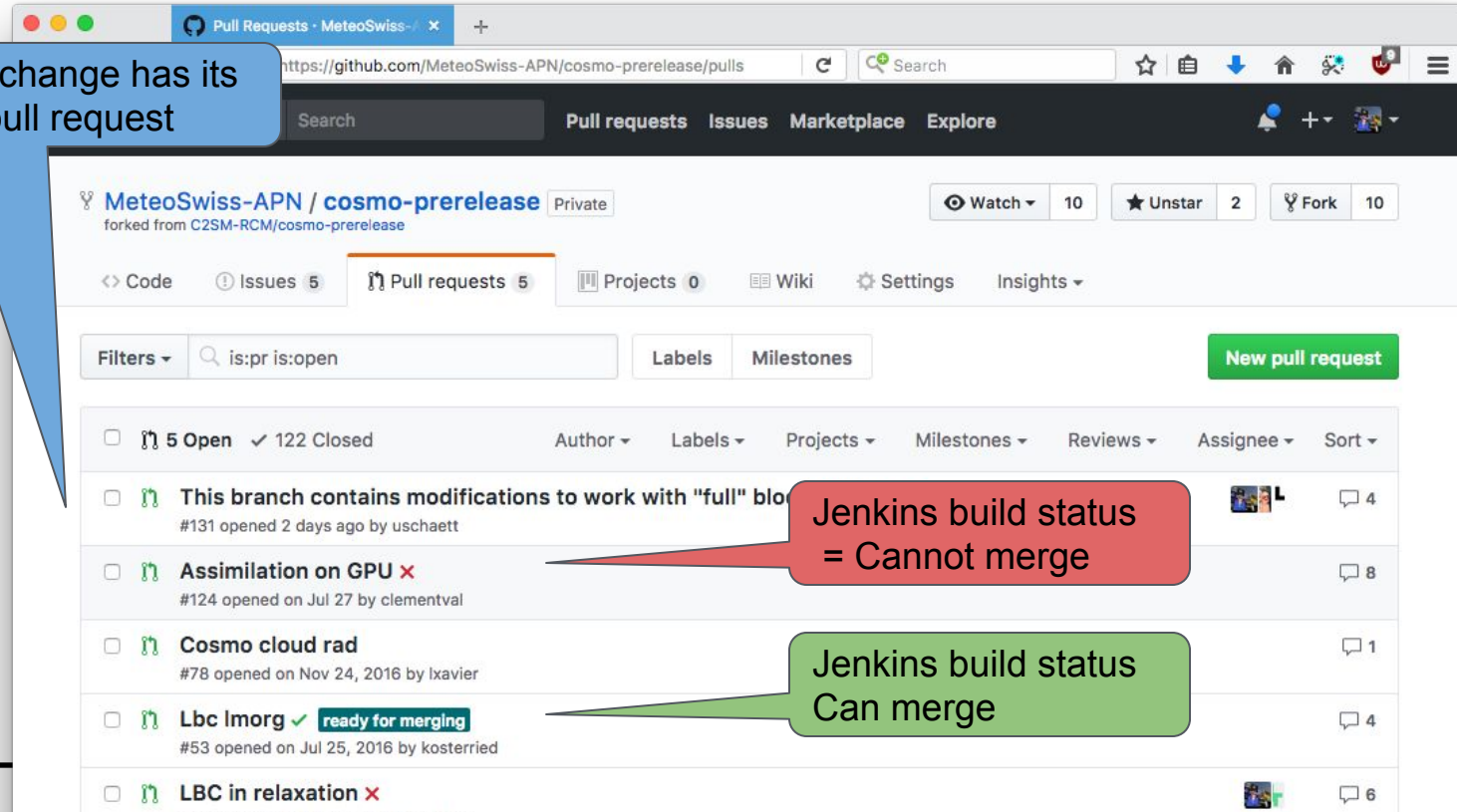
the queue.

uctor Status

- Daily builds
 - CPU and GPU
 - Single and Double Precision
 - Debug and Release
 - C++ Dycore
 - PGI and Cray
- Testing
 - CPU and GPU
 - MeteoSwiss testlist
 - DWD testlist
 - C++ Dycore

Github Integration

Each change has its
own pull request



The screenshot shows the GitHub interface for the repository 'MeteoSwiss-APN / cosmo-prerelease'. The page displays a list of pull requests. The first pull request, '#131', is titled 'This branch contains modifications to work with "full" blo' and is in a 'Cannot merge' state. The second pull request, '#124', is titled 'Assimilation on GPU' and is also in a 'Cannot merge' state. The third pull request, '#78', is titled 'Cosmo cloud rad' and is in a 'Can merge' state. The fourth pull request, '#53', is titled 'Lbc lmorg' and is in a 'Can merge' state. The fifth pull request, '#53', is titled 'LBC in relaxation' and is in a 'Cannot merge' state.

Open/Closed	Author	Labels	Projects	Milestones	Reviews	Assignee	Sort
5 Open / 122 Closed							
<input type="checkbox"/> This branch contains modifications to work with "full" blo #131 opened 2 days ago by uschaett							4
<input type="checkbox"/> Assimilation on GPU							8
<input type="checkbox"/> Cosmo cloud rad #78 opened on Nov 24, 2016 by lxavier							1
<input type="checkbox"/> Lbc lmorg ready for merging							4
<input type="checkbox"/> LBC in relaxation							6

Jenkins build status
= Cannot merge

Jenkins build status
Can merge

Lessons Learned

- Github integration very important
 - Allows us to see the latest changes and regularly test them
 - Scalable for more collaborators


Thank you!

Kesch System Update

Production CUDA 7

GCC 4.9, MVAPICH 2.1, CCE 8.4.4, RHEL 6

- Timeloop **111.6233**
- Dynamics 64.8235
- Physics 26.6754
- Init 1.6635
- Output 4.7423



**Additional
14%**

Updated System CUDA 8

GCC 5.4, MVAPICH 2.2, CCE 8.6.0, RHEL 7

- Timeloop **95.4242**
- Dynamics 55.0604
- Physics 21.8393
- Init 1.8626
- Output 4.4630

RESULTS - PRELIMINARY RESULTS - PRELIMINARY RESULTS - PRELIMINARY