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CONSORTIUM FOR SMALL SCALE MODELING
COSMO

Why do we need (high resolution) models?

Pierre Eckert

COSMO WG4 coordinator
« interpretation and applications »
Regional office MeteoSwiss Geneva

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Why do we need (smart) forecasters?

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The role of models and forecasters

Is there a fight between modellers and forecasters?

Forecasters:
- have a schizophrenic attitude toward models:
- are able to fetch unknown models on Internet
- complain often about the bad quality of models

Modellers:
- do their best to improve "their" models
- are able to believe in sentences like "in 10 years time the models will be so good that the human forecaster will be obsolete" (1974 conference in Bergen, unsafe quotation)

Usefulness of models, two way communication

The big bang (or the big crunch)

Quality of models

Expectations from models

1960 1970 1980 1990 2000 2010
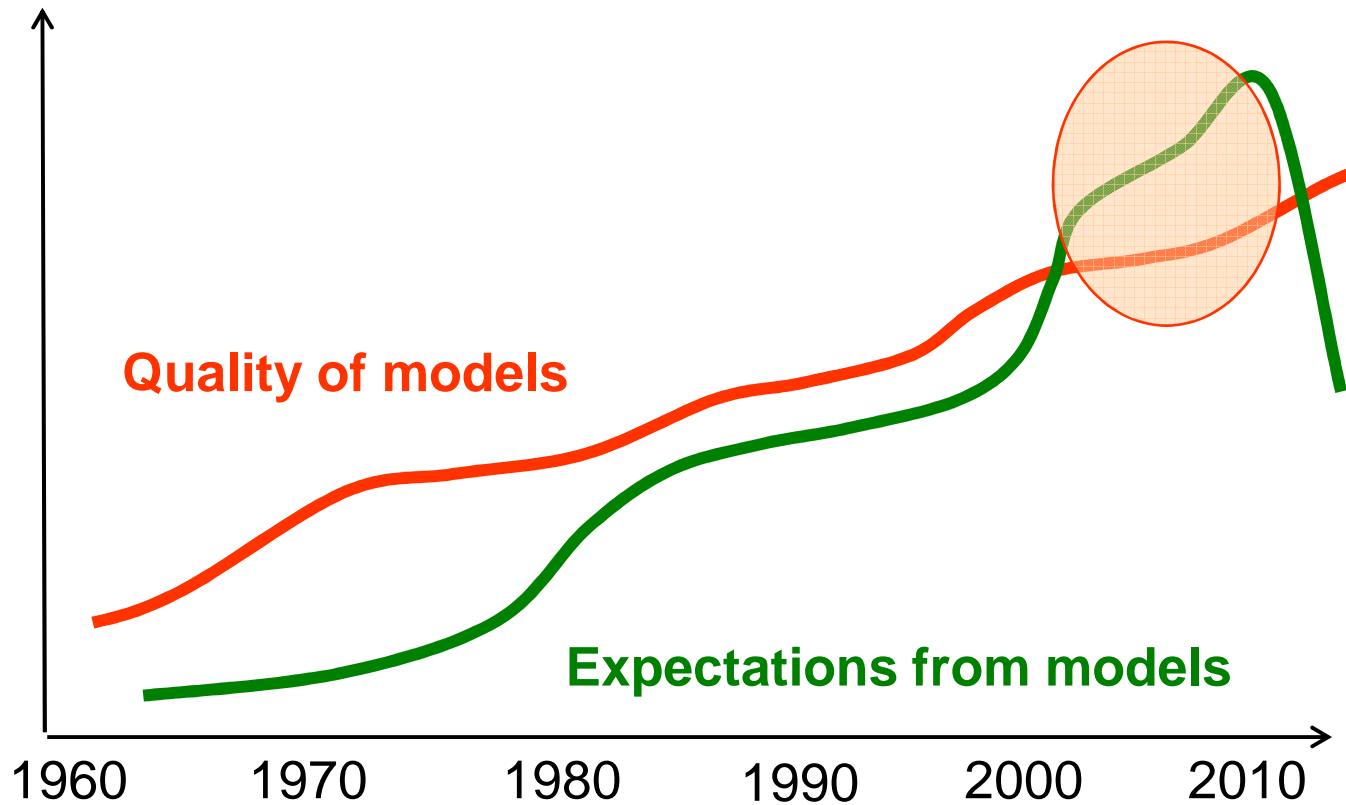
Parameters looked at

