Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

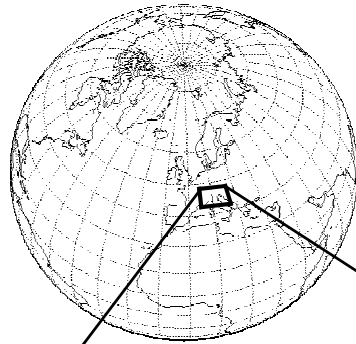# Verification of the experimental version of COSMO-1 of the last three seasons

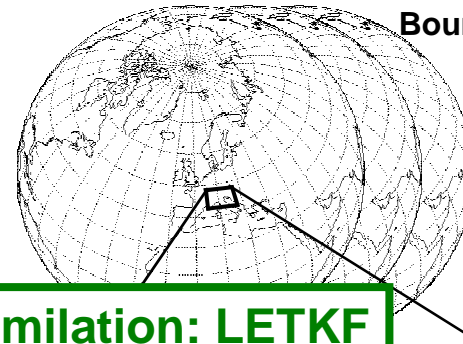Francis Schubiger and Pirmin Kaufmann

COSMO General Meeting 2013

WG5 Parallel Session 2 September 2013

Project COSMO-NExT

Boundary conditions: IFS
10km
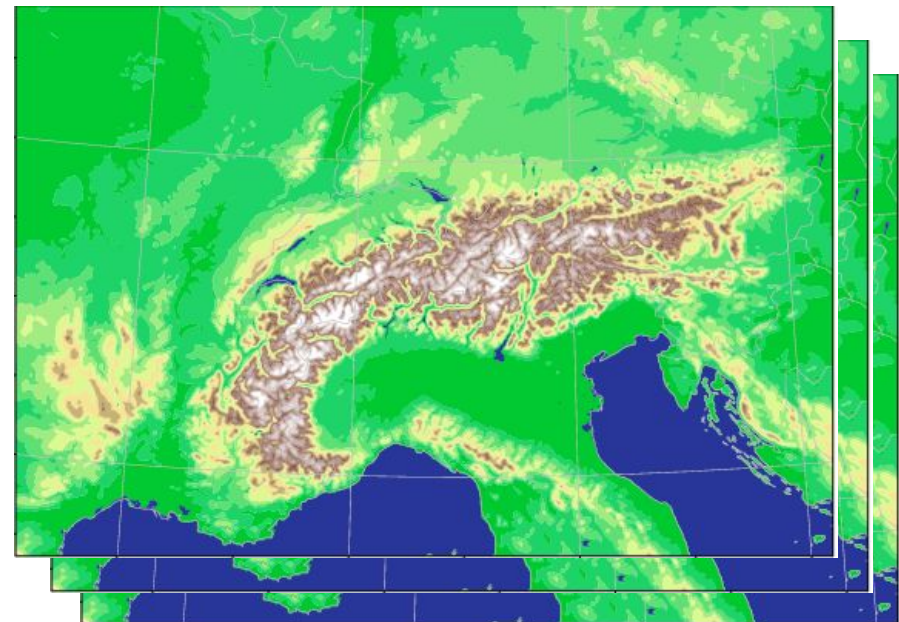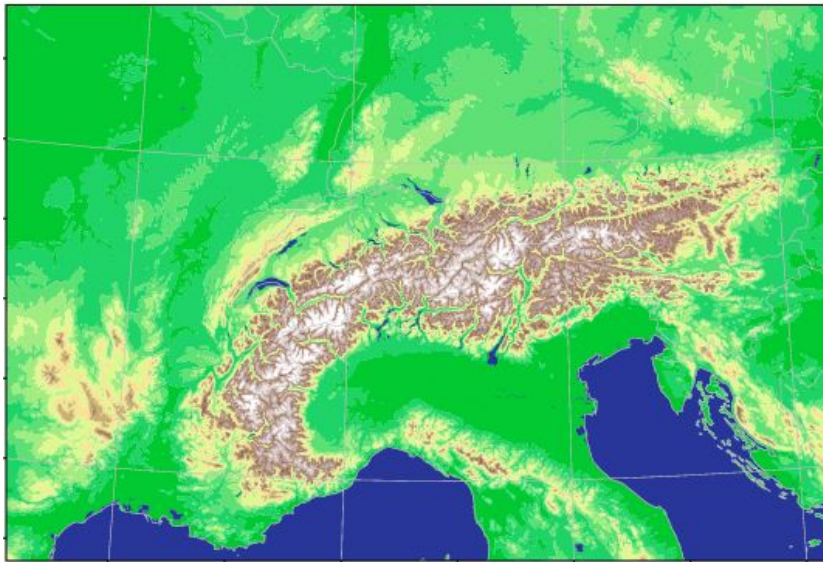**4x daily**

Boundary conditions: VarEPS
20km
2x daily

ensemble data assimilation: LETKF

COSMO-1: 8x daily O(24 hour) forecasts
1.1km grid size (convection permitting)

COSMO-E: 2x daily 5 day forecasts
2.2km grid size (convection permitting)
O(21) ensemble members

COSMO-NExT (and related) talks

- Mon 09:10 (WG1/WG7): First **COSMO-E** experiments with SPPT

- Mon 10:20 (WG4): Status of **COSMO-1** development at MeteoSwiss

- Mon 11:00 (WG5): **Verification** of the experimental version of **COSMO-1**: Winter-Spring 2013

- Mon 11:30 (WG3a): Turb-i-Sim: Evaluation and **improvement of COSMO turbulence** over Alpine topography

- Mon 12:00 (WG1): First Experience with **KENDA** at MeteoSwiss

- Tue 14:55: **EXTPAR** developments towards version 2.0

Project COSMO-NExT: Structure and timeline

- **4 Sub-Projects**
  - KENDA (leader: Daniel Leuenberger)
  - COSMO-1 (leader: Oliver Fuhrer)
  - COSMO-E (leader: André Walser)
  - Infrastructure (leader: André Walser)
- Co-Projectleaders: Philippe Steiner & Marco Arpagaus
- **4 yrs** project (2012 – 2015)
- Project-phases and milestones **strongly coupled to development and extension of HPC platform at CSCS** ($\rightarrow$ implementation of HPCN Strategy)

Strategy of MeteoSwiss for its Numerical Weather Prediction system

- **Client expectations**
  - Two classes of products
    - **High(est) resolution in space and time** out to +24h, high update frequency
    - Regional **probabilistic forecasts** out to +3/5 days
    - Focus on Alpine region
  - Consistency of products across all scales (space & time)
  - High reliability (quality and availability of products)
- MeteoSwiss strategy is consistent with **COSMO Science Plan** and **ECMWF Strategy** 2006-2015

Verification 00 & 12 UTC forecasts

1) SYNOPs

                (a) COSMO-2 domain («Alps»)
                (b) Switzerland («CH»)

2) TEMPs

COSMO-7

COSMO-2

COSMO-1

forecasts missing for the verification:
17 in Autumn 2012, **1** in Winter 2012/13, **0** in Spring 2013
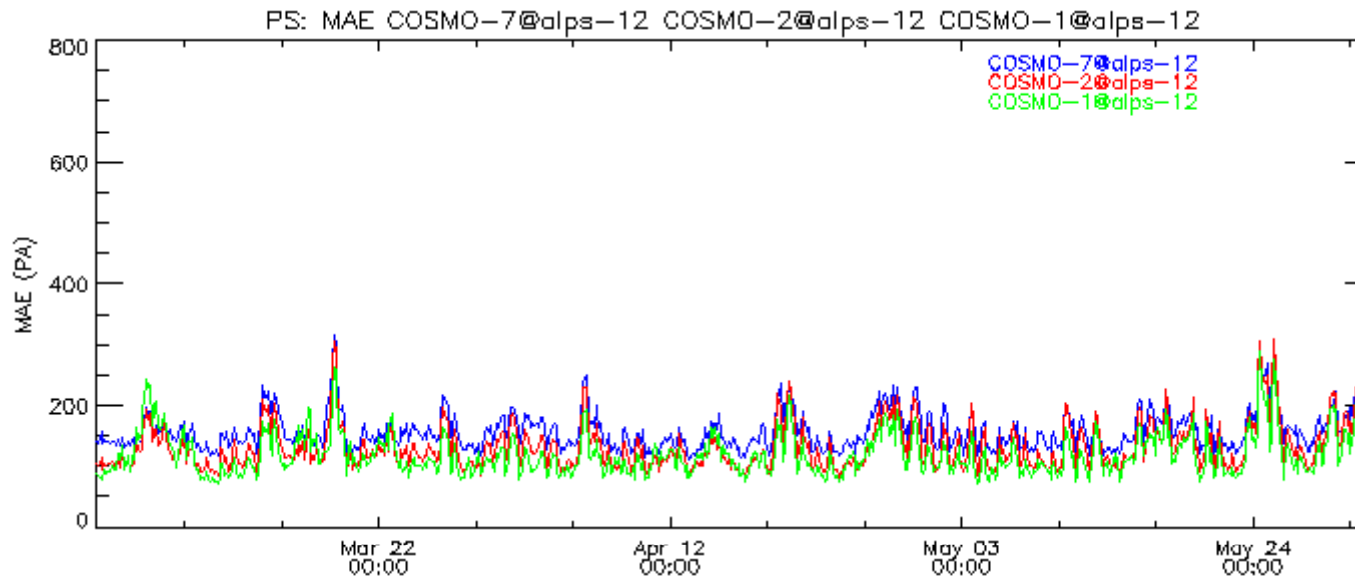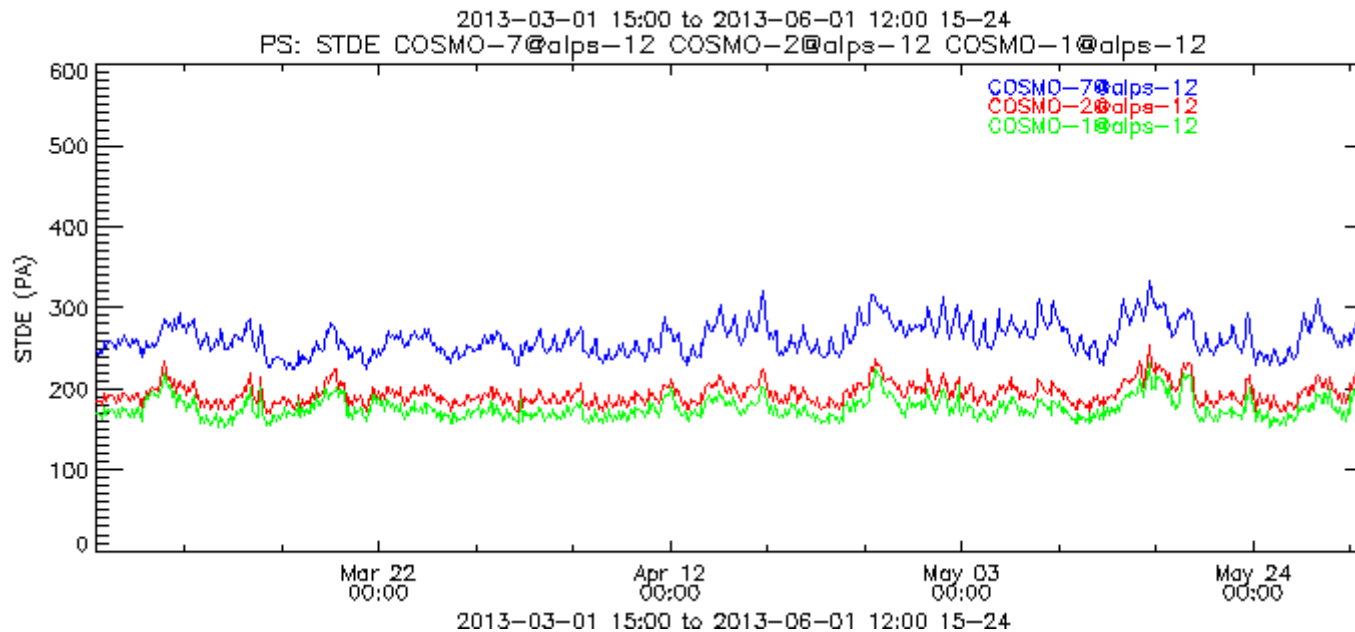
Surface pressure Spring 2013 Alps
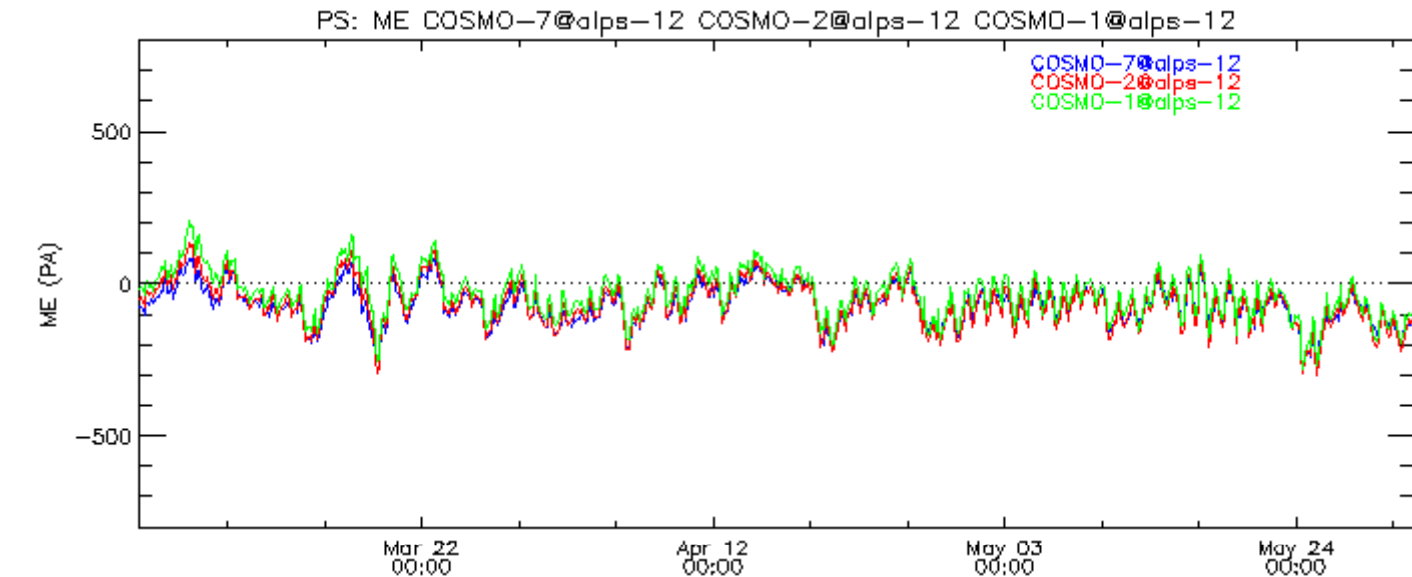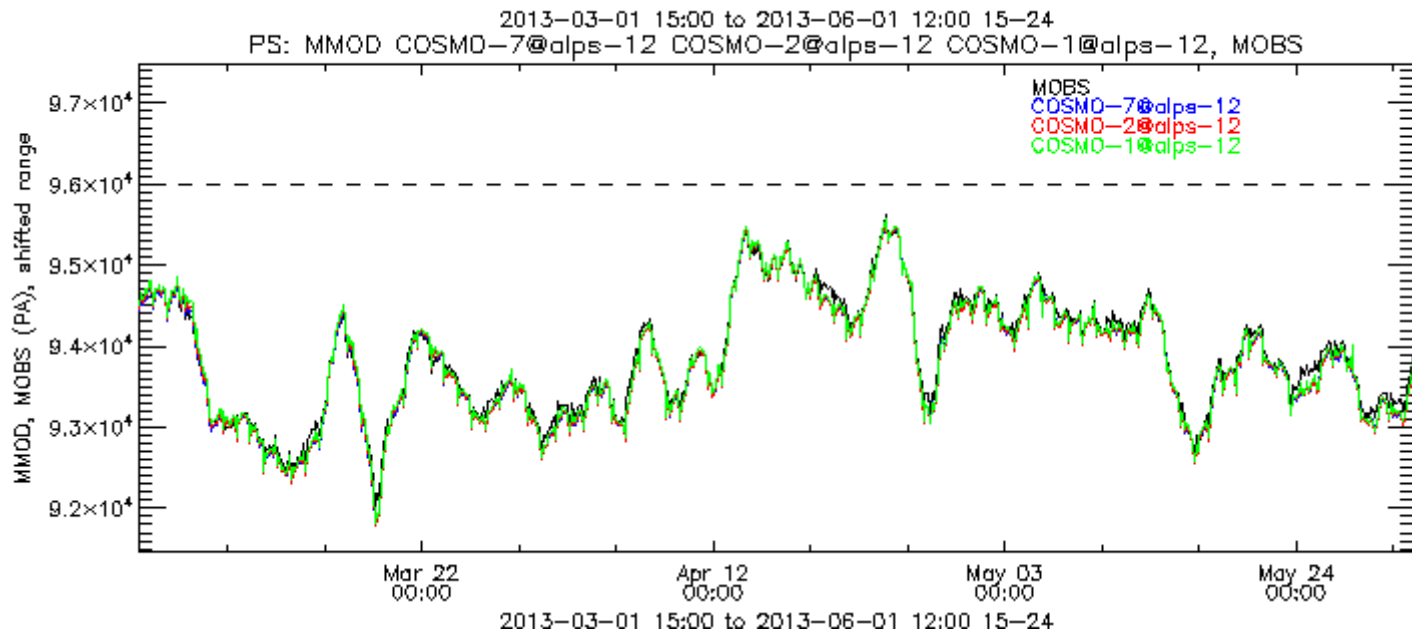
bias

