Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

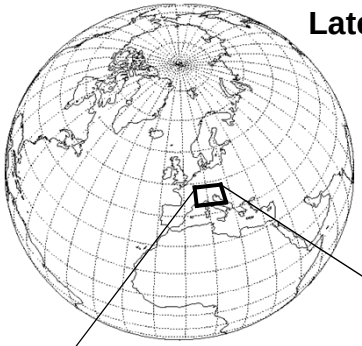
Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

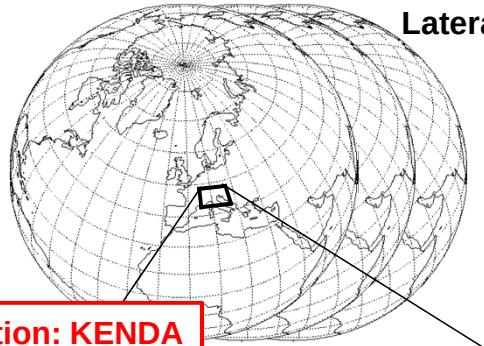
COSMO-1 & COSMO-E

Philippe Steiner and the whole team
COSMO GM 2016, Offenbach

New operational models since 2016



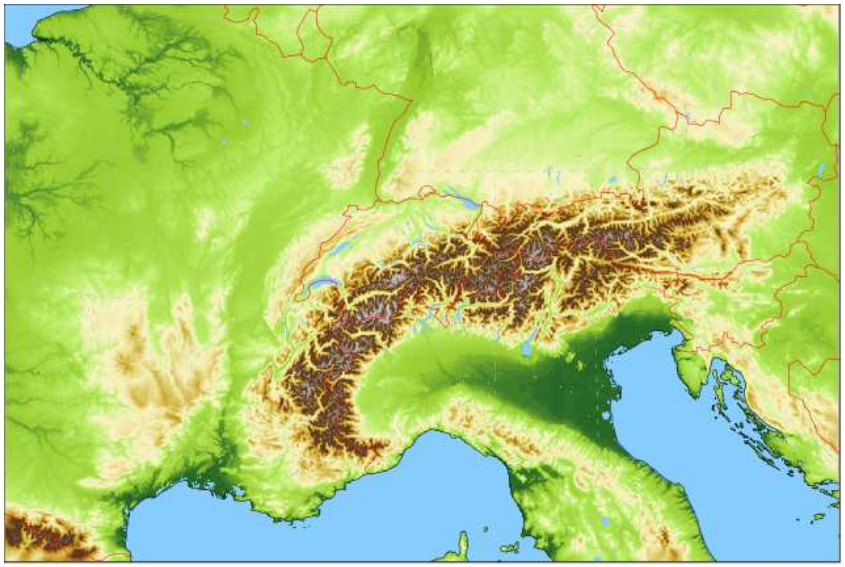
Lateral boundary conditions:
IFS-HRES
9km / 0.1°
4x per day



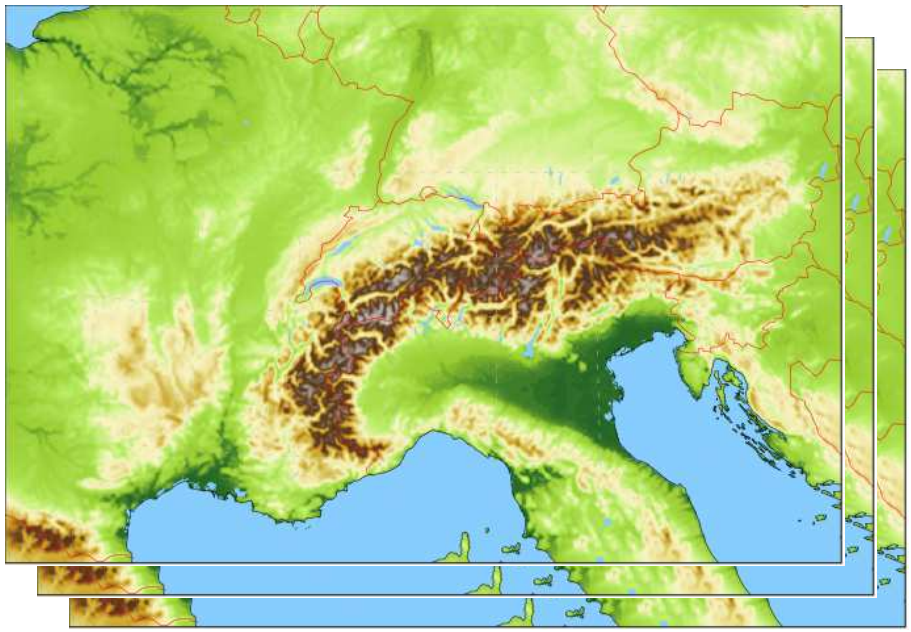
Lateral boundary conditions:
IFS-ENS
18km / 0.2°
4x per day

ensemble data assimilation: KENDA

COSMO-1: 33+ hour forecasts, 8x per day
1.1km grid size



COSMO-E: 5 day forecasts, 2x per day
2.2km grid size, 21 ensemble members



Benchmarks to decide on operationalisation

COSMO-1

√ • at least as good as COSMO-2

COSMO-E

√ • **probabilistic:**
at least as good as COSMO-LEPS

√ • **deterministic (control and median):**
at least as good as COSMO-2 (till +33h) / COSMO-7 (from +36h on)