COSMO-7 Forecast for: Sun 20 Sep 2009 12 UTC   Version: opr 7km (869)
500hPa   Geopotential Height   Units: m
         Temperature shaded   Units: °C   Run: 20.09.2009 00UTC+12h

Quelle / Source: MeteoSwiss

COSMO-2 Forecast for: Sun 20 Sep 2009 12 UTC   Version: opr 2km (869)
500hPa   Geopotential Height   Units: m
         Temperature shaded   Units: °C   Run: 20.09.2009 00UTC+12h

Quelle / Source: MeteoSwiss

500 hPa

7 km
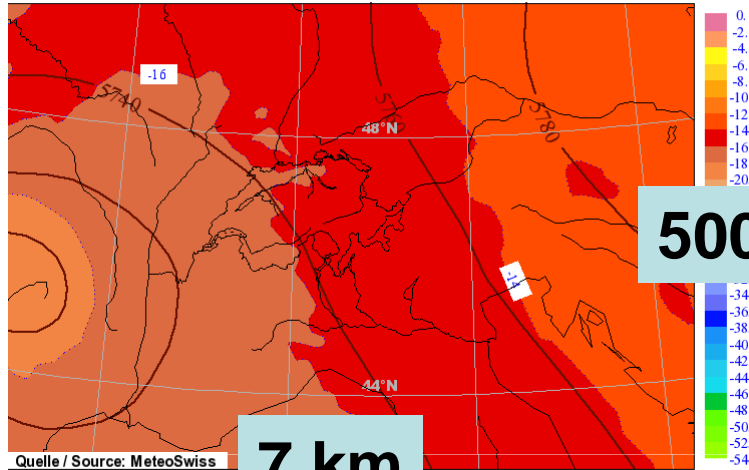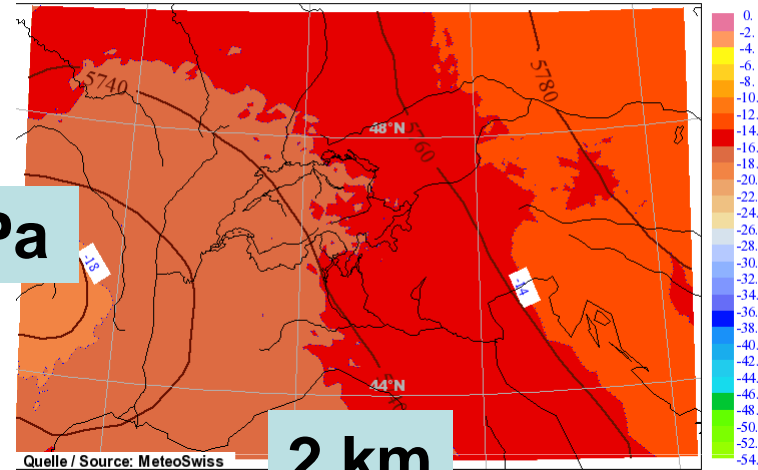
2 km

COSMO-7 Forecast for: Sun 20 Sep 2009 12 UTC   Version: opr 7km (869)
6h Sum of precipitation   Mean: 0.544mm   Run: 20.09.2009 00UTC+12h