values

Surface pressure Spring 2013 Alps
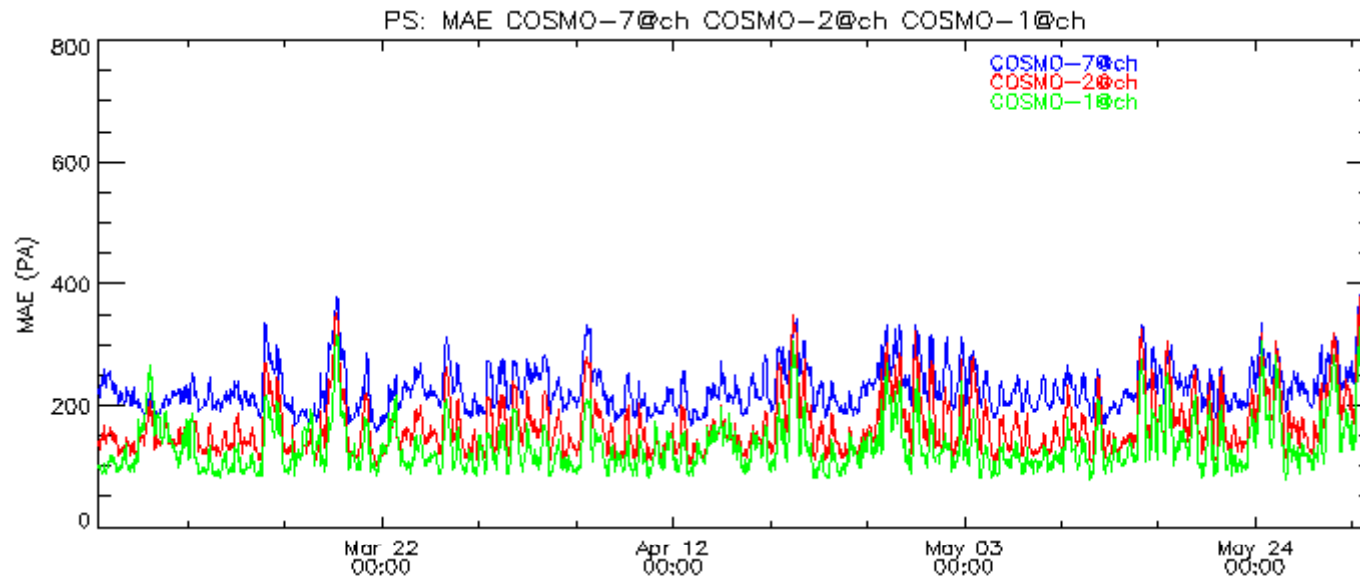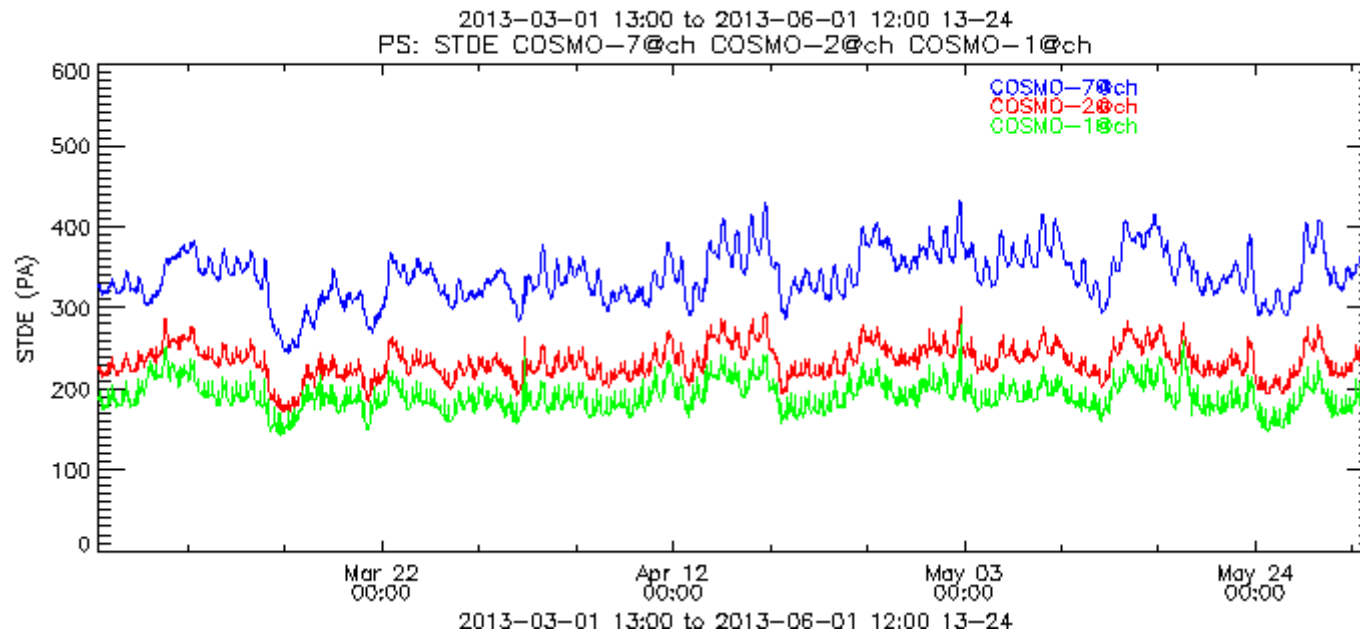

mean absolute error

std dev

Surface pressure Spring 2013 CH
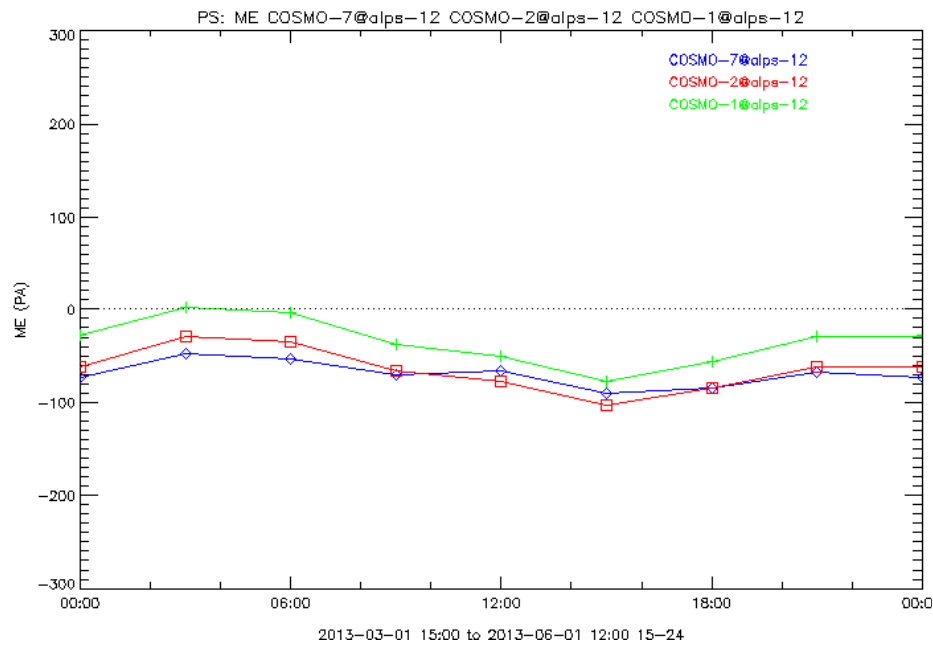

mean absolute error

std dev

Surface pressure Spring 2013 Alps
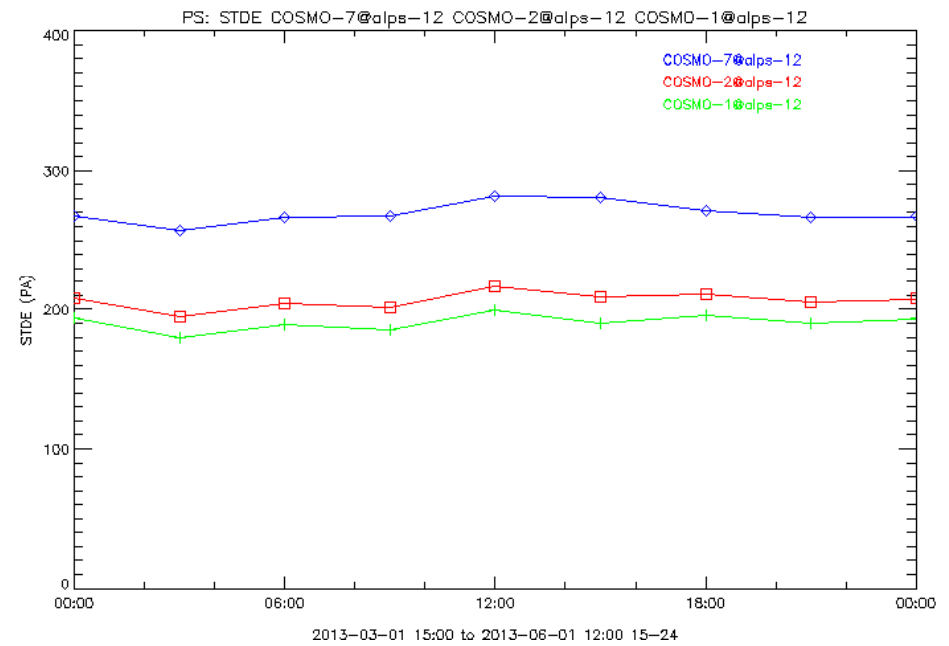
bias
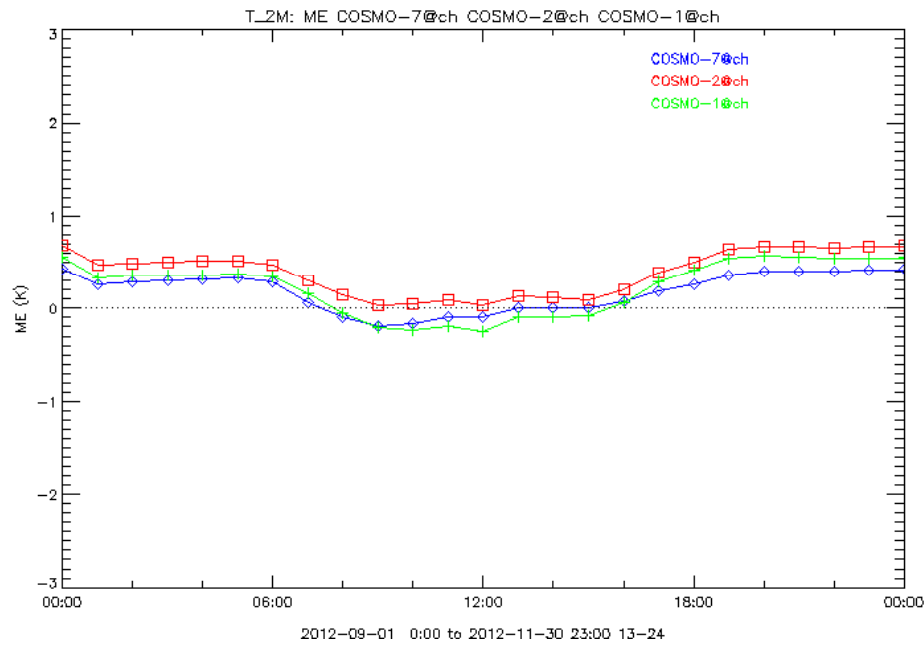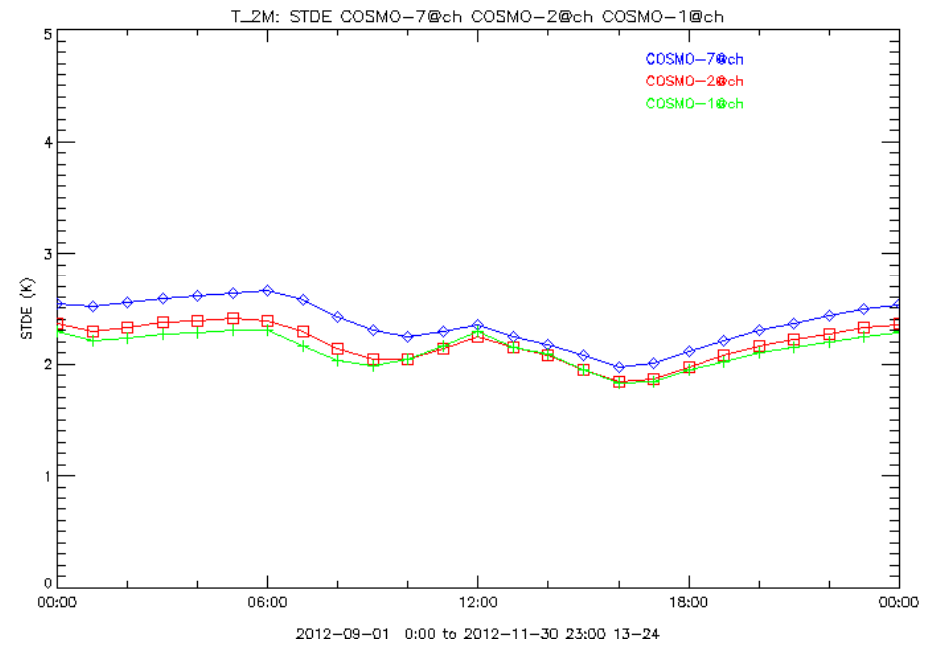
std dev

temperature @2m Autumn 2012 CH

bias

std dev

Verification of the experimental version of COSMO-1 of the last three seasons COSMO-GM 02.09.2013, Sibiu
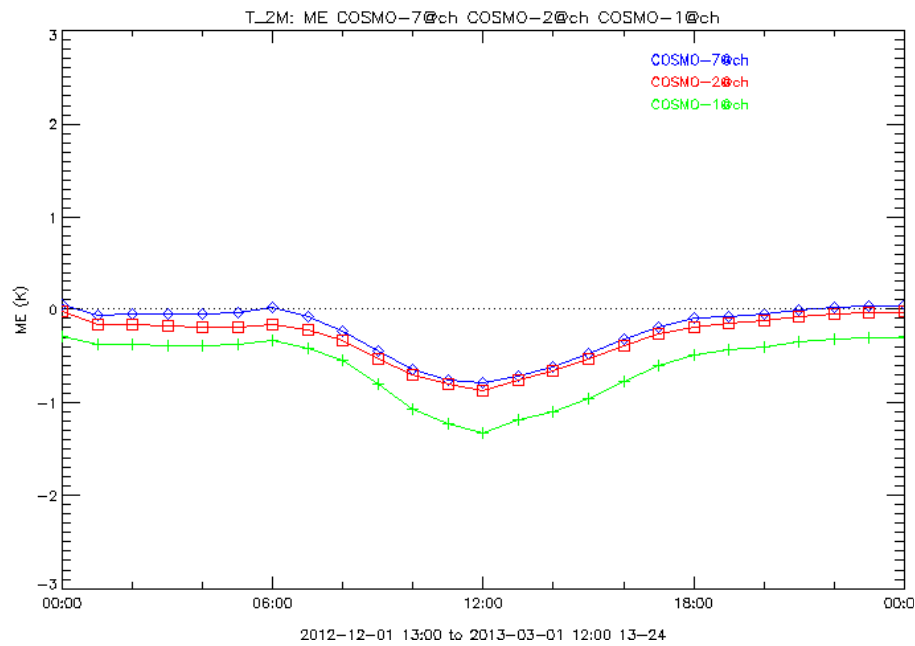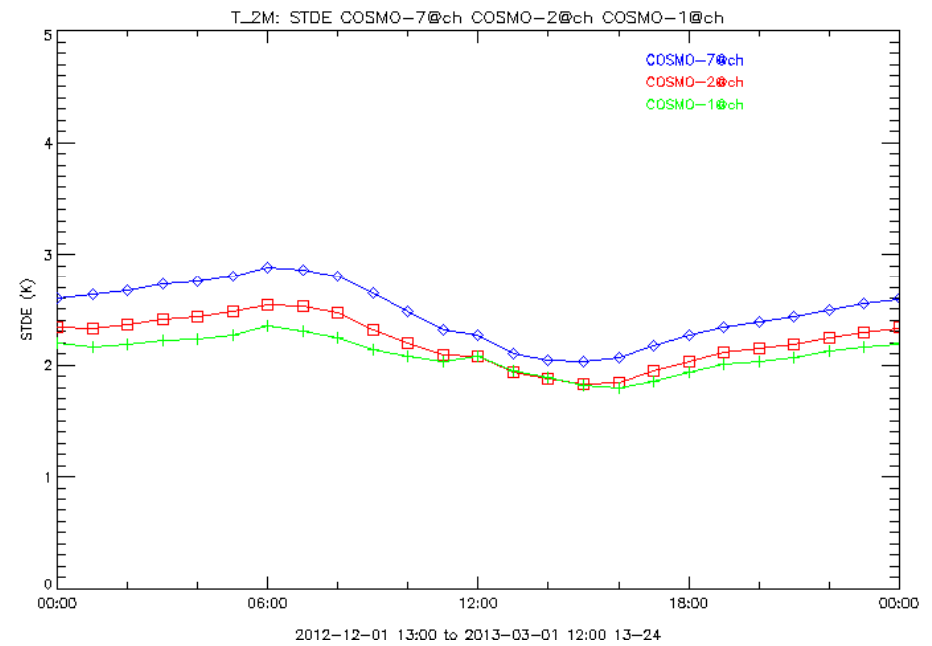Francis Schubiger & Pirmin Kaufmann