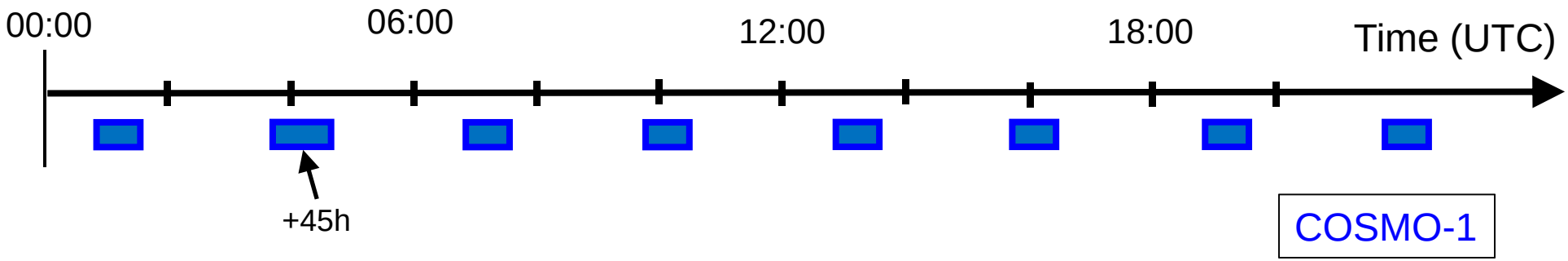
KENDA

⌐ • **Analysis for COSMO-1:**
at least as good as nudging (for COSMO-1)
verification done for 6h free COSMO-1 forecast based on both analysis

√ • **Analysis for COSMO-E:**
at least as good as a downscaling of IFS-ENS
verification done for 6h free COSMO-E forecast based on both analysis

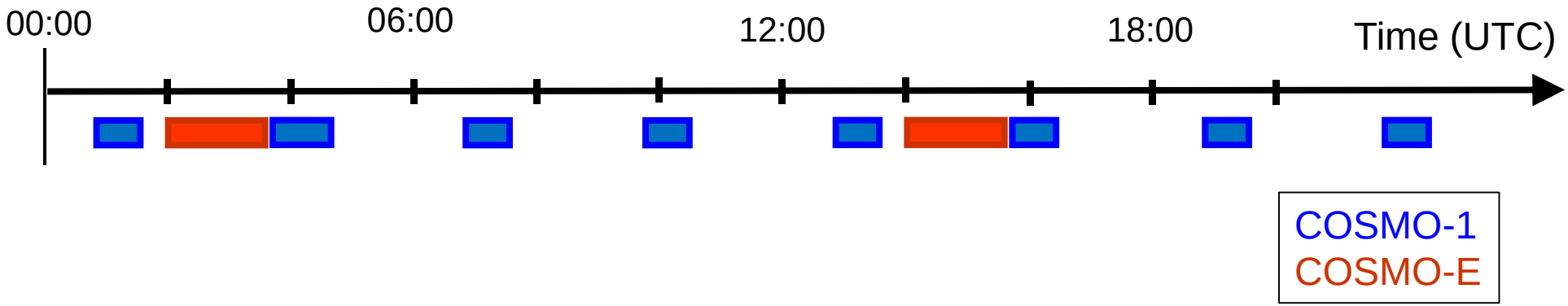
Production schedule (daily)

- COSMO-1 runs 8 times per day (00, 03, ..., 21 UTC runs)



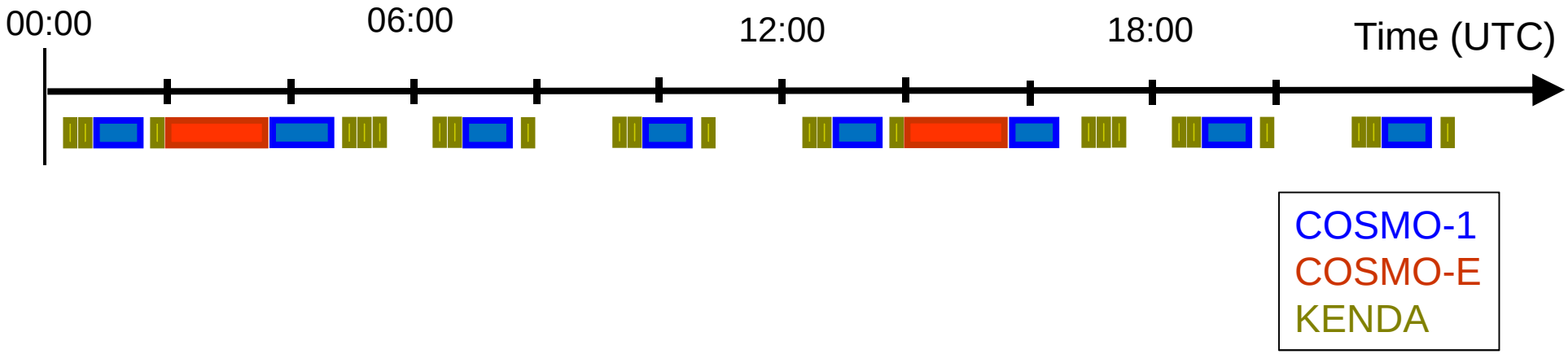
Production schedule (daily)