Quelle / Source: MeteoSwiss
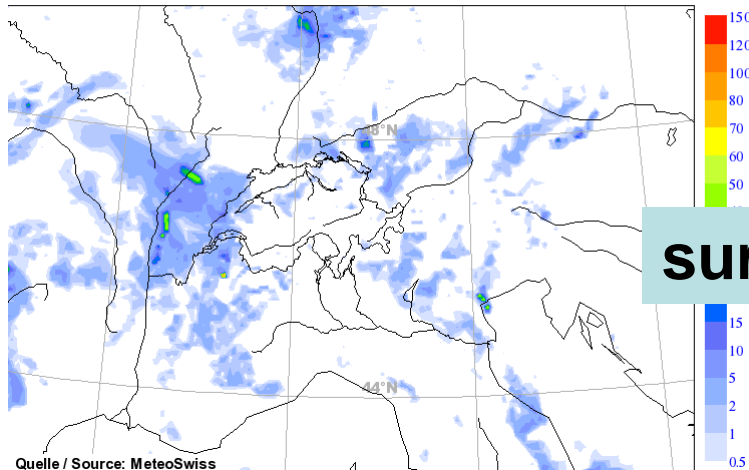
COSMO-2 Forecast for: Sun 20 Sep 2009 12 UTC   Version: opr 2km (869)
6h Sum of precipitation   Mean: 0.264mm   Run: 20.09.2009 00UTC+12h