11

temperature @2m Winter 12/13 CH

bias

std dev

Verification of the experimental version of COSMO-1 of the last three seasons COSMO-GM 02.09.2013, Sibiu
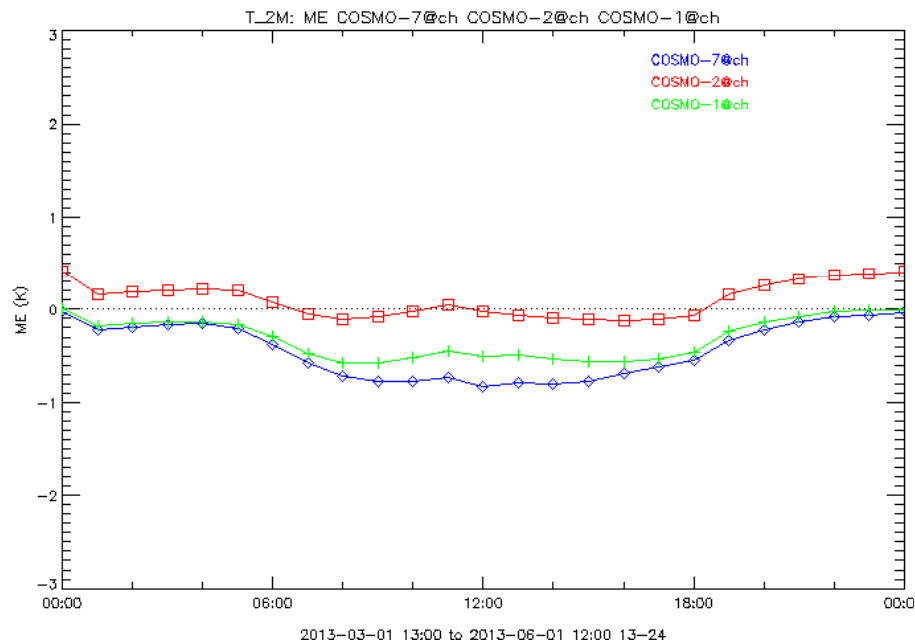Francis Schubiger & Pirmin Kaufmann
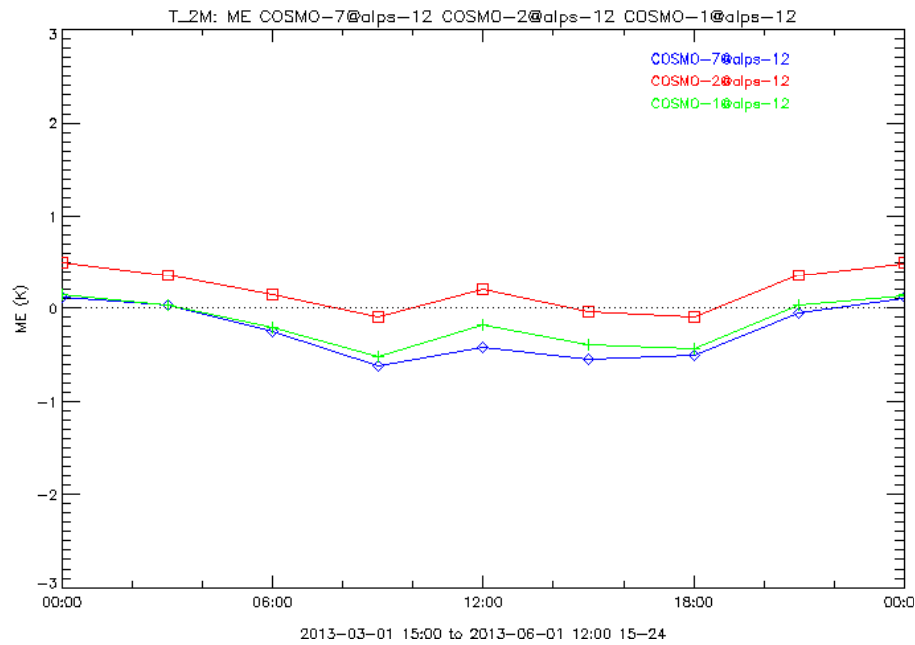
12

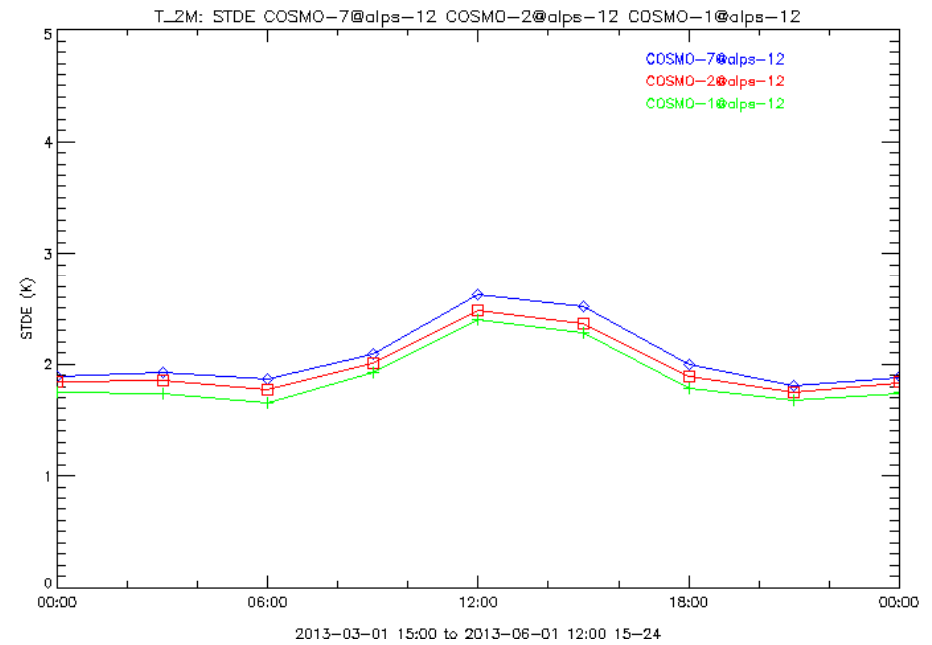# temperature @2m Spring 2013 CH

bias

std dev
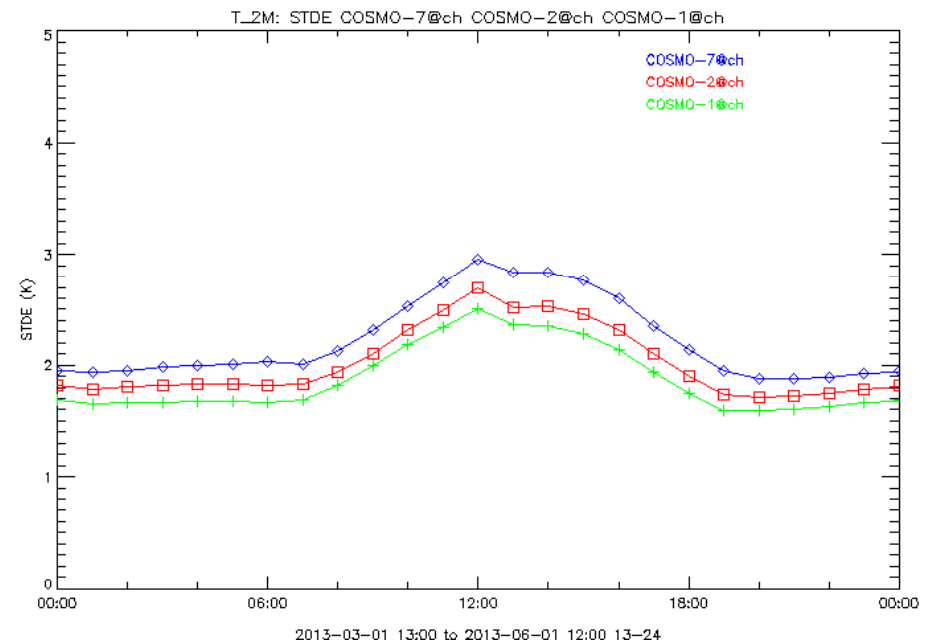
temperature @2m Spring 2013 Alps

bias

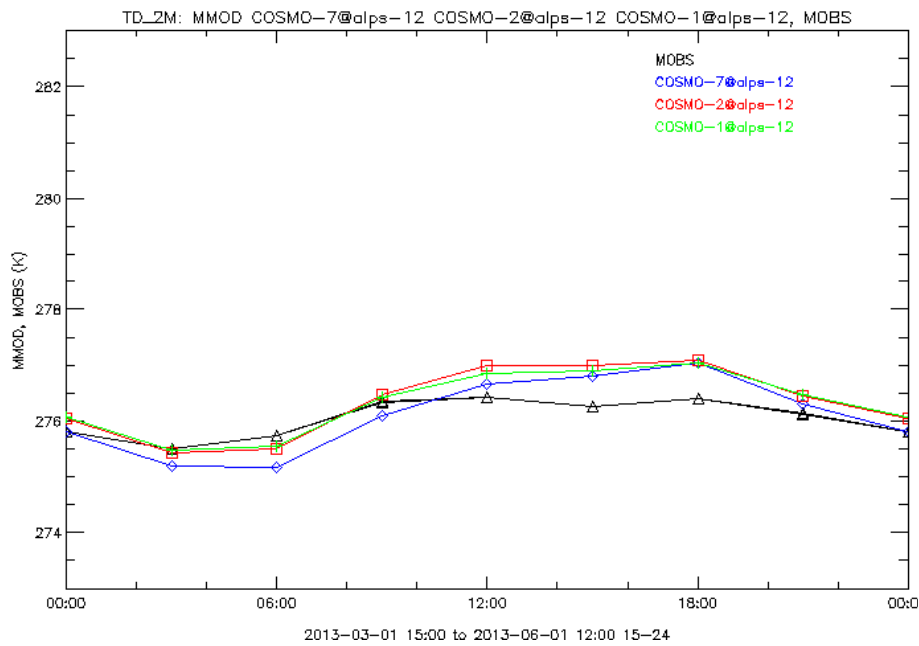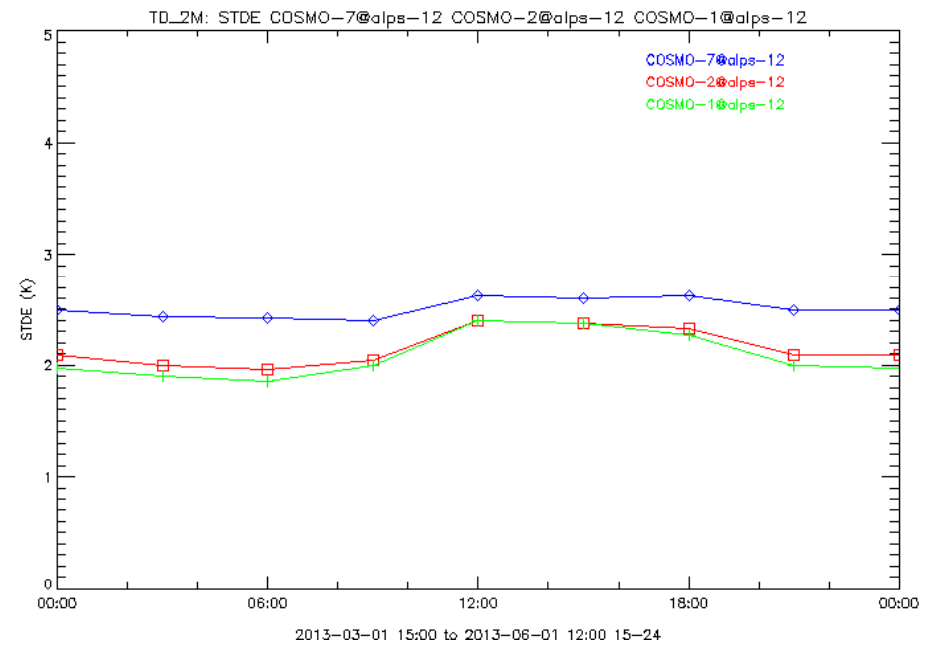std dev

dewpoint @2m Spring 2013 Alps

values

std dev

TD_2M: MMOD COSMO-7@alps-12 COSMO-2@alps-12 COSMO-1@alps-12, MOBS

MOBS
COSMO-7@alps-12
COSMO-2@alps-12
COSMO-1@alps-12

2013-03-01 15:00 to 2013-06-01 12:00 15-24

TD_2M: STDE COSMO-7@alps-12 COSMO-2@alps-12 COSMO-1@alps-12

COSMO-7@alps-12
COSMO-2@alps-12
COSMO-1@alps-12

2013-03-01 15:00 to 2013-06-01 12:00 15-24
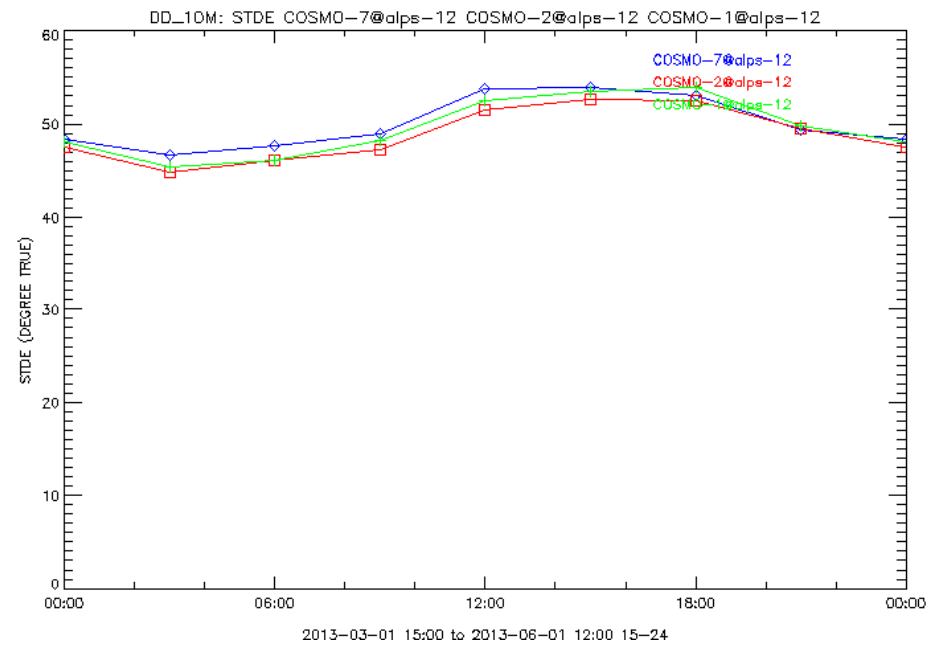
10m-wind direction Spring 2013 Alps