- COSMO-1 runs 8 times per day (00, 03, ..., 21 UTC runs)
- COSMO-E runs 2 times per day (00 & 12 UTC runs)

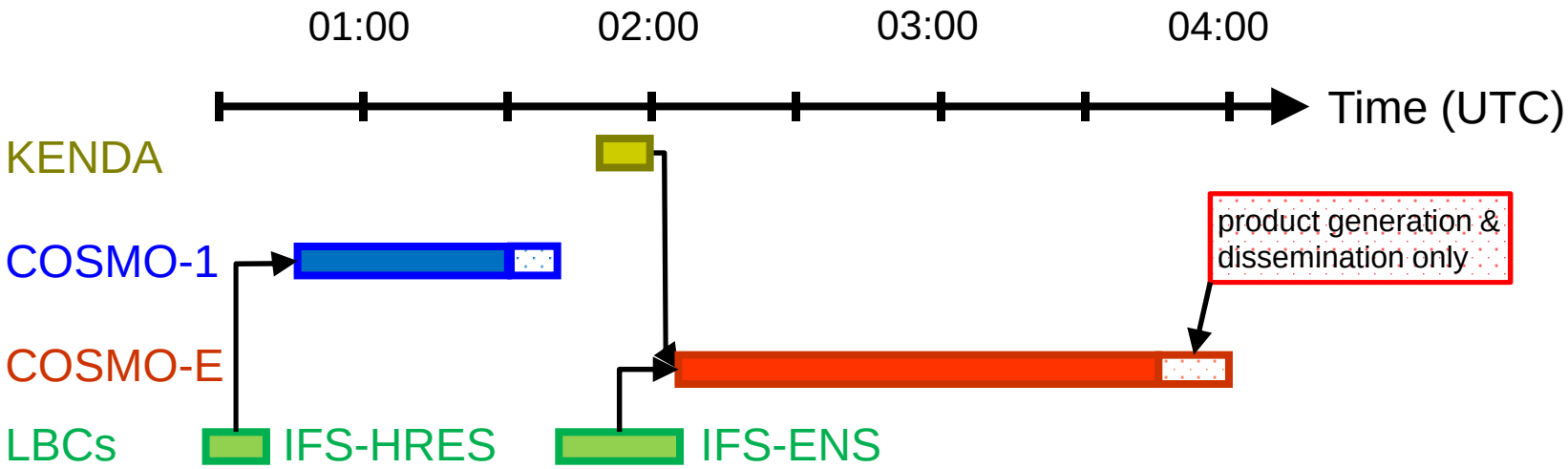


Production schedule (daily)

- COSMO-1 runs 8 times per day (00, 03, ..., 21 UTC runs)
- COSMO-E runs 2 times per day (00 & 12 UTC runs)
- KENDA runs in 24 hourly junks