Quelle / Source: MeteoSwiss
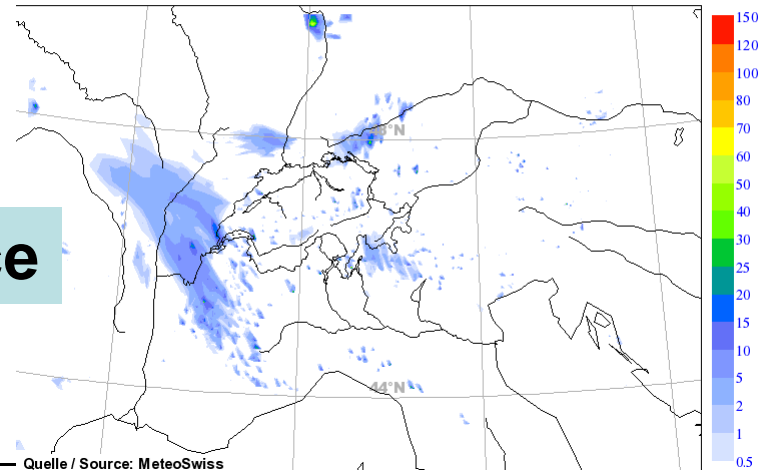
surface

Parameters looked at
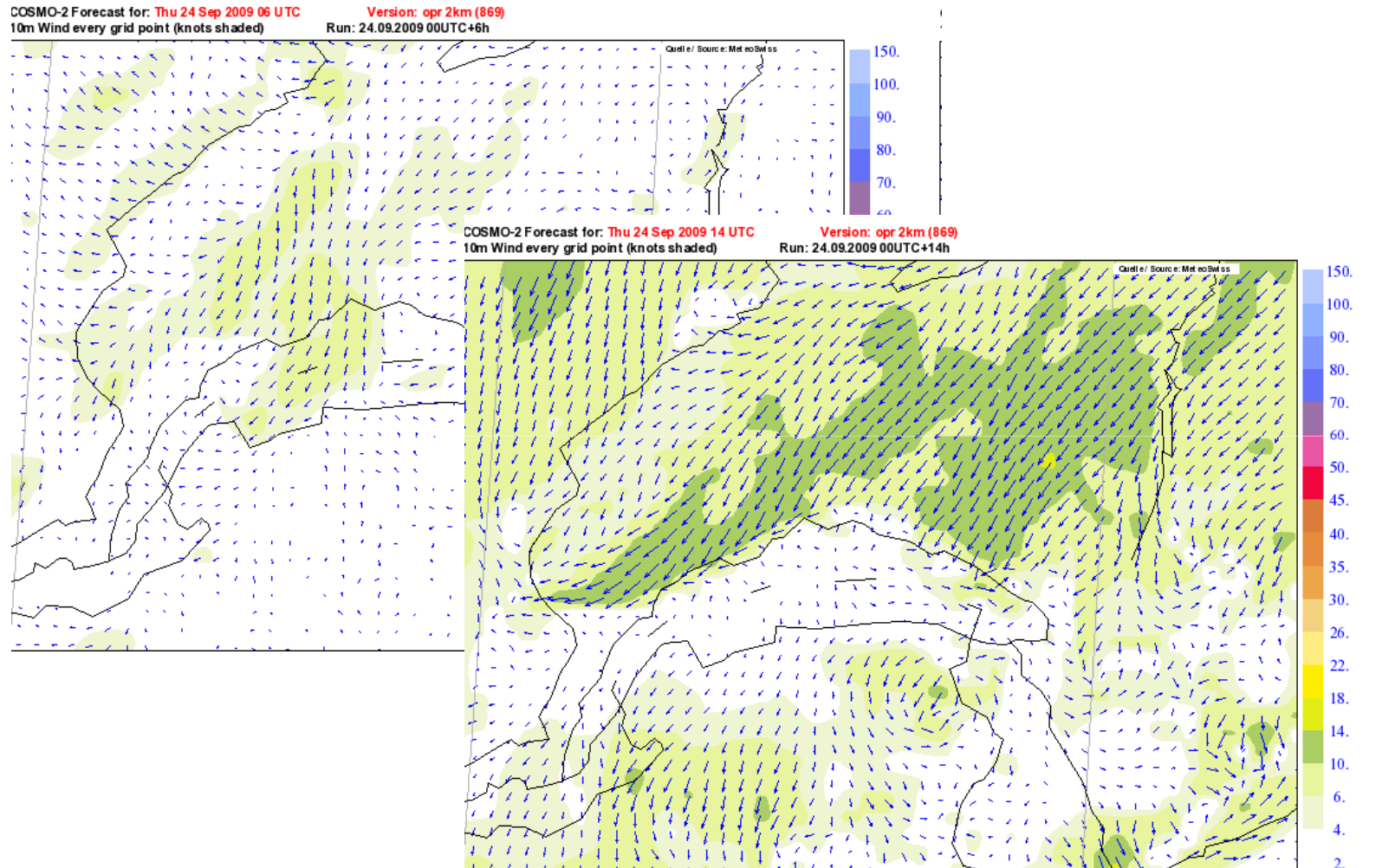
Expectations / promises

- Small grid spacing → high resolution forecast
- Good (perfect) timing
- Desire for sophisticated parameters:
    - Surface temperature
    - Rainfall
    - Cloudiness
    - Fog
    - Wind gusts
    - …..

Expectations: from forecasters
Promises: from modellers

What should be verified?