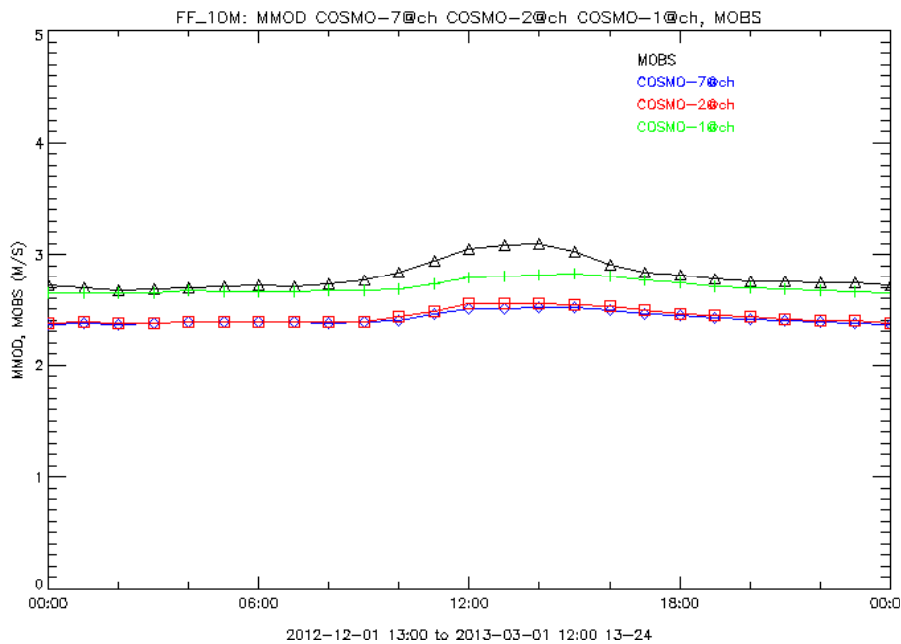bias
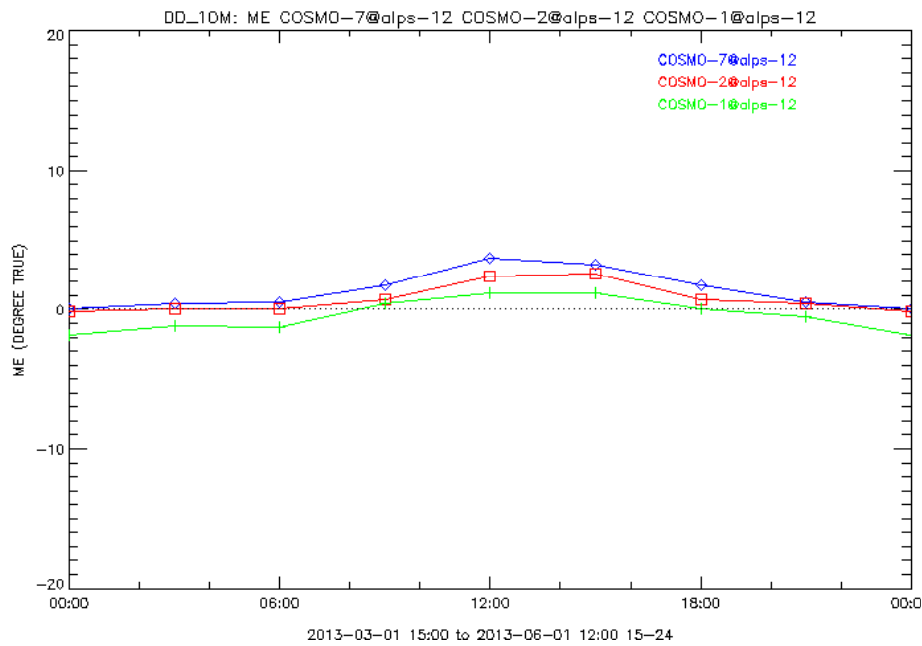
std dev
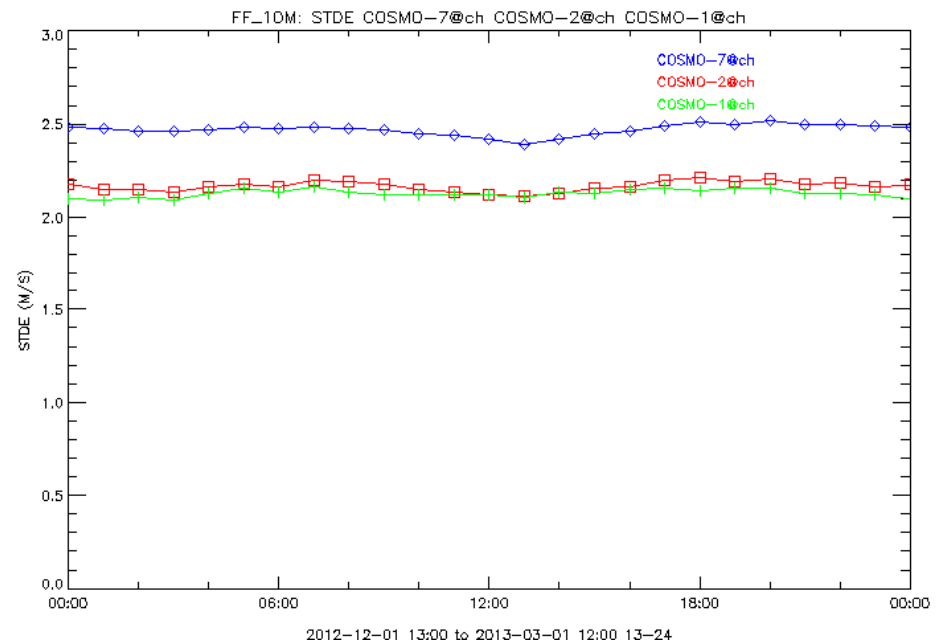
10m-wind speed Winter 12/13

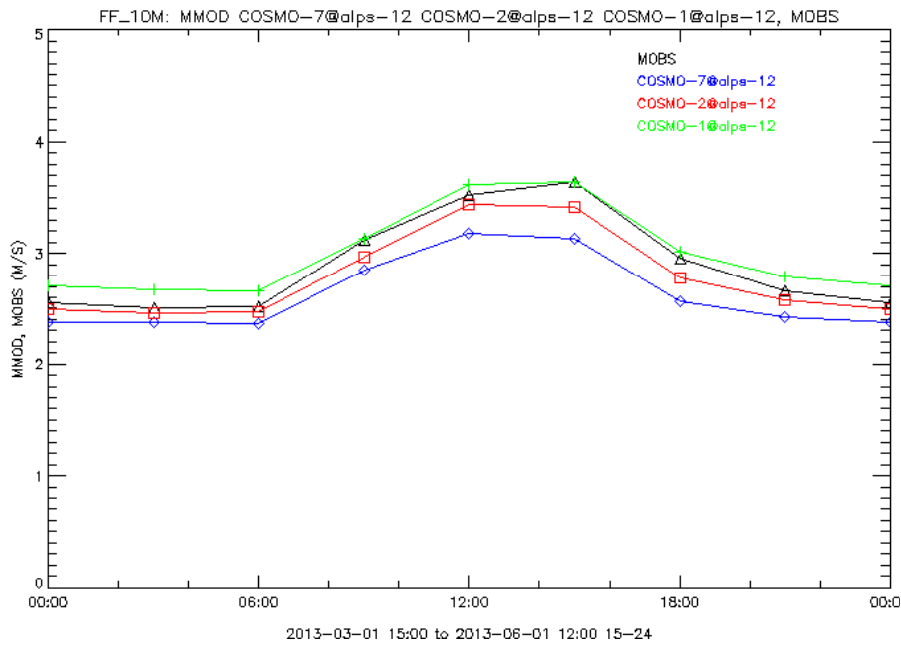values   std dev

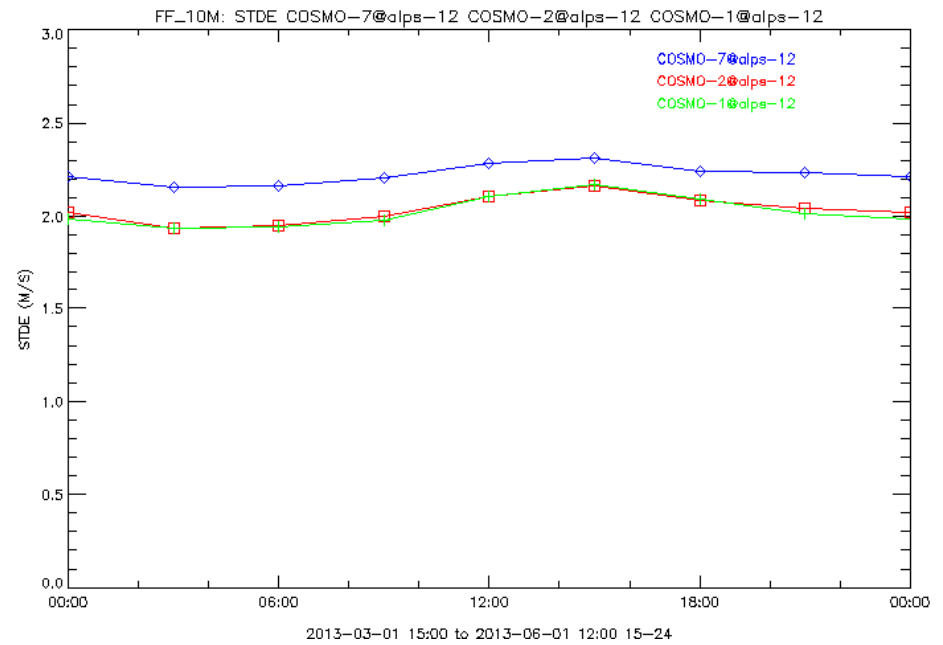Higher windspeed due to missing of subgrid scale orography
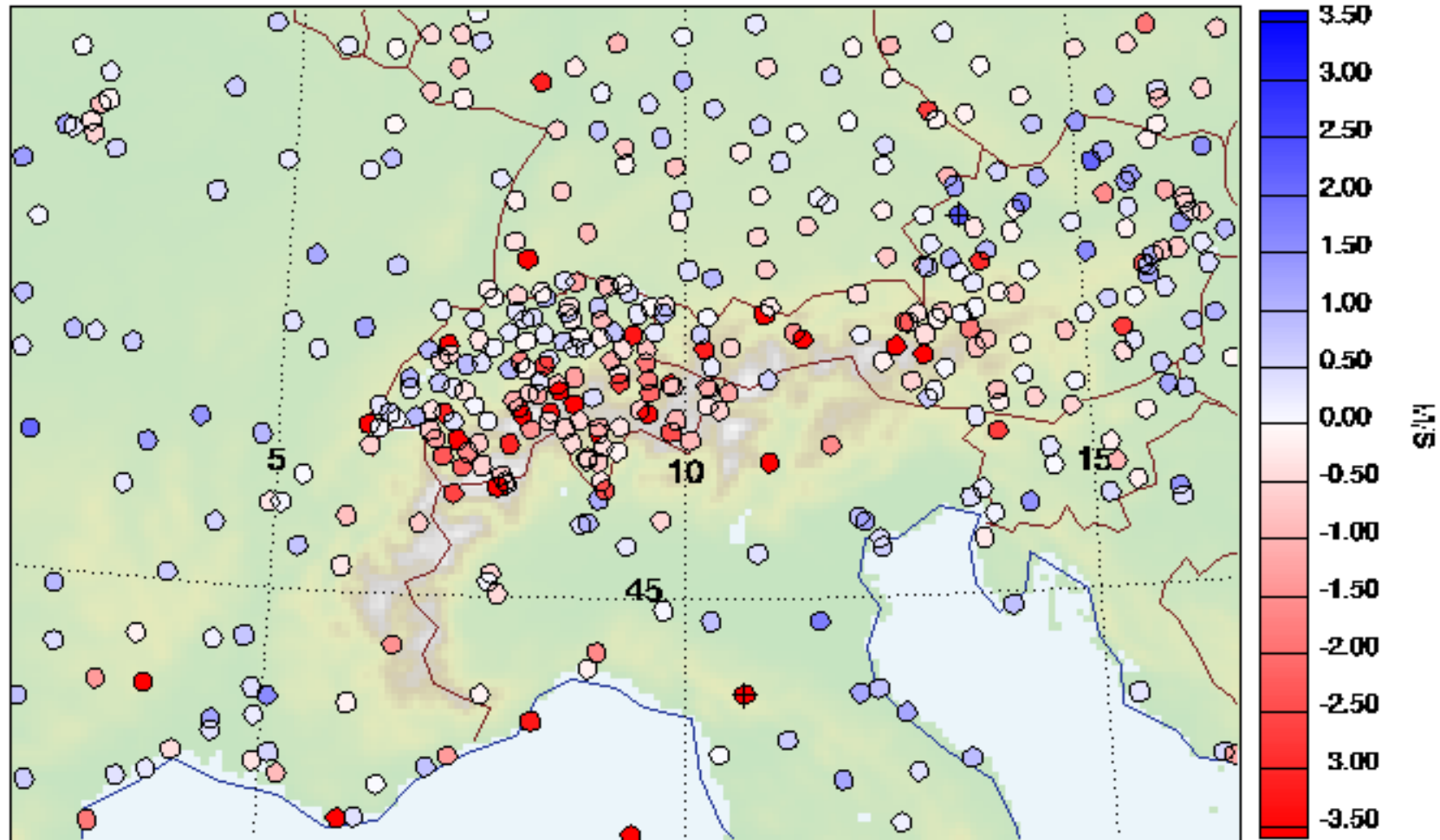
10m-wind speed Spring 2013 Alps