Schedule 00 UTC forecasts

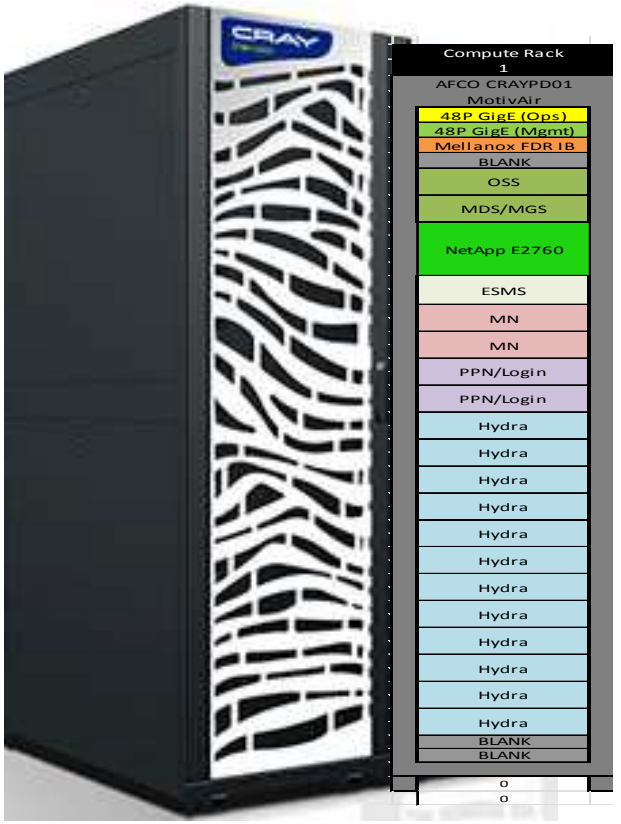


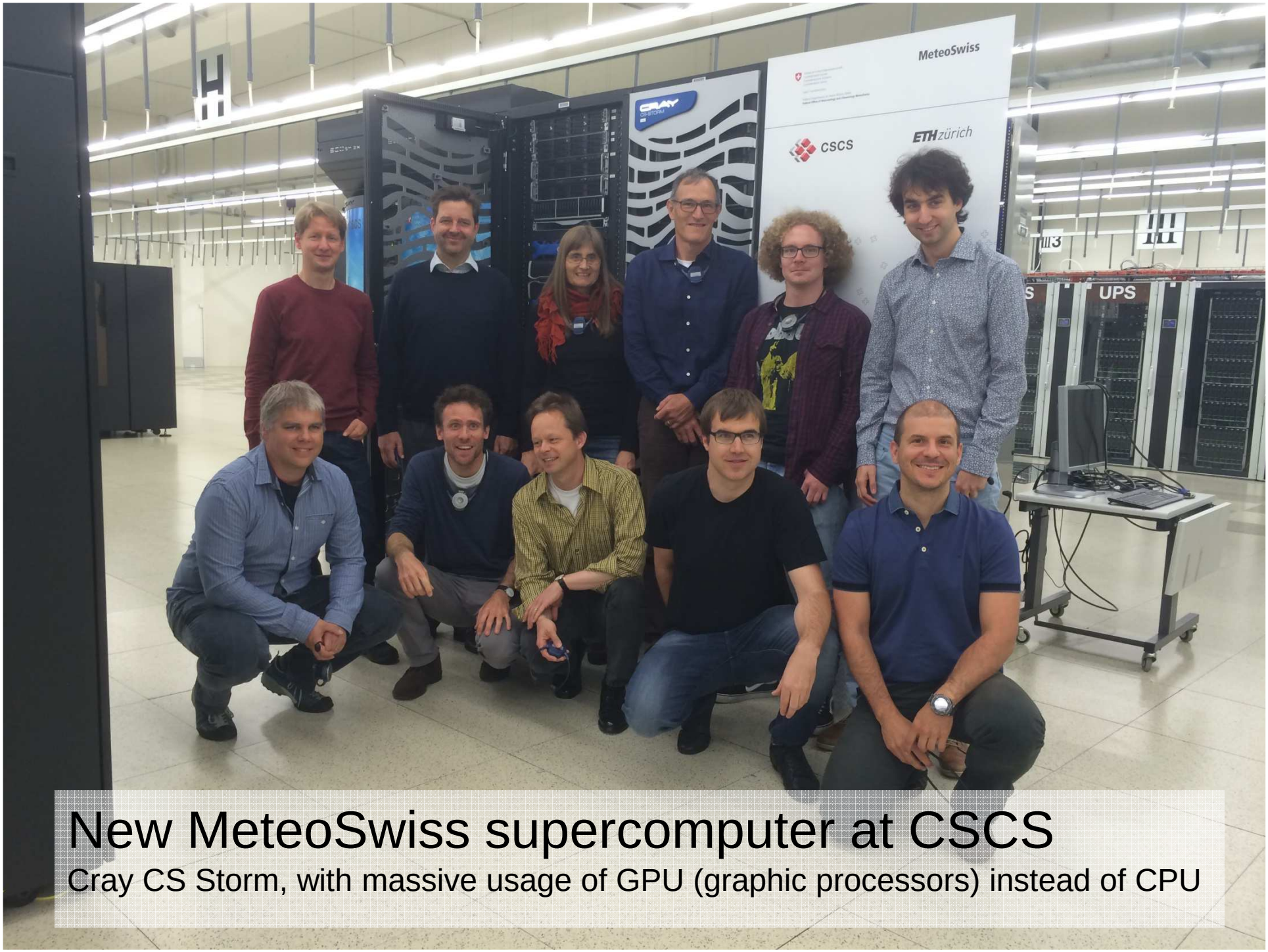
- COSMO-1 +33h available ~1:40h after analysis time
- COSMO-E +120h disseminated ~4:00h after analysis time, start triggered by arrival of IFS-ENS LBCs
- products generated and disseminated parallel to forecast computation

New MeteoSwiss supercomputer at CSCS

Piz Kesch (Cray CS Storm)