- Fuzzy verification show that 2km models are better than 7km or global models…
- But they have to be averaged (or other statistics) over sizes of 30-50 km
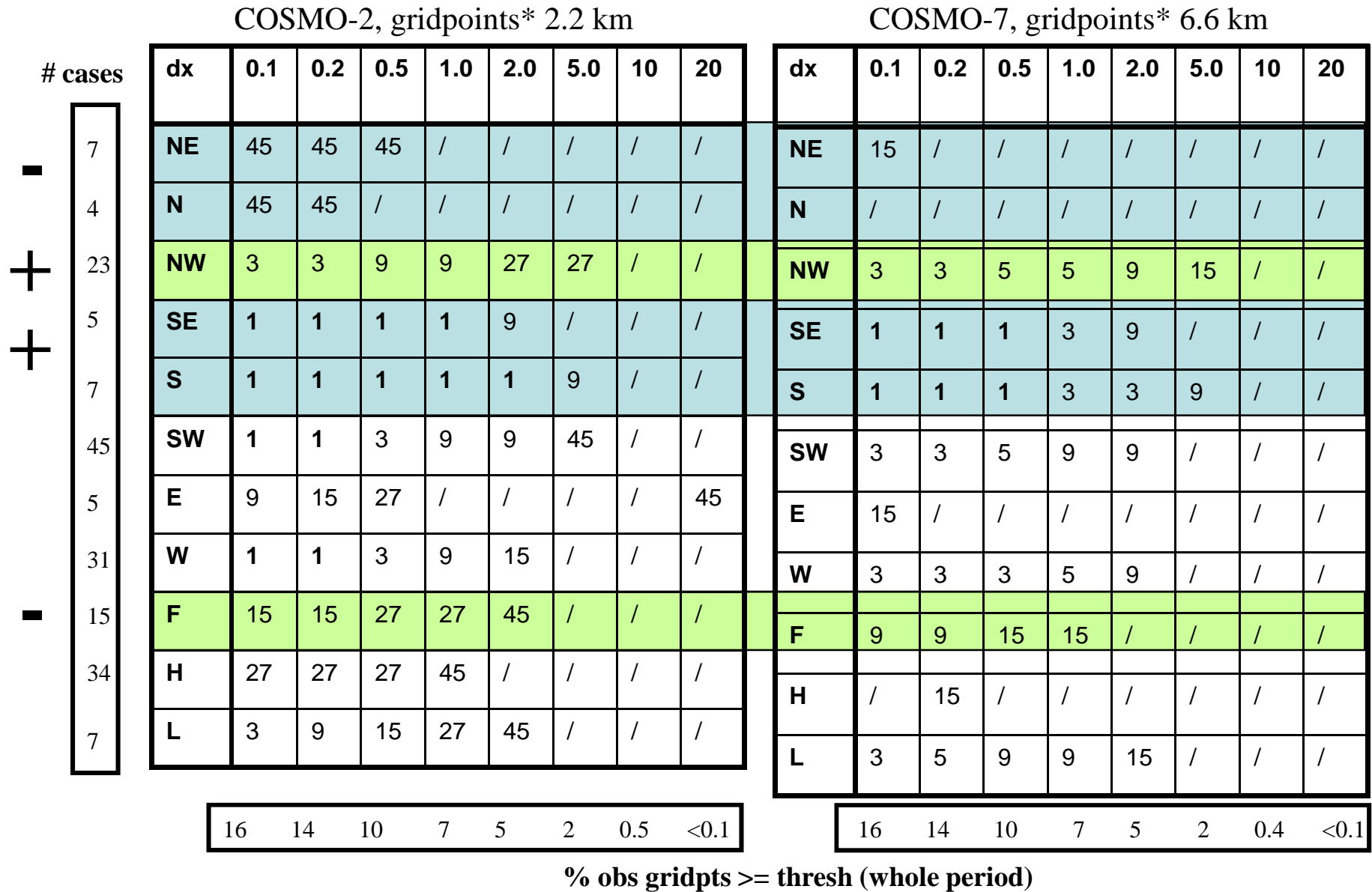- Stratified verification (by synoptic situation) show that this affirmation is not universally true
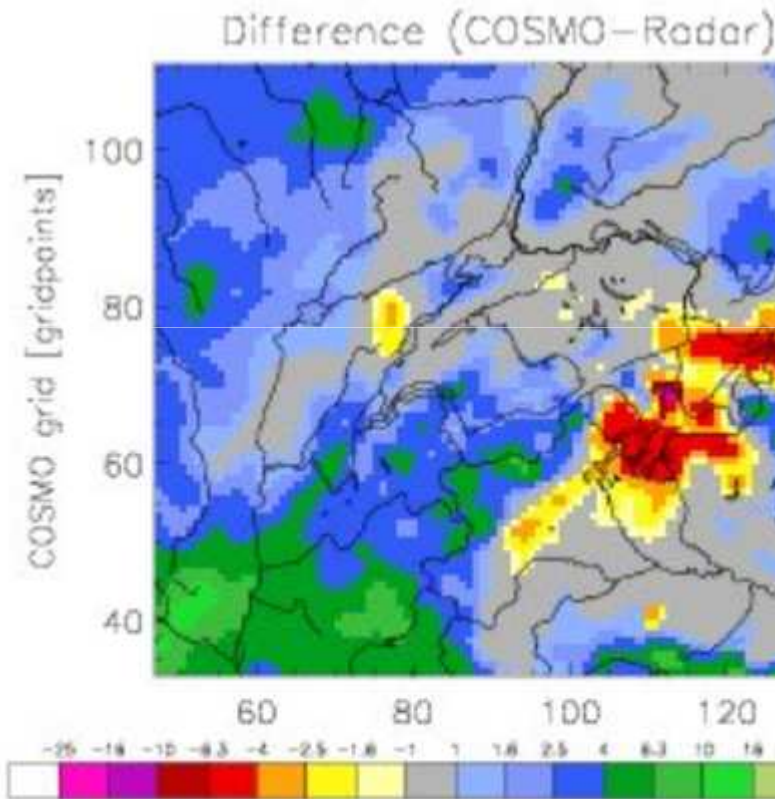- Some type of phenomena can be trusted a small scales