values

std dev

Higher windspeed due to missing of subgrid scale orography

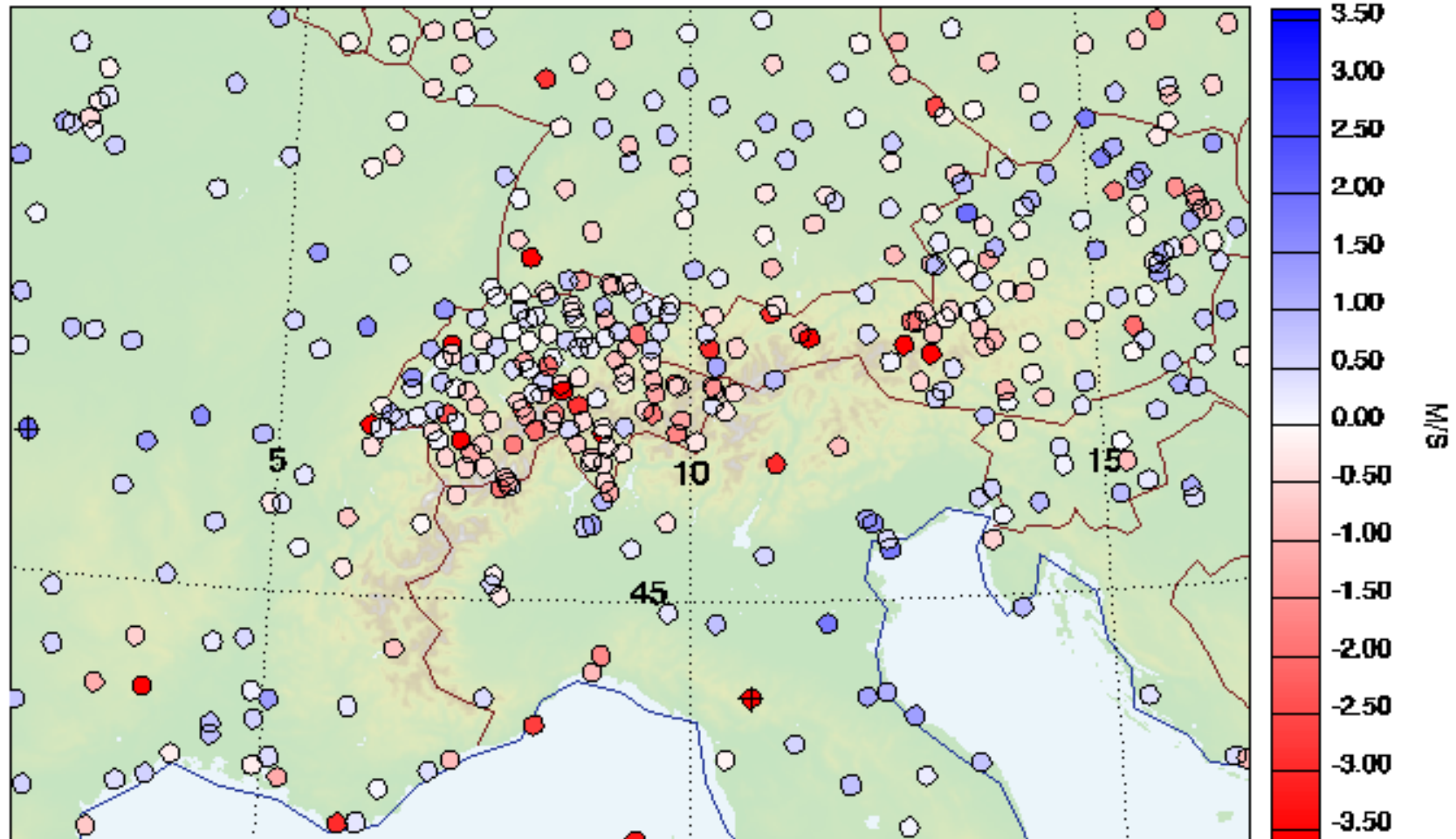# 10m-wind speed COSMO-7 Spring 2013

Alps

FF_10M: ME

COSMO-7@alps-12 2013-03-01 15:00 to 2013-06-01 12:00 15-24
+Min: -6.728 M/S at station 16134 +Max: 2.260 M/S at station 11053
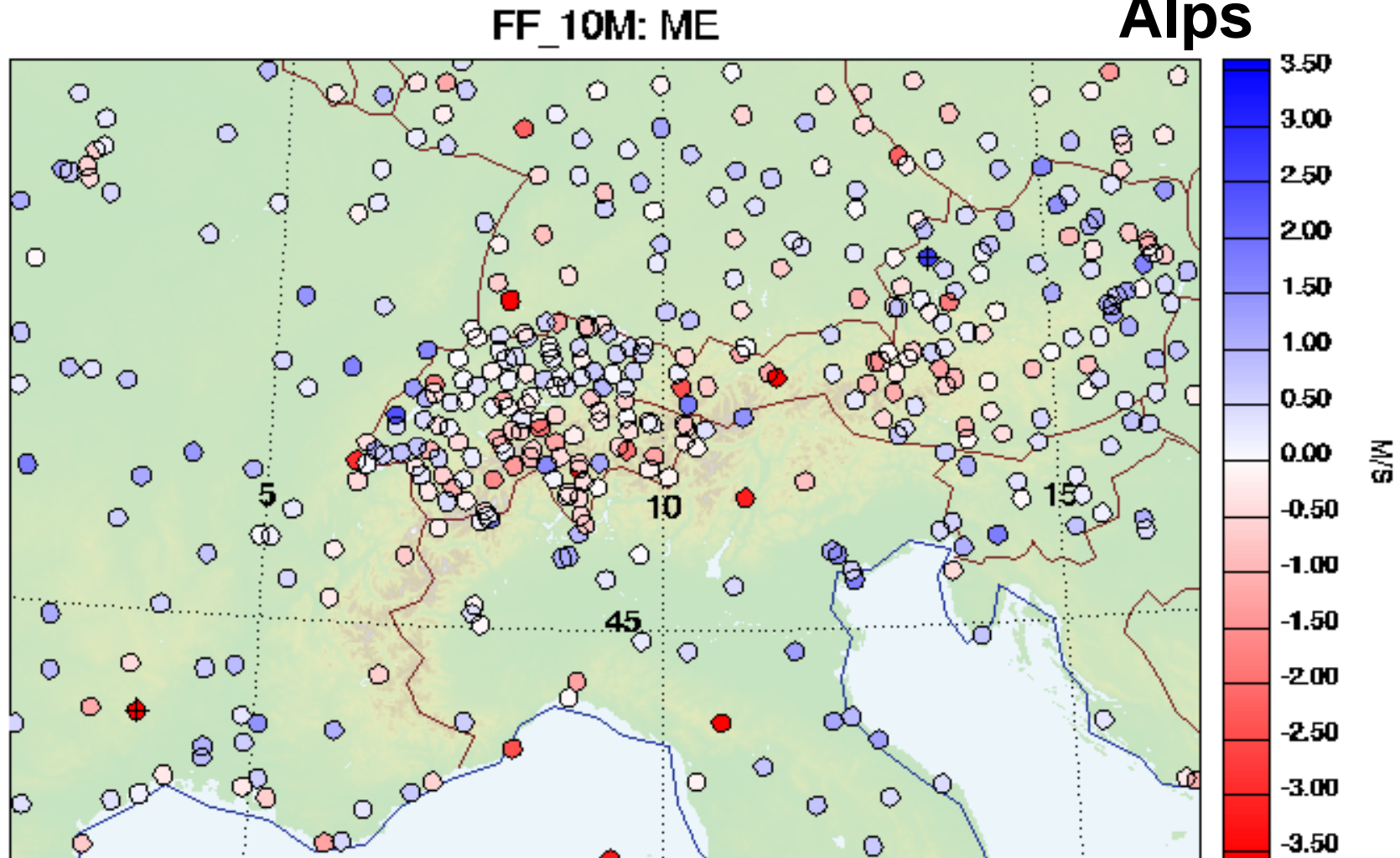
10m-wind speed COSMO-2 Spring 2013

Alps

FF_10M: ME

COSMO-2@alps-12 2013-03-01 15:00 to 2013-06-01 12:00 15-24
+Min: -5.719 M/S at station 16134 +Max: 2.032 M/S at station 07361

10m-wind speed COSMO-1 Spring 2013

Alps

FF_10M: ME

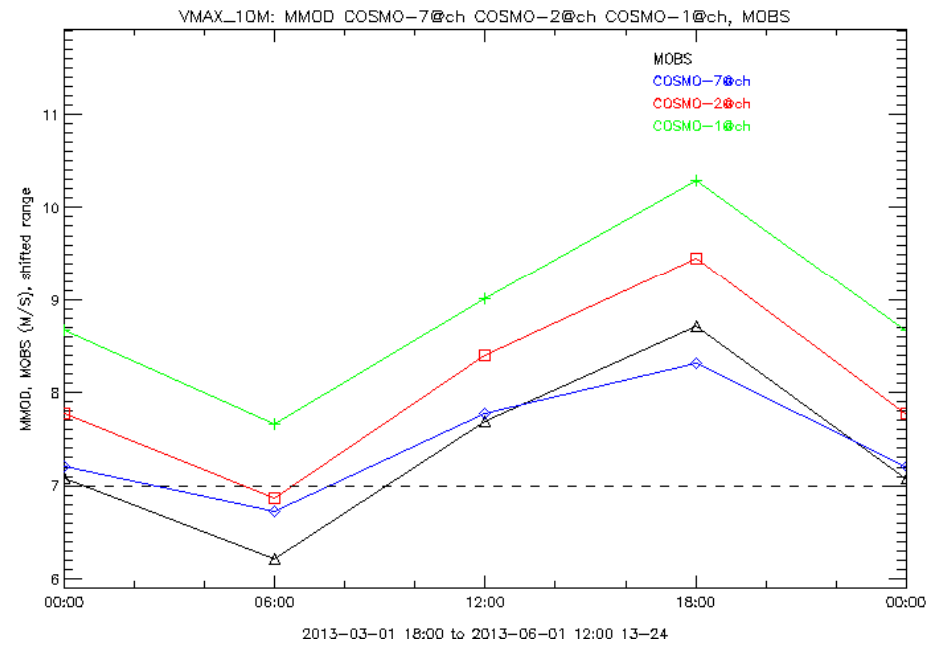**Higher windspeed in COSMO-1 mainly on mountain stations**

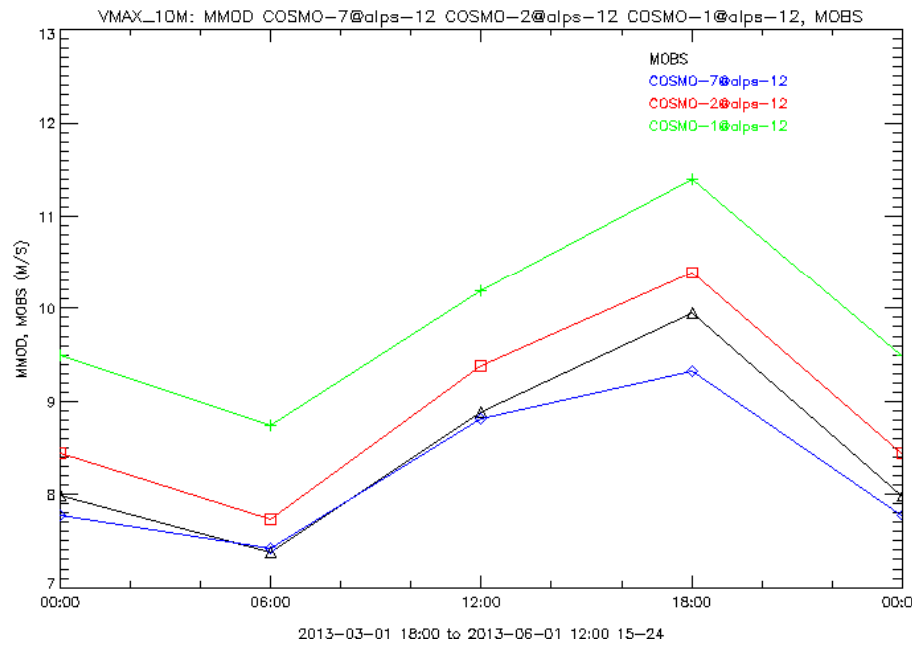COSMO-1@alps-12 2013-03-01 15:0
+Min: -4.521 M/S at station 07560 +Max: 2.725 M/S at station 11053
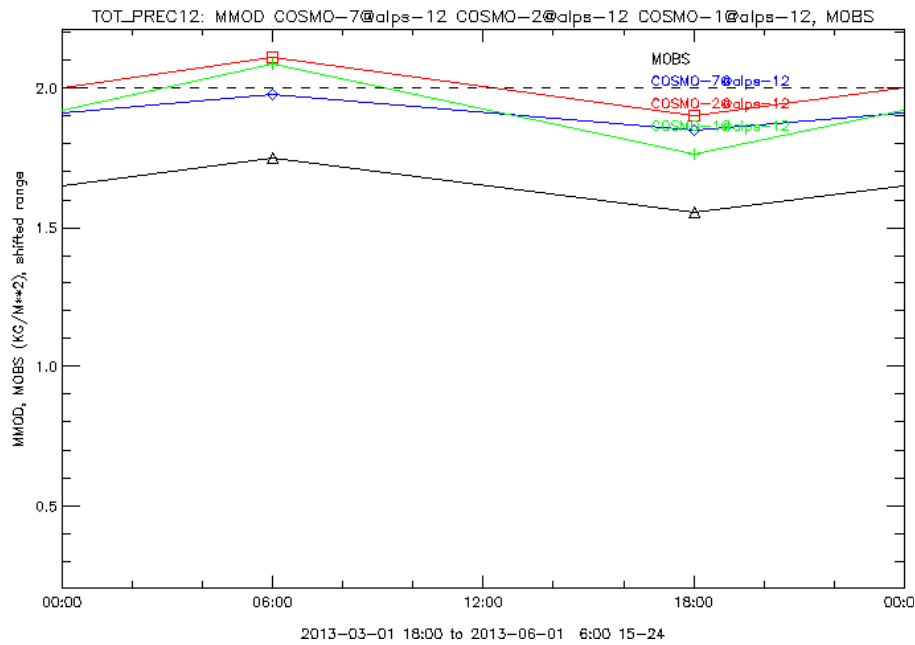
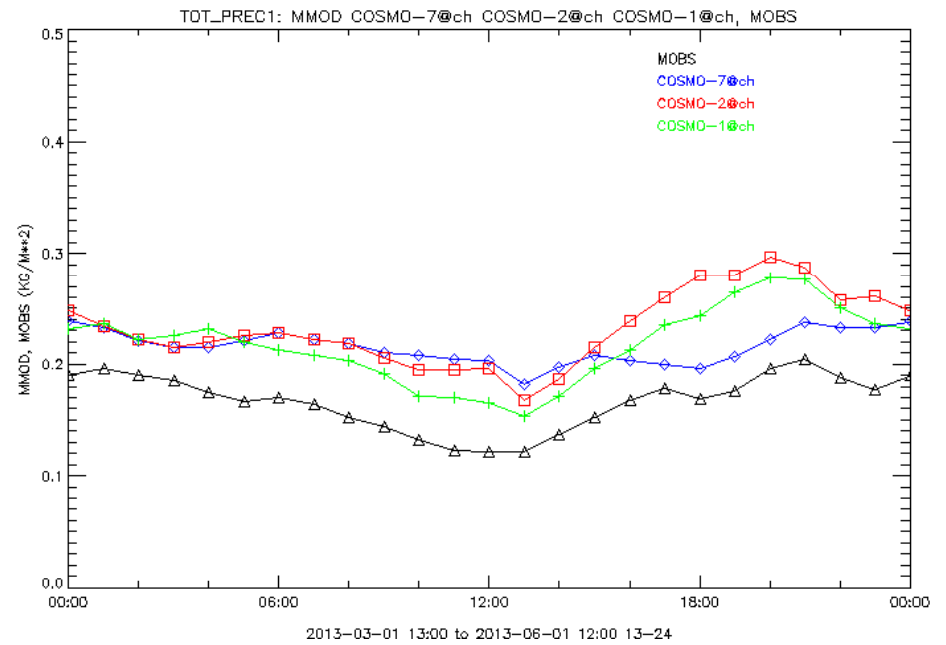# Wind gusts (max. over 6 hours) Spring 2013

values Alps

values CH

Verification of the experimental version of COSMO-1 of the last three seasons COSMO-GM 02.09.2013, Sibiu
Francis Schubiger & Pirmin Kaufmann

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precipitation Spring 2013
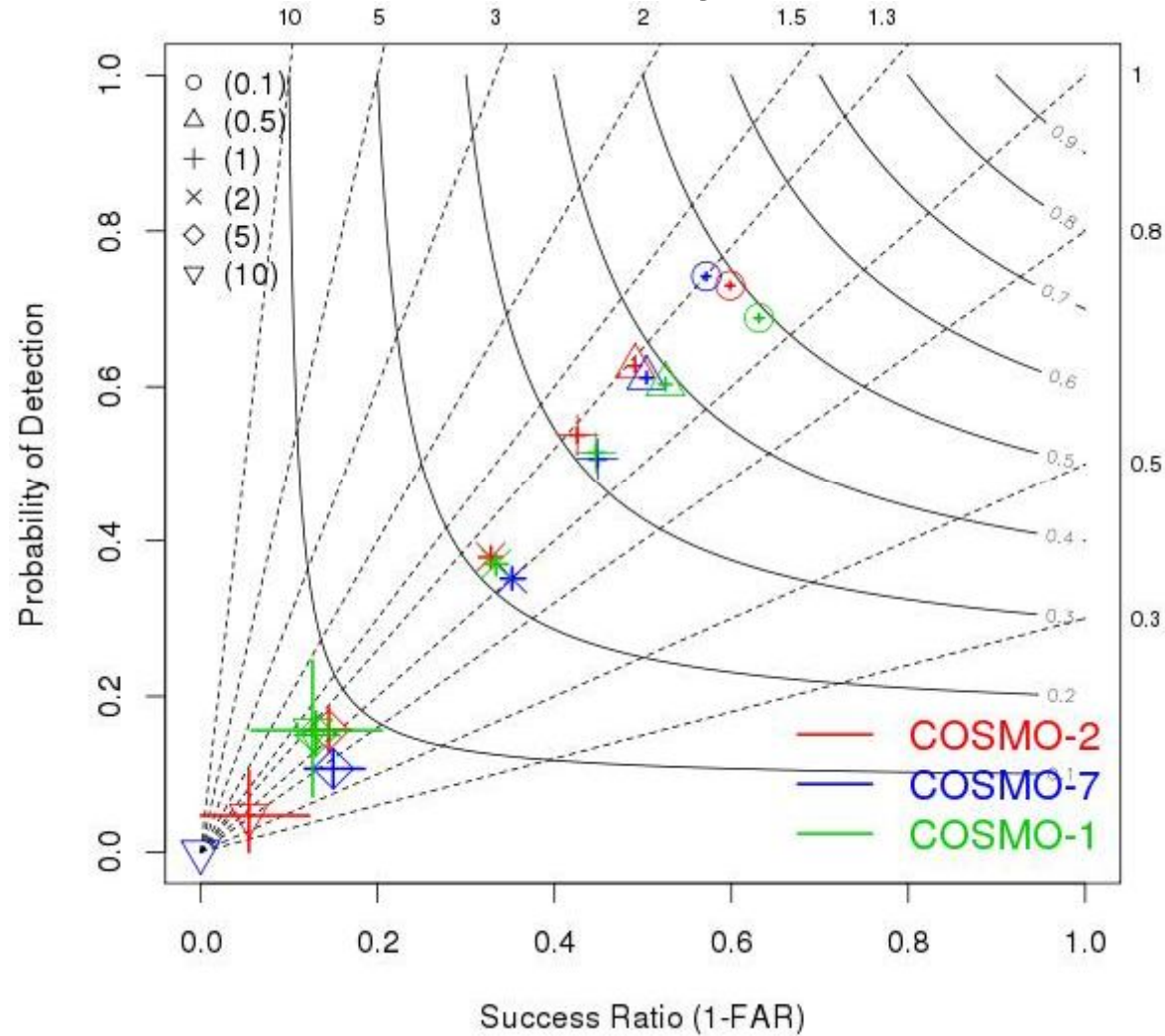
values Alps (12h-sums)

values CH (1h-sums)