- Installed at CSCS in July 2015
- Hybrid system with a mixture of CPUs and GPUs
- “Fat” compute nodes with
  2 Intel Xeon E5 2690 (Haswell) and
  8 Tesla K80 (each with 2 GK210)
- Fully redundant (failover for research and development)
- Only 12 out of 22 possible compute nodes

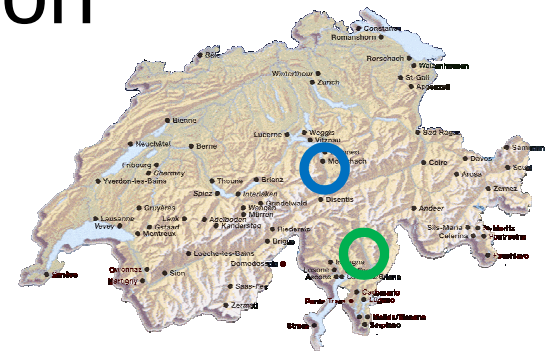




New MeteoSwiss supercomputer at CSCS

Cray CS Storm, with massive usage of GPU (graphic processors) instead of CPU

Benefit of the higher resolution

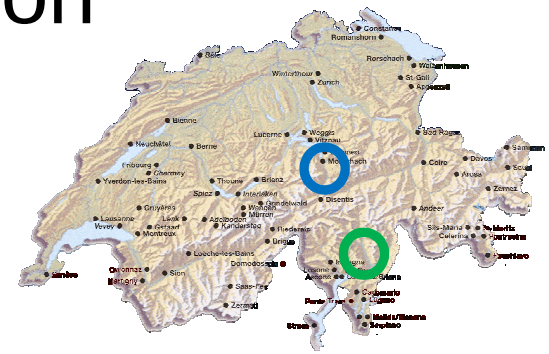


Altdorf (Reuss valley)

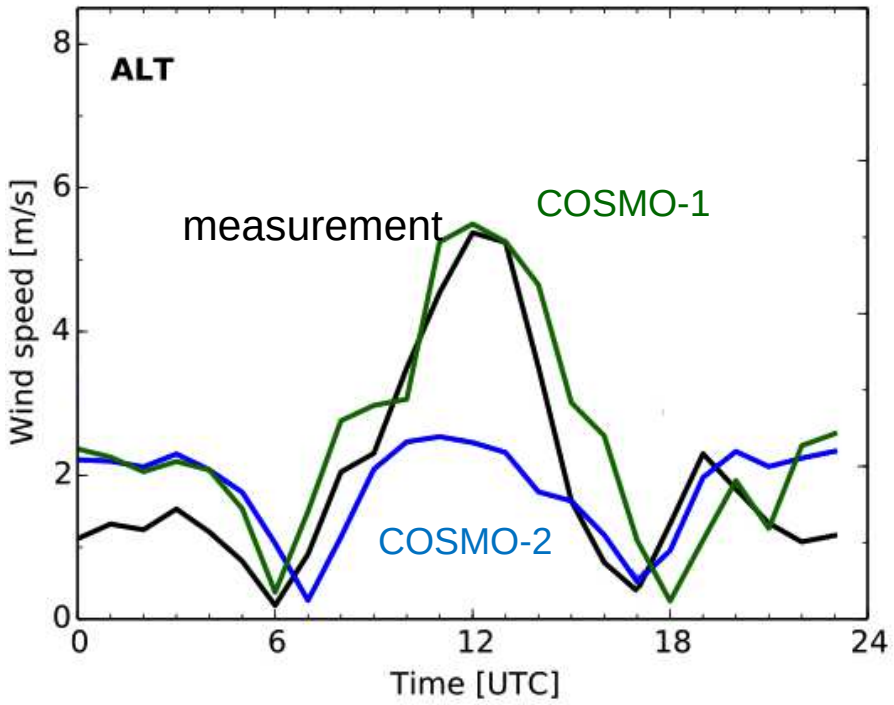
Lodrino (Leventina)