Smallest spatial scale [gridpoints] where the forecast has been useful regarding to **FSS „useful scales"** definition (from T. Weusthoff)
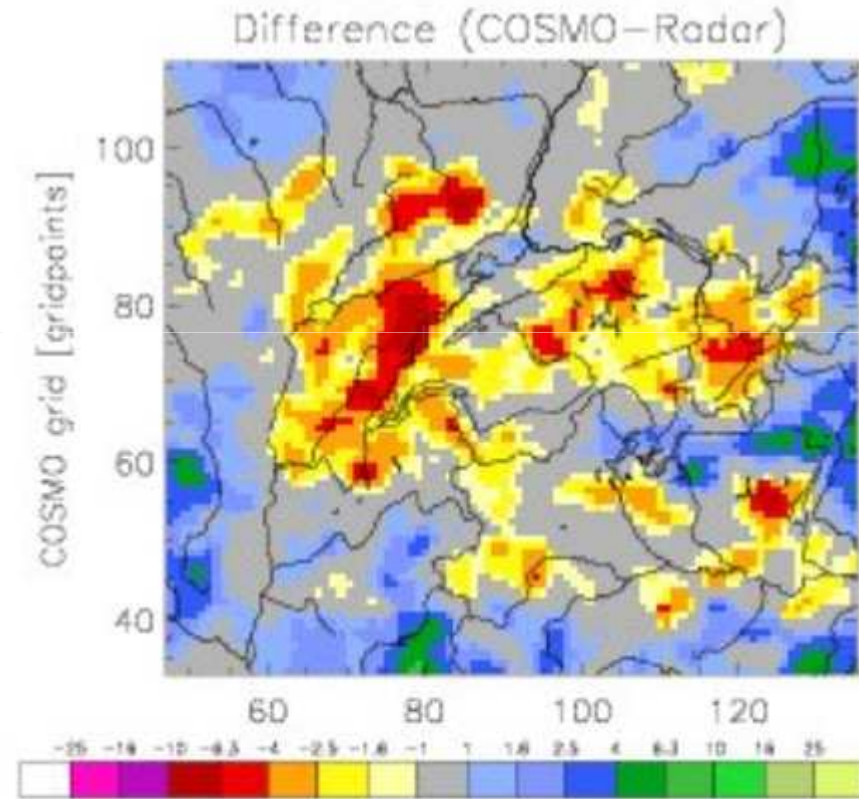
COSMO-2, gridpoints* 2.2 km