Performance diagram: 1h precipitation sums
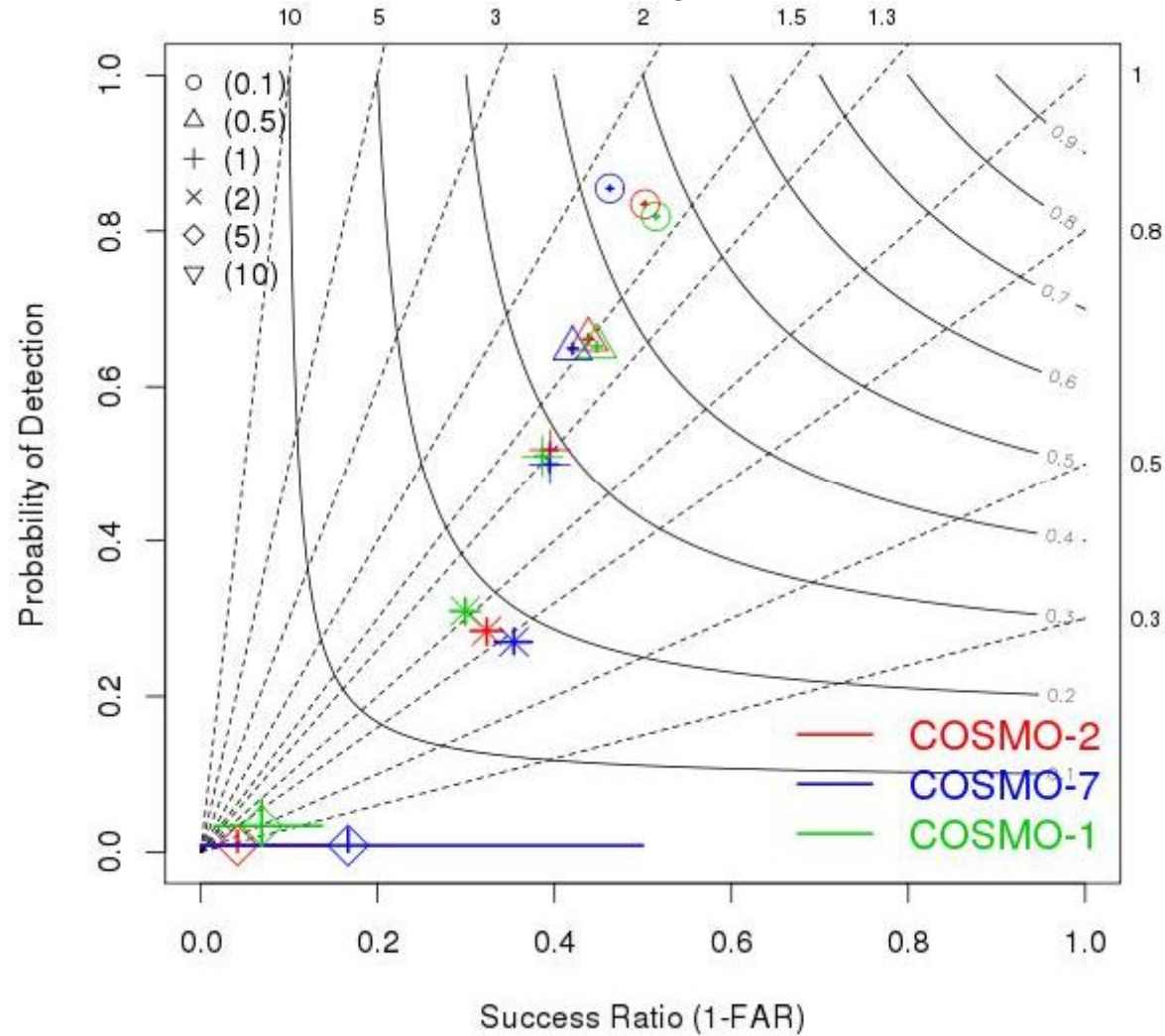## Autumn 2012: all hourly sums from +12 to +24h

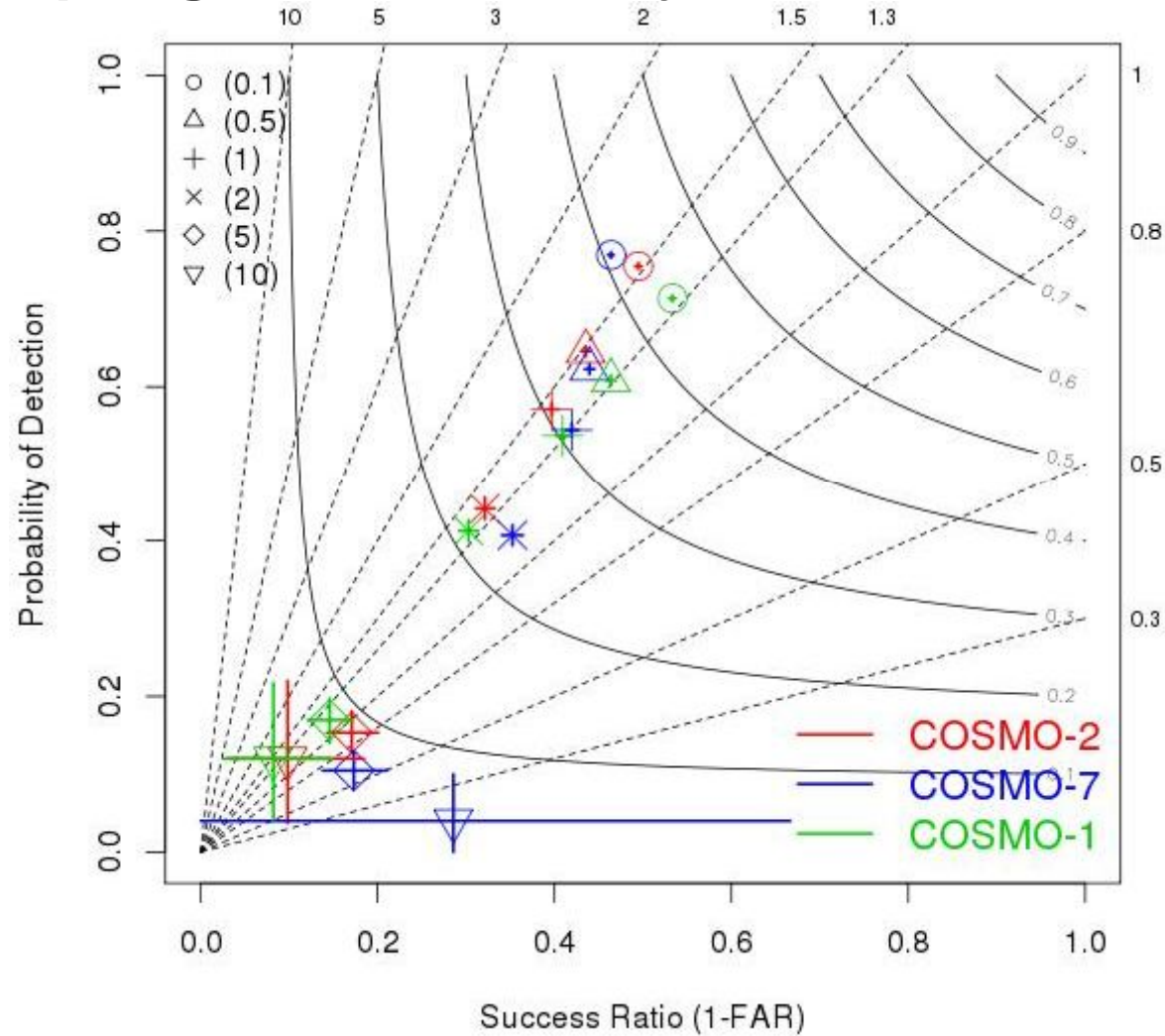# Performance diagram: 1h precipitation sums
Winter 12/13: all hourly sums from +12 to +24h

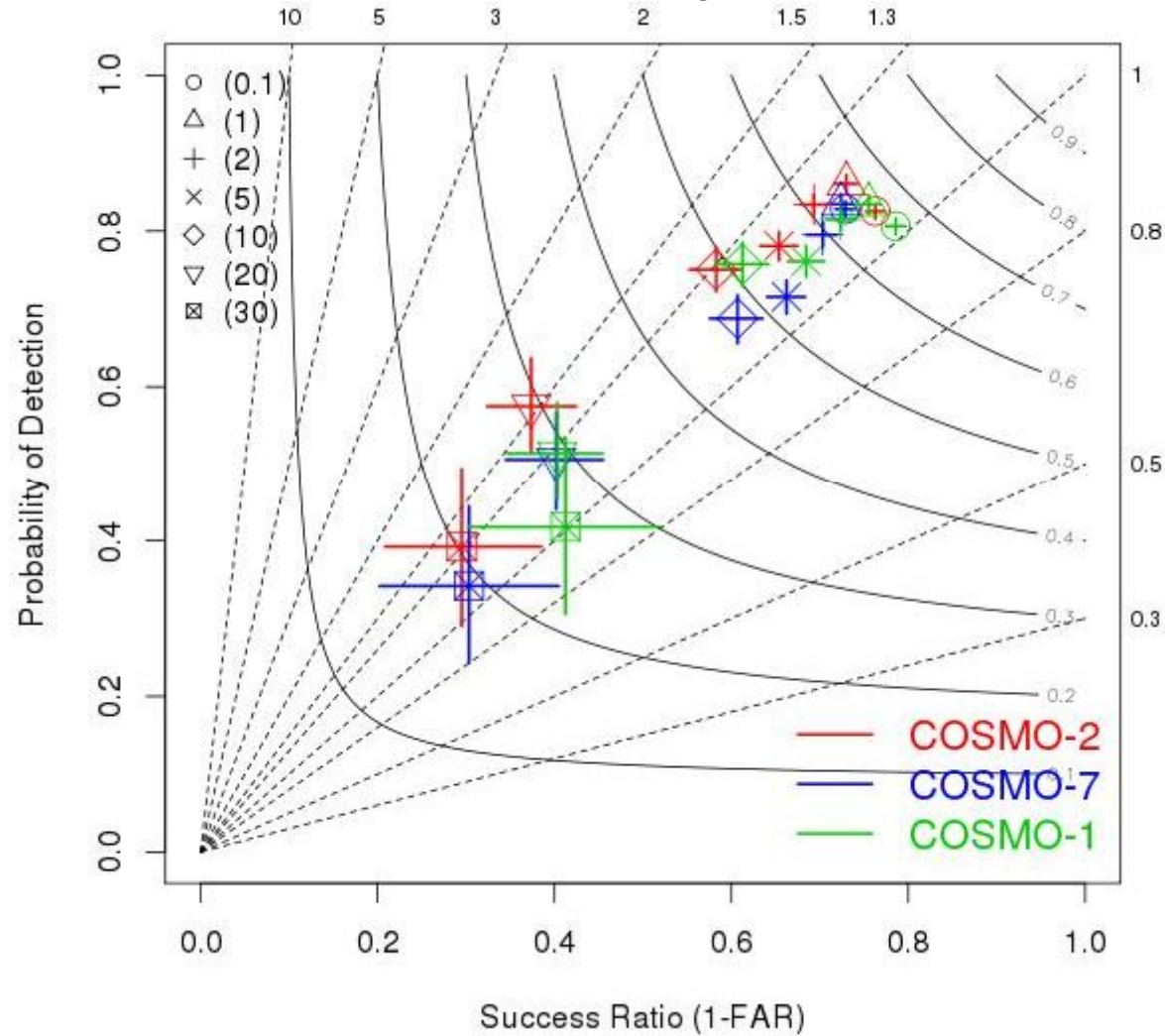# Performance diagram: 1h precipitation sums
Spring 2013: all hourly sums from +12 to +24h

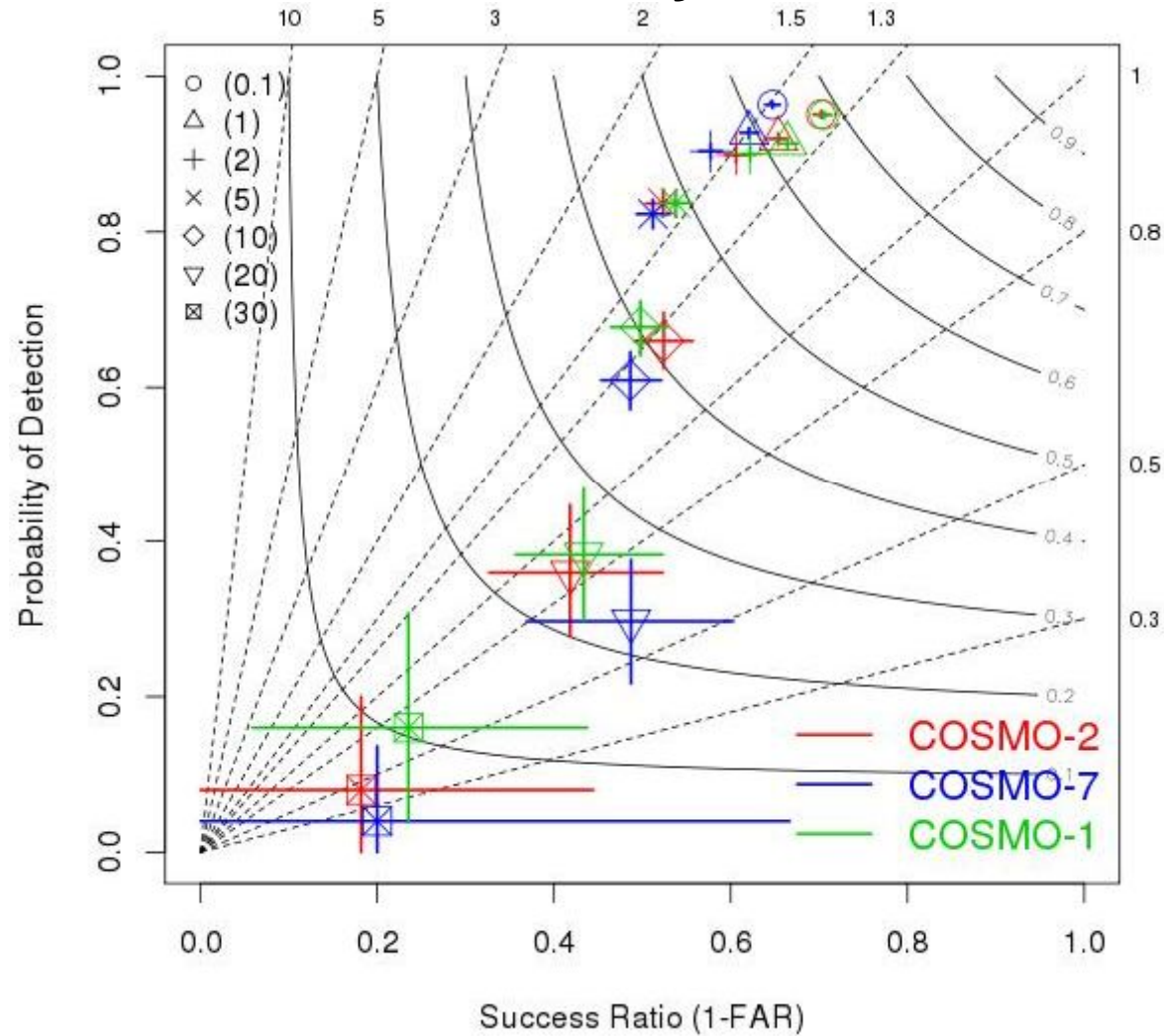# Performance diagram: 12h precipitation sums
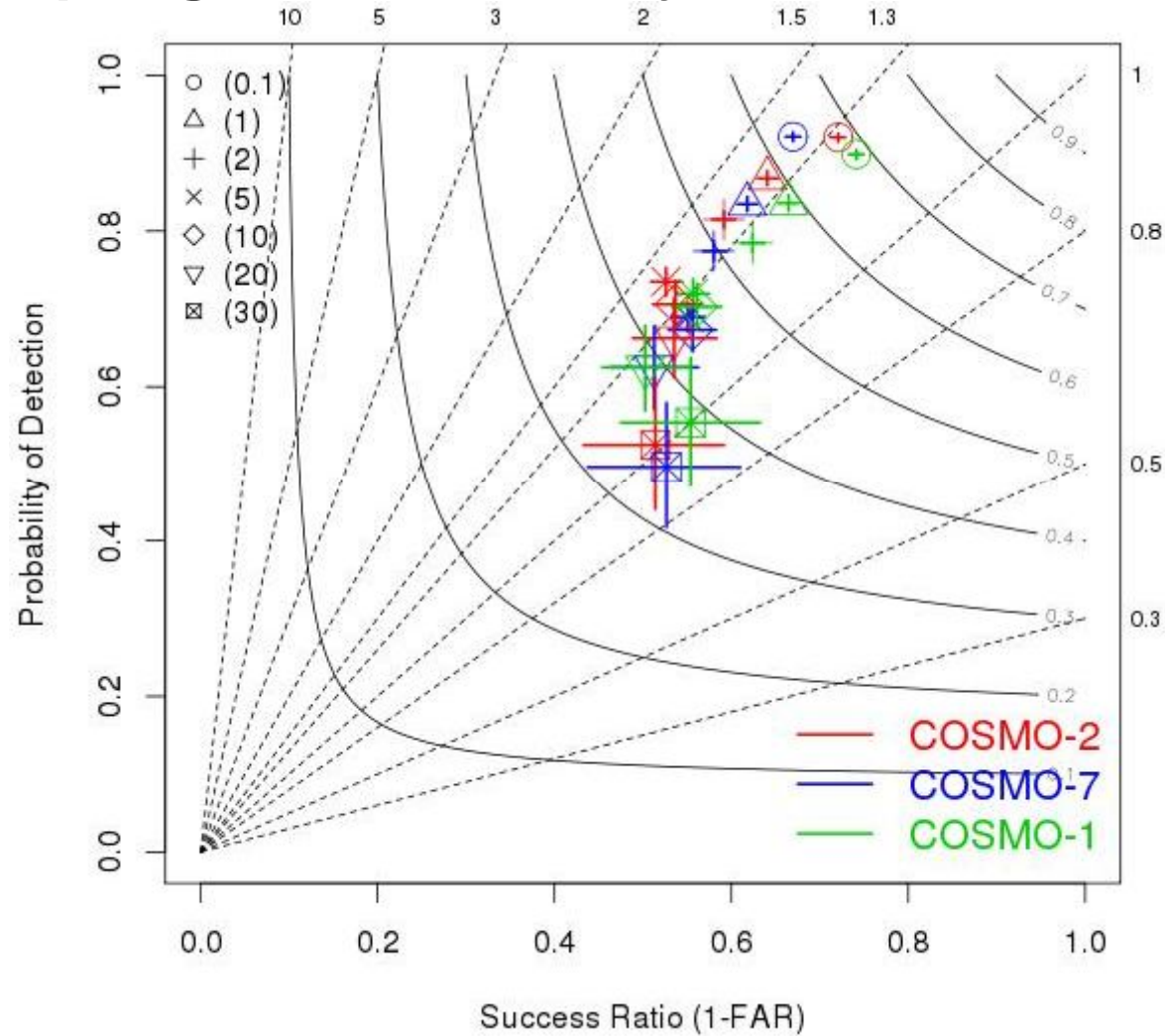## Autumn 2012: all hourly sums from +6h to +18h