Benefit of the higher resolution

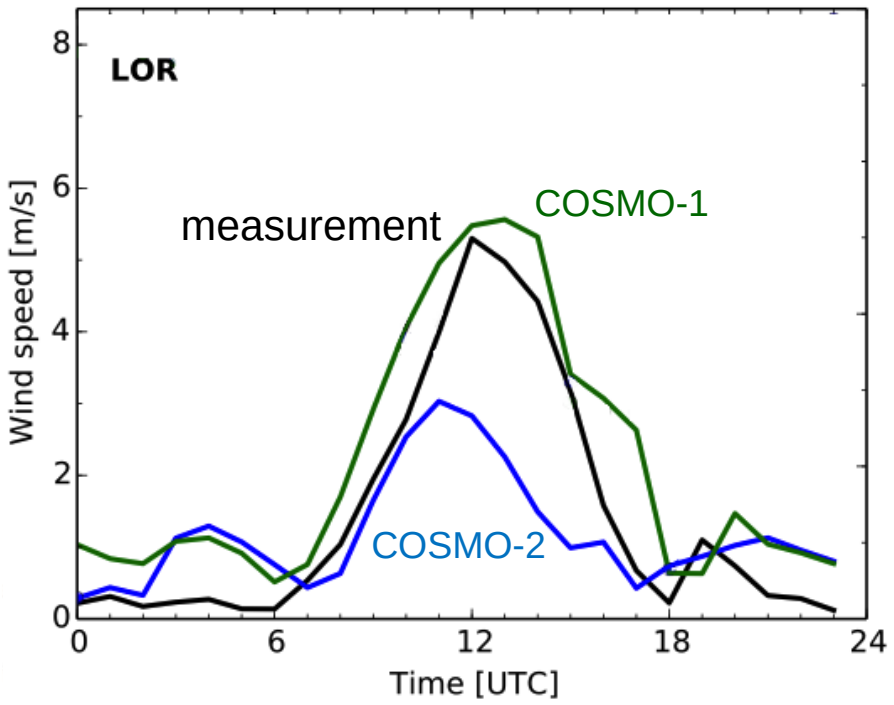
(18 days: 9. – 27.7.2006)



Altdorf (Reuss valley)

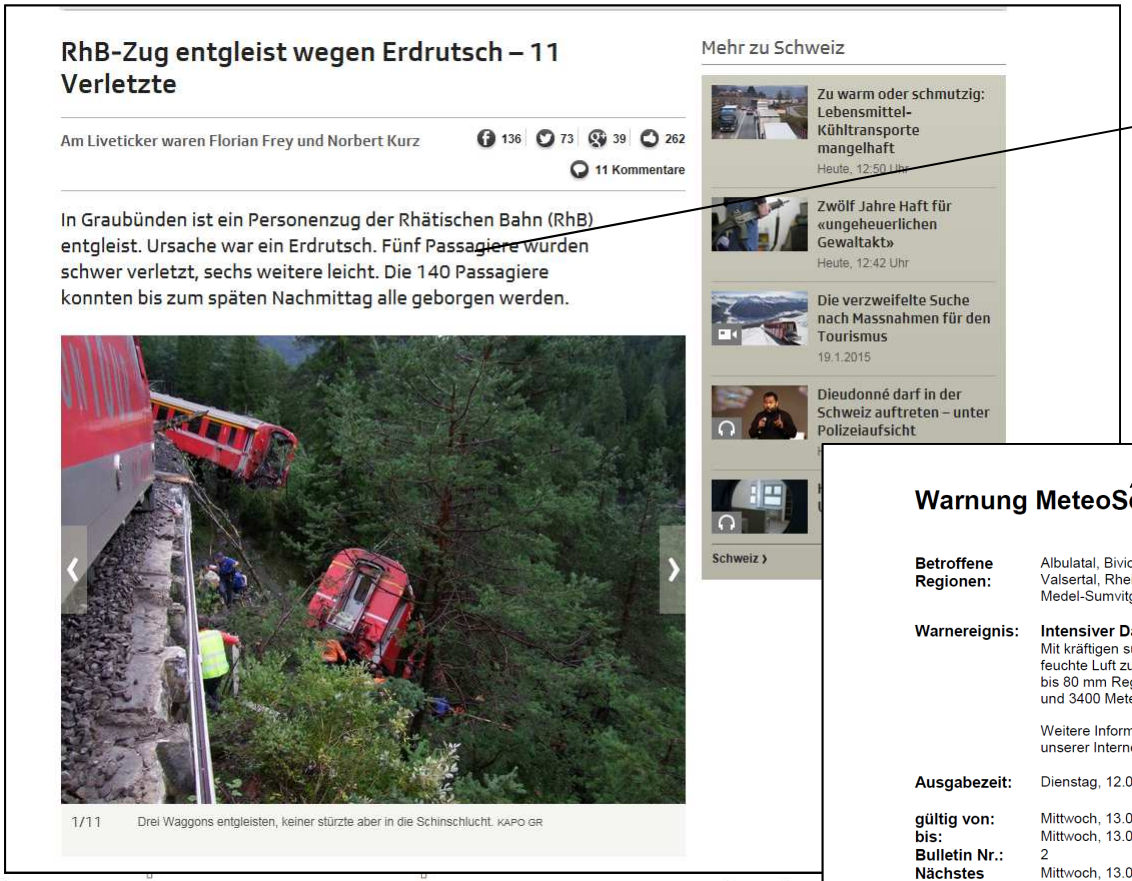


Lodrino (Leventina)



Benefit of ensemble for warnings

Example: Landslide affecting railway in the Alps, 13.8.2014



RhB-Zug entgleist wegen Erdrutsch – 11 Verletzte

Am Liveticker waren Florian Frey und Norbert Kurz

136 73 39 262

11 Kommentare

In Graubünden ist ein Personenzug der Rhätischen Bahn (RhB) entgleist. Ursache war ein Erdrutsch. Fünf Passagiere wurden schwer verletzt, sechs weitere leicht. Die 140 Passagiere konnten bis zum späten Nachmittag alle geborgen werden.