# cases	dx	0.1	0.2	0.5	1.0	2.0	5.0	10	20
7	NE	45	45	45	/	/	/	/	/
4	N	45	45	/	/	/	/	/	/
23	NW	3	3	9	9	27	27	/	/
5	SE	1	1	1	1	9	/	/	/
7	S	1	1	1	1	1	9	/	/
45	SW	1	1	3	9	9	45	/	/
5	E	9	15	27	/	/	/	/	45
31	W	1	1	3	9	15	/	/	/
15	F	15	15	27	27	45	/	/	/
34	H	27	27	27	45	/	/	/	/
7	L	3	9	15	27	45	/	/	/

Scale (left): 16 14 10 7 5 2 0.5 <0.1

COSMO-7, gridpoints* 6.6 km

dx	0.1	0.2	0.5	1.0	2.0	5.0	10	20
NE	15	/	/	/	/	/	/	/
N	/	/	/	/	/	/	/	/
NW	3	3	5	5	9	15	/	/
SE	1	1	1	3	9	/	/	/
S	1	1	1	3	3	9	/	/
SW	3	3	5	9	9	/	/	/
E	15	/	/	/	/	/	/	/
W	3	3	3	5	9	/	/	/
F	9	9	15	15	/	/	/	/
H	/	15	/	/	/	/	/	/
L	3	5	9	9	15	/	/	/

Scale (right): 16 14 10 7 5 2 0.4 <0.1

% obs gridpts >= thresh (whole period)

Precipitation bias by weather class

2008, SW

2008, flat

Stratified verification

- Verification has to be local (not too much)…
- …and stratified
- It can be stratified by type of phenomena (thunderstorms, drizzle,…) either observed or forecasted
- Or by type of synoptic situation (any classification)

- These results can be used in order to implement targeted postprocessing…
- …or be used by the forecasters in order to correct the models, not use them in certain cases, use different indicators from models,…

- The verification should be relevant to the present version of the model

COSMO guidelines for forecasters

Precipitation

Precipitation is the most difficult parameter to forecast ... and also to verify [due to the double penalty problem] and even to observe [how representative are raingauge observations? - and how well can radar-estimates be calibrated with surface observations over the Alpine area] !

For sure: never look at single gridpoints, take at least a mean of five gridpoints (in the psANETZ-tables).

Walser et al. (2004) and Hohenegger and Schaer (2007) show that the predictibility of convection is strongly dependent on the specific case as well as the scale of the region of interest. On the grid-point scale, the predictibility is on the order of 5 hours. Thus, convection should NEVER be considered on a single grid point. Also, sometimes the model will simply be wrong due to limited predictability. Nevertheless, experience has shown that in many cases

Seasonal factsheet autumn 2009

Precipitation

The **operational verification shows that for Autumn:**

- the low precipitation amounts (0.1mm/12h) are overestimated (by 33-34% for both COSMO-2 and COSMO
This means that the area with low precipitation on the graphics is too large.
- the high precipitation amounts (10 mm/12h) are about correct for COSMO-7 but overestimated by ~25% in
COSMO-2. There are great geographical diferences: see the frequency bias (threshold 10 mm/12h) of Autumn
2008: COSMO-7 and COSMO-2.

Look also at the weather-type dependant verification for COSMO-7 for the year 2008: the errors are quite
different for the different wind regimes over the Alps. For NW-flow there is an underestimation over Central and
NE Switzerland, for SW-flow there is an underestimation over Tessin and Grisons and for flat situations there is an
overall strong und   2008 (you can scr

Propositions and conclusions

Modellers → forecasters

Stratified verification

→ Redaction of "COSMO guidelines for forecasters"

→ Redaction of seasonal factsheets

Forecasters → modellers

Organise feed-back (Intranet, meetings,…)

→ Listing of all forecasters feedback "good /bad cases"

I am open to any exchange of experiences in this direction during the breaks and evenings of this meeting