Performance diagram: 12h precipitation sums
Winter 12/13: all hourly sums from +6h to +18h

Verification of the experimental version of COSMO-1 of the last three seasons ¦ COSMO-GM 02.09.2013, Sibiu
Francis Schubiger & Pirmin Kaufmann

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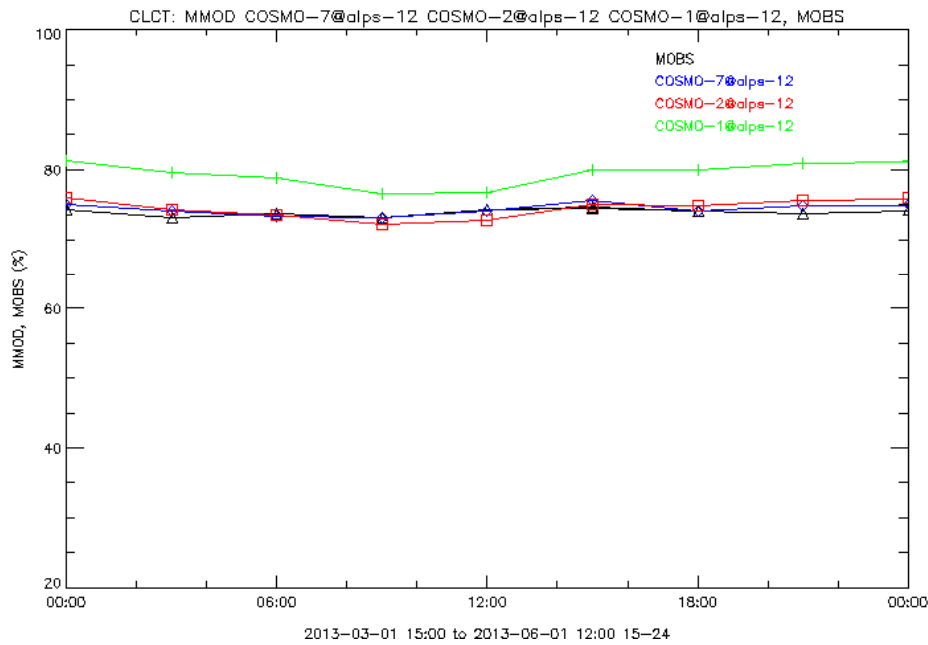
Performance diagram: 12h precipitation sums
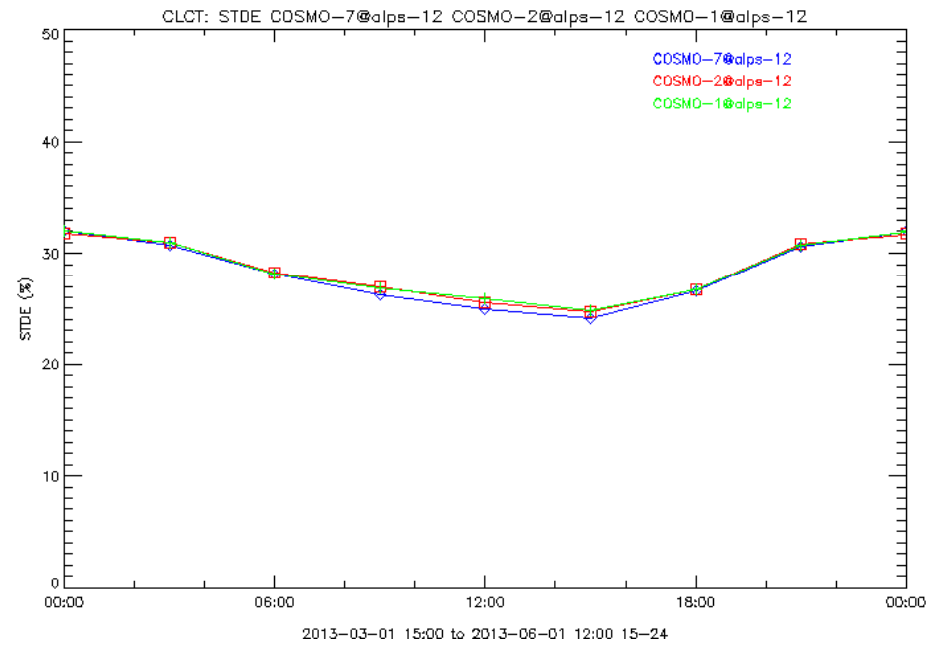## Spring 2013: all hourly sums from +6h to +18h

Total cloud cover Spring 2013 Alps

values

std dev
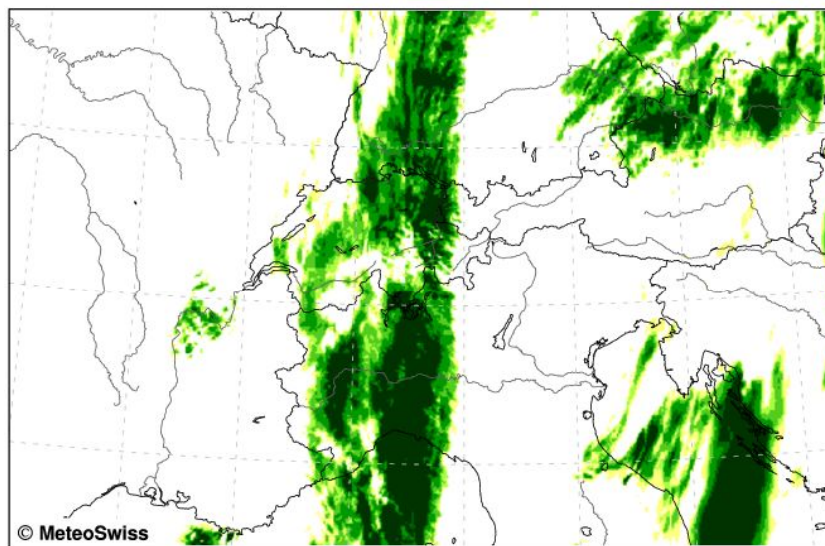
High cloud cover: 15.01.13 00 UTC +9h
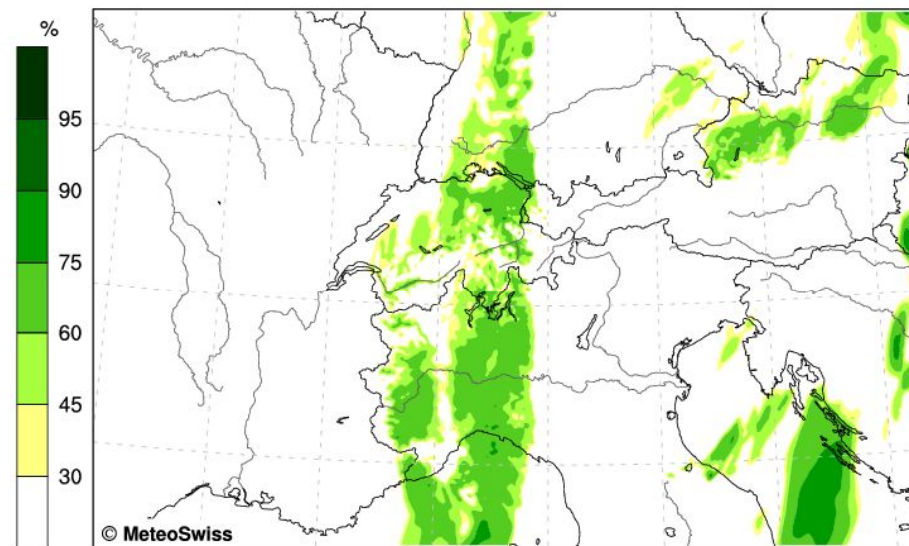
COSMO-1

COSMO-2

new version 4.23 (in COSMO-1): now the model can really achieve 100% cloud cover for cirrus clouds. Before the maximal cloud cover has been at about 80%, which is not realistic
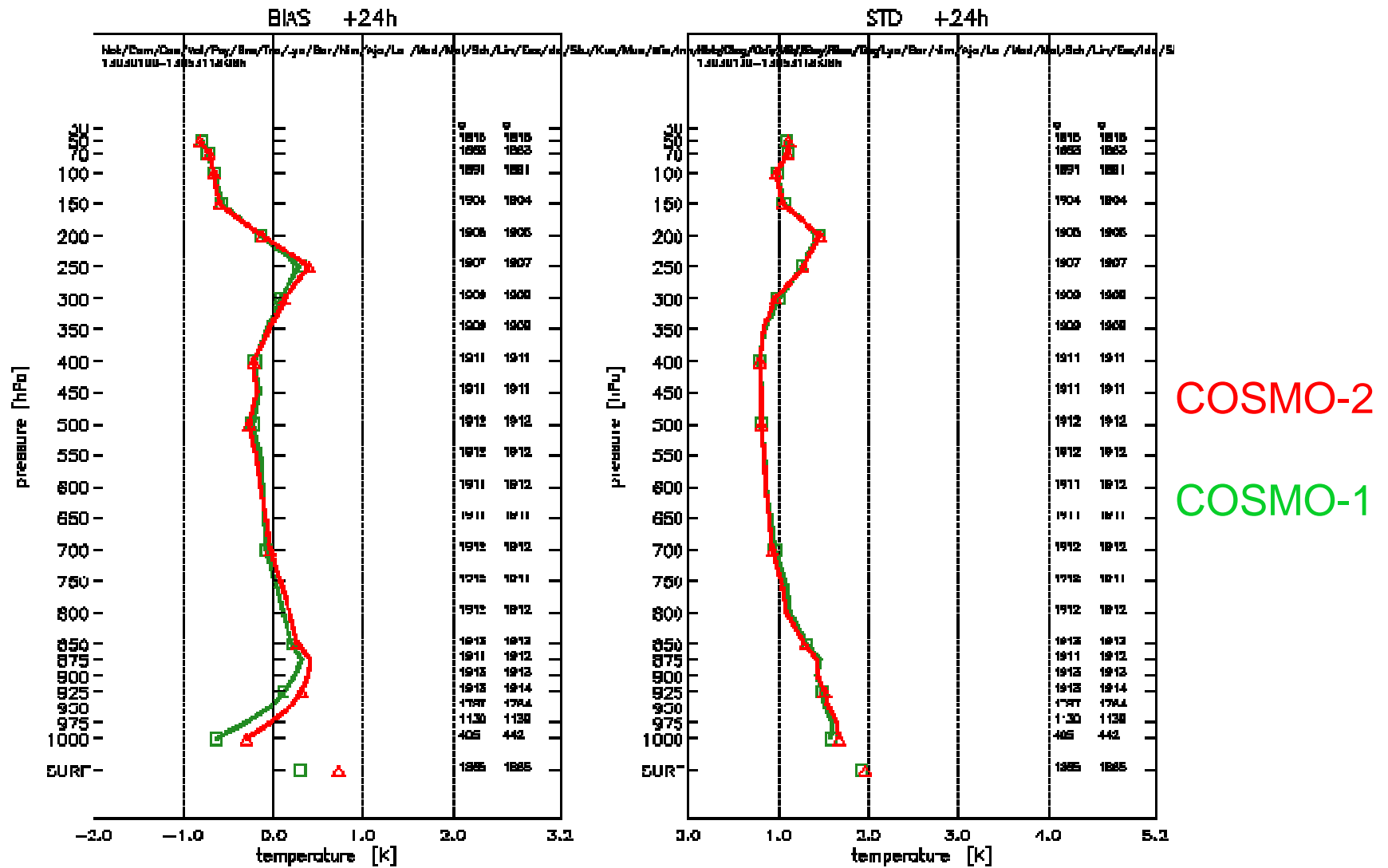
Verification with TEMPs   Spring 2013

	mean error (BIAS)
temperature	~ / below 900 hPa colder than COSMO-2, i.e: + for Payerne (and partly also stations close to the Alps), but - for stations south of the Alps
relative humidity	~ (positive bias slightly increased below 700 hPa and reduced between 300-700 hPa)
wind direction	~
wind speed	~
geopotential	~