1/11 Drei Waggons entgleisten, keiner stürzte aber in die Schinschlucht. KAPO GR

Mehr zu Schweiz

Zu warm oder schmutzig: Lebensmittel-Kühltransporte mangelhaft
Heute, 12:50 Uhr

Zwölf Jahre Haft für «ungeheuerlichen Gewaltakt»
Heute, 12:42 Uhr

Die verzweifelte Suche nach Massnahmen für den Tourismus
19.1.2015

Dieudonné darf in der Schweiz auftreten – unter Polizeiaufsicht

Schweiz ›

11 injured persons, 5 heavily

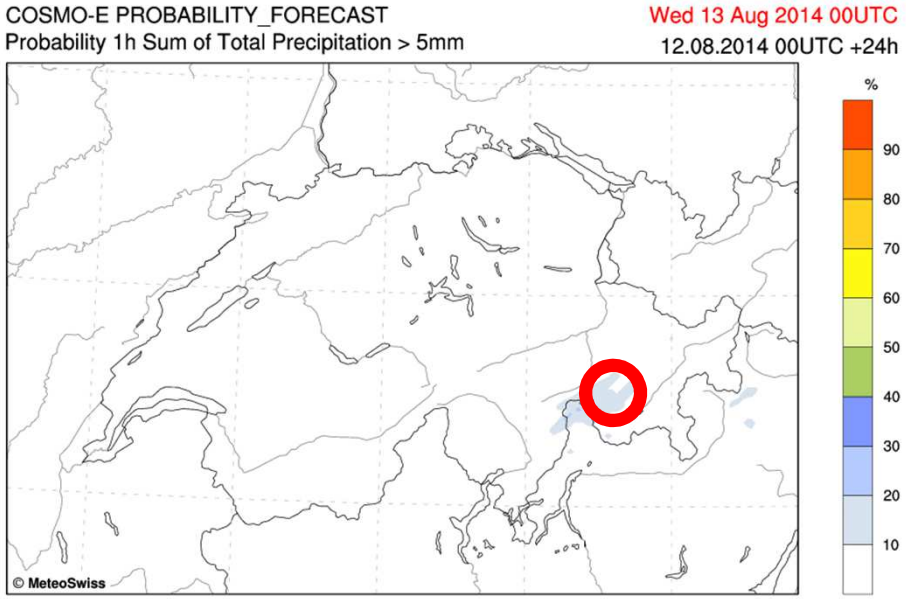
Correct level 3 warning issued the day before at 16:51

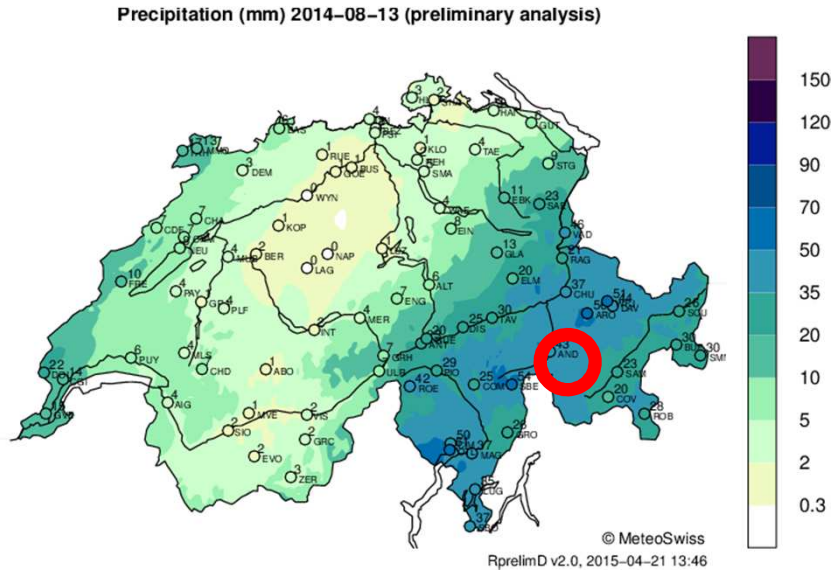
Warnung MeteoSchweiz, Stufe 3

Betroffene Regionen:	Albulatal, Bivio-Avers, Brigels, Davos, Domleschg, Flims-Laax, Lugnez-Valsertal, Rheinwald, Riein-Safiental, Savognin, Schams, Schanfigg, Val Medel-Sumvitg
Warnereignis:	**Intensiver Dauerregen mit 50 bis 80 mm** Mit kräftigen südwestlichen Höhenwinden wird warme, aber auch sehr feuchte Luft zur Schweiz geführt. In den gewarnten Gebieten ist mit 50 bis 80 mm Regen zu rechnen. Die Schneefallgrenze liegt zwischen 2800 und 3400 Metern. Am Mittwochabend erfolgt eine Beruhigung. Weitere Informationen zum Warnereignis sind im Unwetterbulletin auf unserer Internetseite oder auf der ELD der NAZ zu finden.
Ausgabezeit:	Dienstag, 12.08.2014 16:51 Uhr
gültig von:	Mittwoch, 13.08.2014 00:00 Uhr
bis:	Mittwoch, 13.08.2014 18:00 Uhr
Bulletin Nr.:	2
Nächstes Bulletin:	Mittwoch, 13.08.14 18:00 Uhr
Ausgabestelle:	Bundesamt für Meteorologie und Klimatologie, MeteoSchweiz

Benefit of ensemble for warnings

Example: Landslide affecting railway in the Alps, 13. 8. 2014





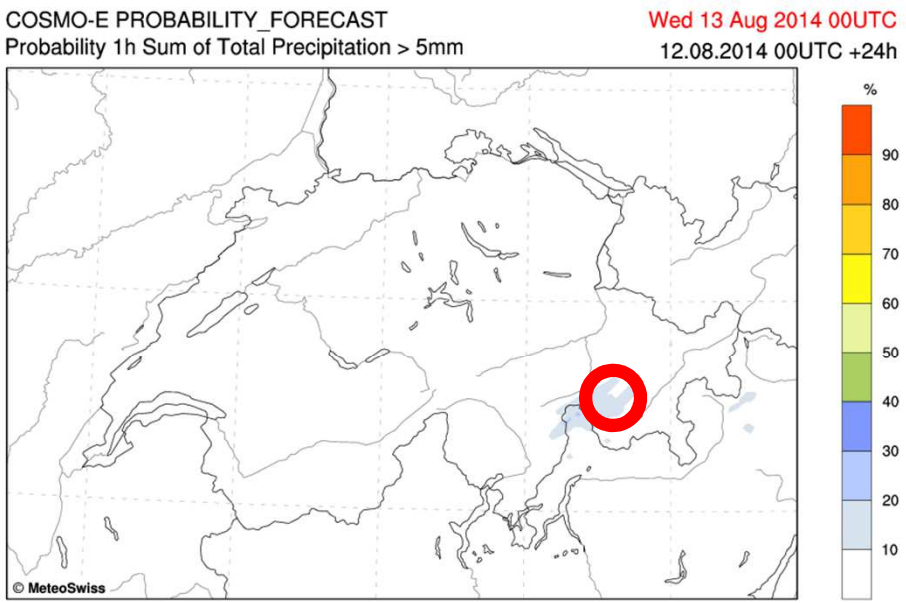
Probabilistic rain forecast

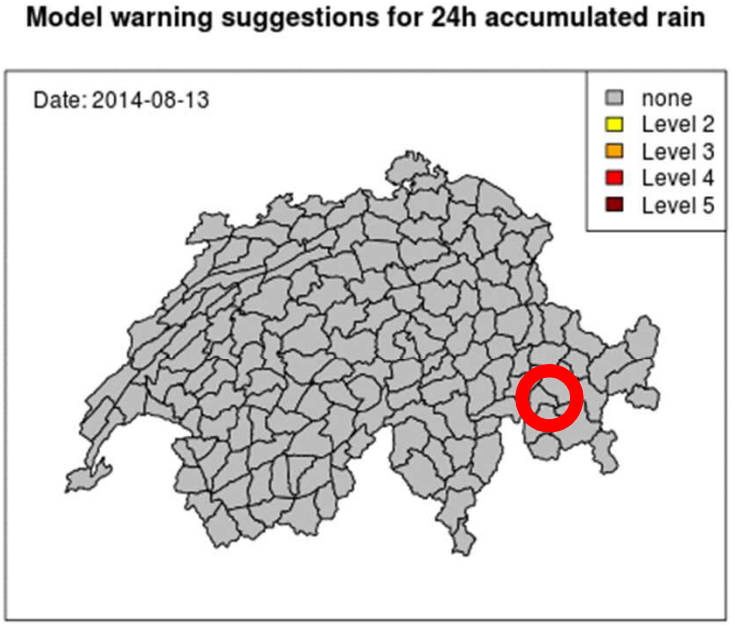
1h Sum > 5mm Modell COSMO-E

24h rain measurement

Benefit of ensemble for warnings

Example: Landslide affecting railway in the Alps, 13. 8. 2014





Probabilistic rain forecast
1h Sum > 5mm from COSMO-E

Automatic warning proposals derived from COSMO-E
(currently in preoperational tests)

Conclusions

- New models operational after nearly 5 years of work within the project COSMO-NExT (2012-2016)
- Great profit from common development within COSMO
- Enabled by the projects for the migration on accelerator started 2010, largely funded by initiatives HP2C & PASC
- Co-design approach involving CSCS, NVIDIA and Cray

- First operational use of GPU for NWP by a national weather service worldwide

- Finalist of Swiss ICT Award 2016!

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