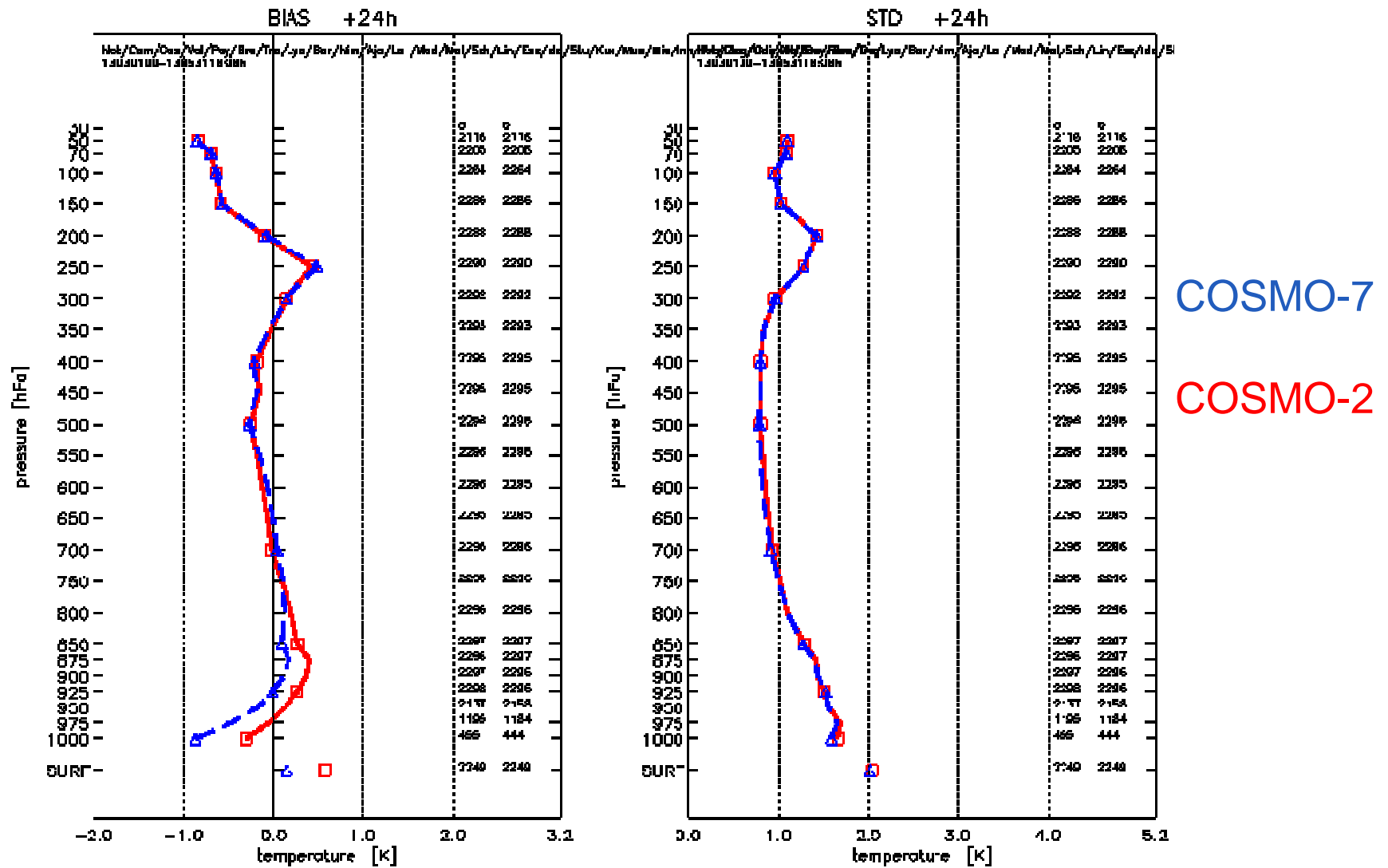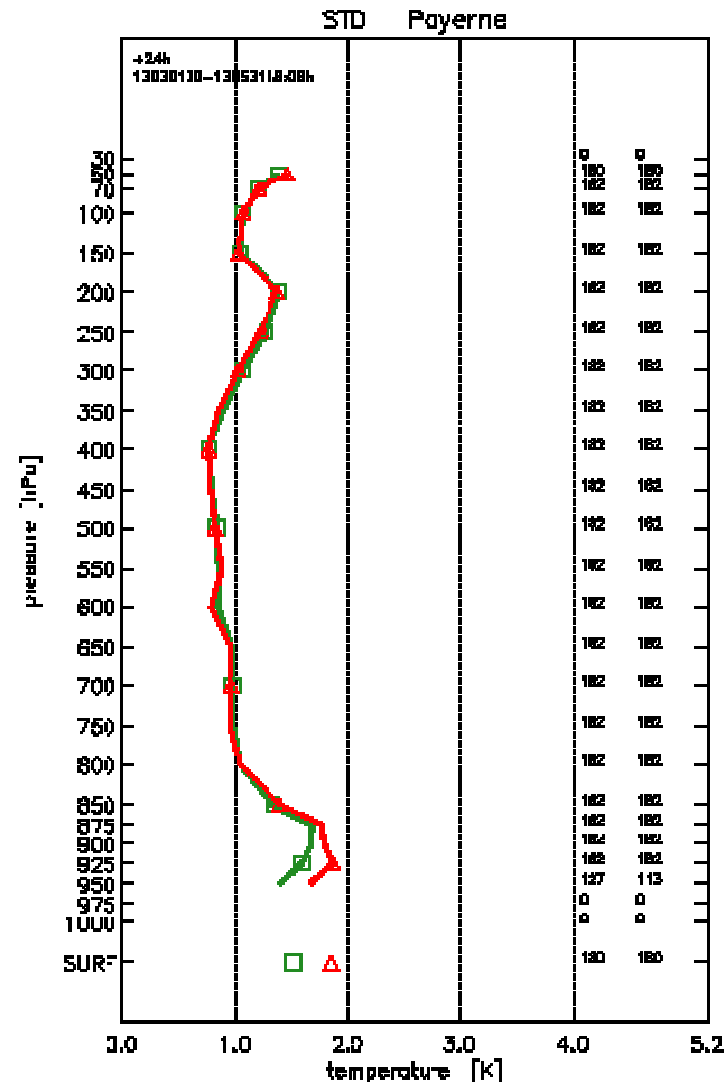|	standard deviation of error (STD)
temperature	~
relative humidity	~
wind direction	~ (- slightly increased below 850 hPa)
wind speed	~
geopotential	~

temperature@+24h: all stations

temperature@+24h: all stations

COSMO-7

COSMO-2

temperature@+24h: Payerne

Verification of the experimental version of COSMO-1 of the last three seasons ¦ COSMO-GM 02.09.2013, Sibiu
Francis Schubiger & Pirmin Kaufmann
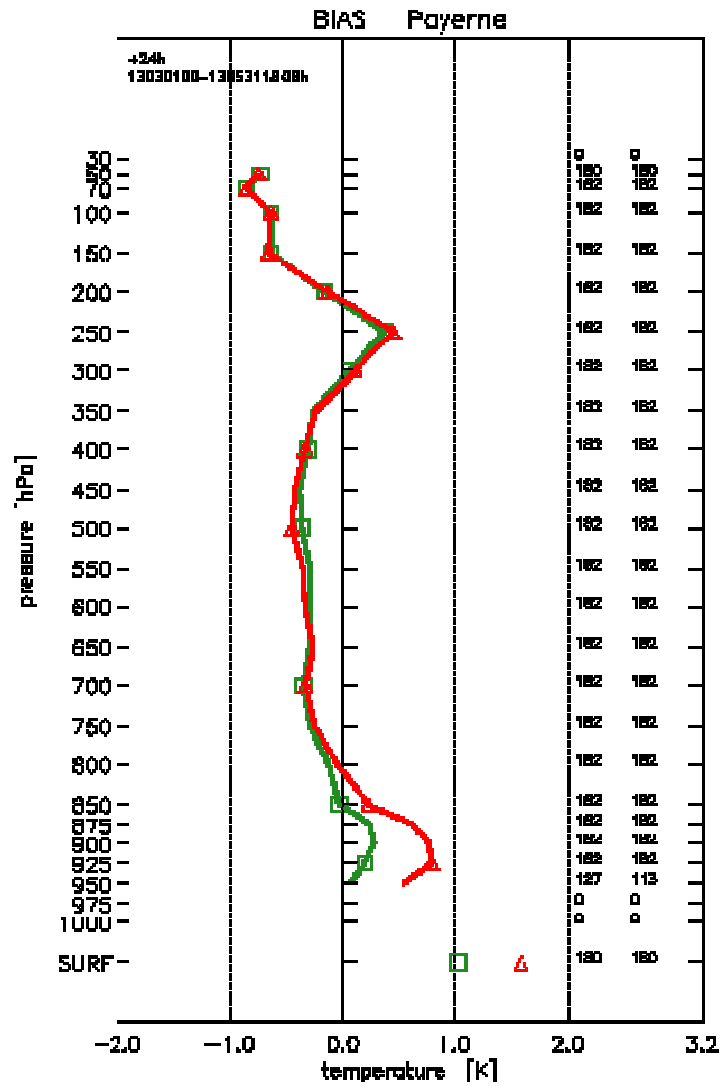
temperature@+24h: Payerne
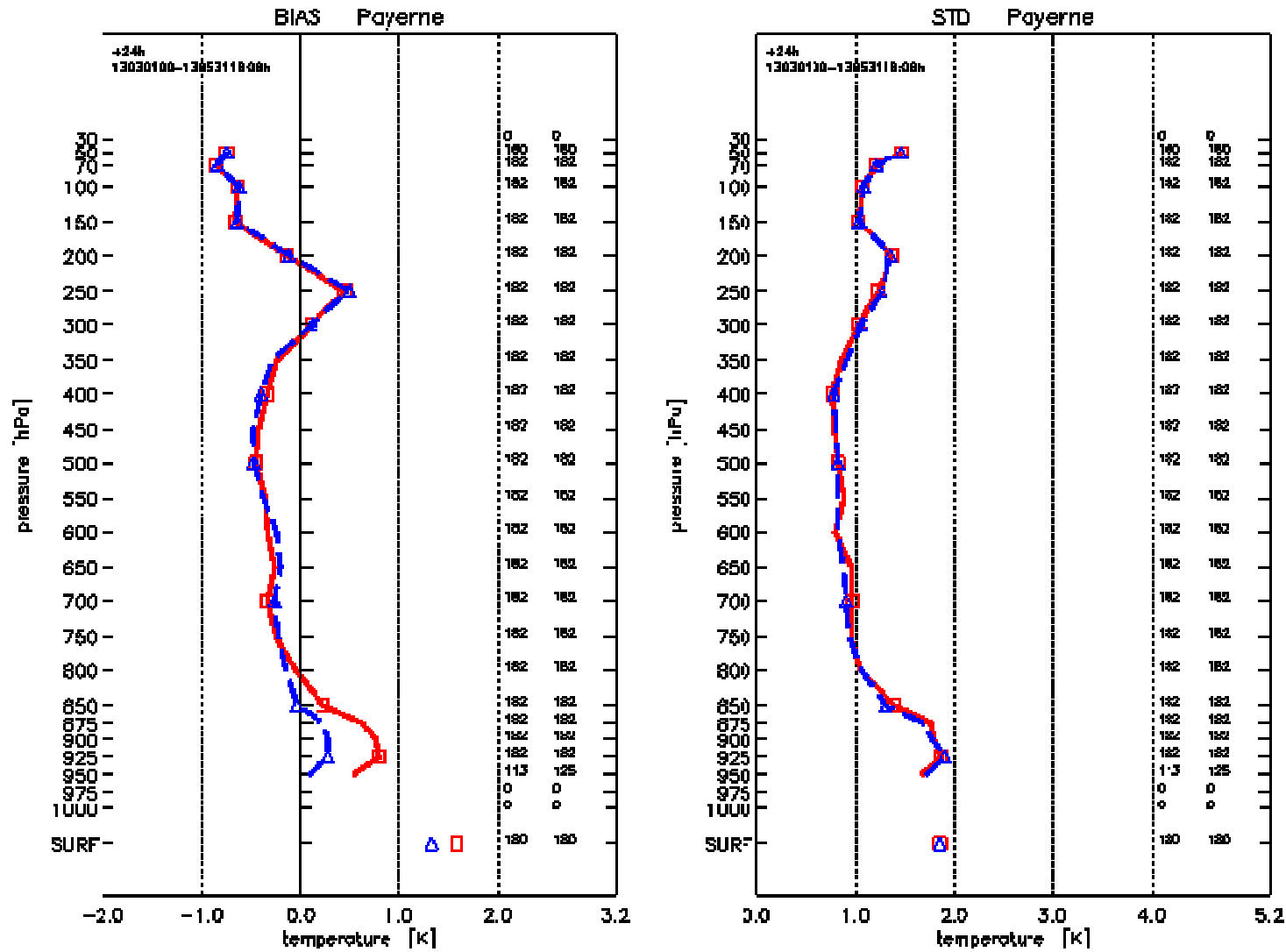
COSMO-7

COSMO-2

relative humidity@+24h: all stations

Verification of the experimental version of COSMO-1 of the last three seasons | COSMO-GM 02.09.2013, Sibiu
Francis Schubiger & Pirmin Kaufmann
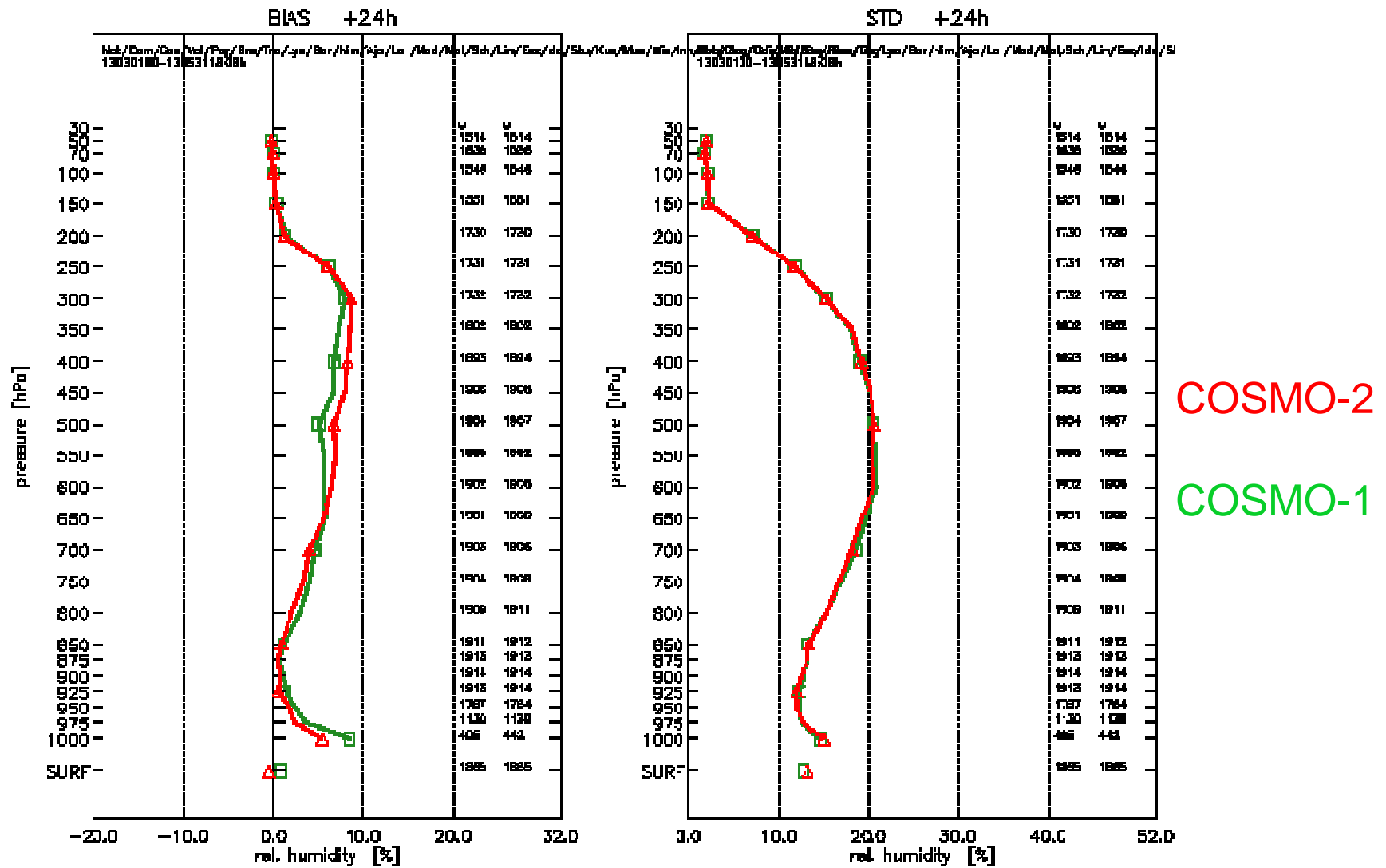
Summary SYNOP and TEMP verification

- **good results of COSMO-1 as compared to COSMO-2:**

    - higher surface pressure (reduced negative bias and reduced standard deviation of errors)

    - lower temperature < 850 hPa, i.e. colder (reduced standard deviation of errors)

    - 10m-wind: higher windspeed (mainly on mountain stations, i.e. reduced negative bias on mountains)

    - cloud cover: more high clouds (new COSMO version 4.23), i.e. higher positive bias in total cloud cover

    - precipitation: slightly better results despite the smaller radius for the mean, reduced errors in bias, better false alarm ratio

- **next steps:**

    - neighborhood Verification (4d-verif): precipitation, …

    - validation of COSMO-1 with turbulence measurements in complex topography (Innsbruck, A).