Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

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

KENDA at MeteoSwiss

Current and future activities

Daniel Leuenberger, Yann Lepoittevin, André Walser, Marco Arpagaus
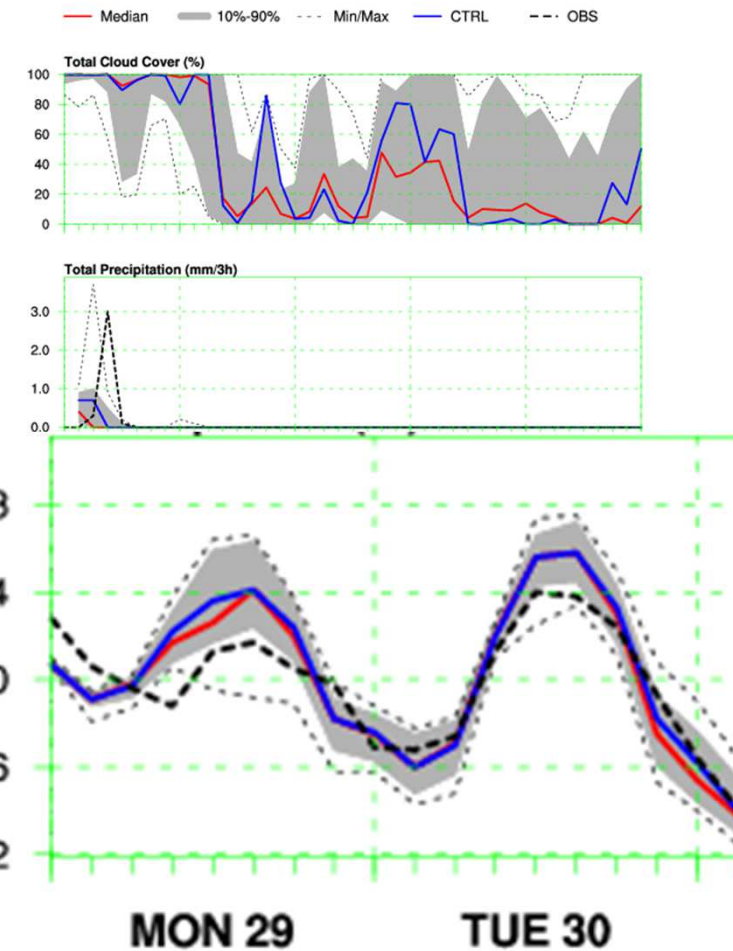MeteoSwiss, Zürich, Switzerland

COSMO General Meeting, 5.– 8. September 2016

Introduction

- COSMO-E and KENDA opr since May 2016

- One possibility for improvement are near-surface spread and error of T_2M and TD_2M

- No soil moisture perturbations and SPPT opr yet

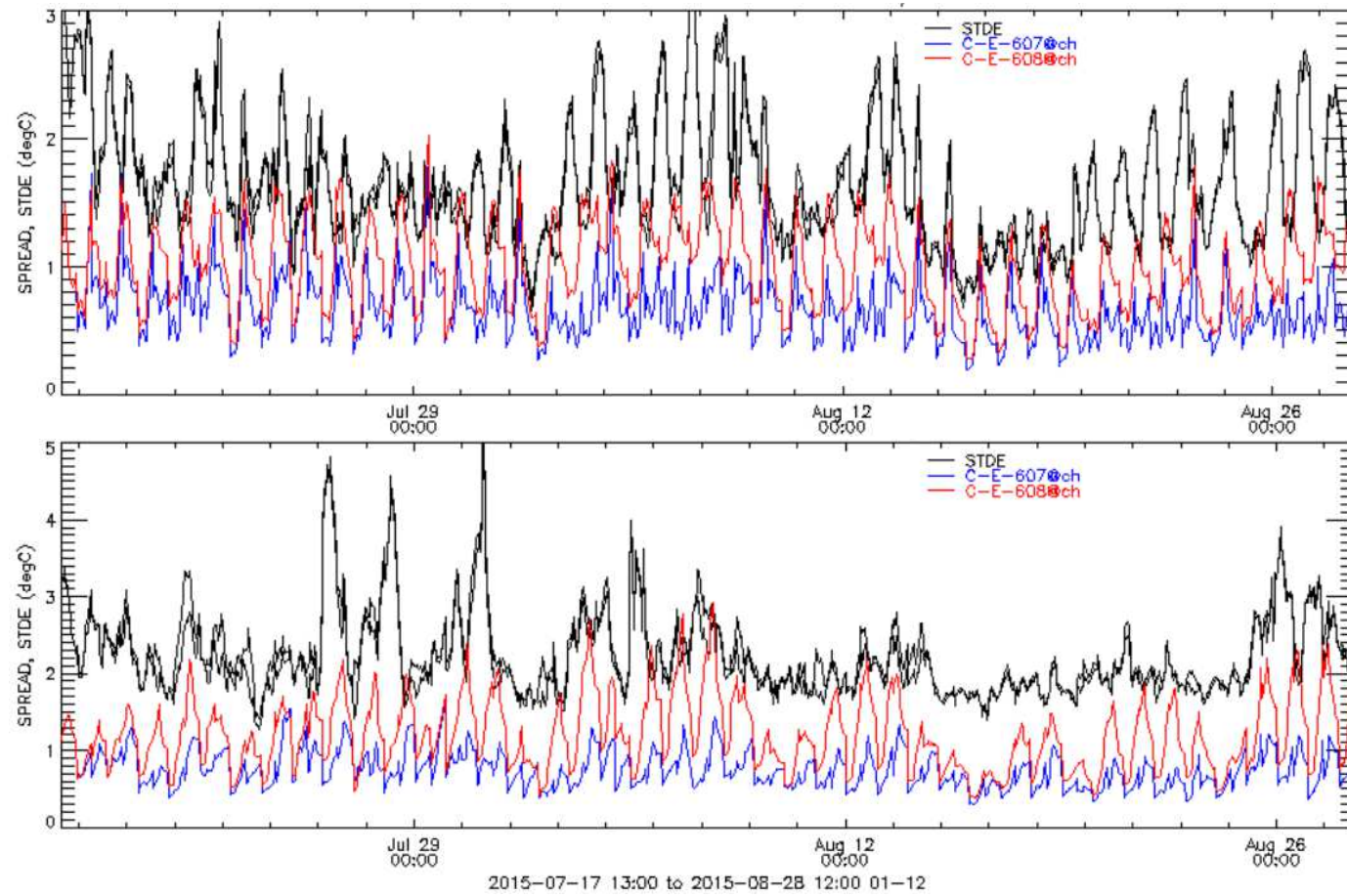# Increase of Spread with SMP and SPPT

T_2M Spread and STDDEV (black)

T_2M

CTRL
SPPT+SMP

TD_2M

Assimilation of T_2M and TD_2M

- Adding perturbations improve bias and stddev, but still much room for improvement

- Startet work with internship of Tobias Necker (LMU)
  - Single obs experiments
  - Observation increments were found to be spread too widely (horizontally and vertically)
  - Reduced localization horizontal and vertical localisation length

- Recently started to look at obs minus first guess statistics for each station (COSMO-2)

Obs – FG Statistics of T_2M and TD_2M

- Per station statistics

- Verification period: DJF 2015/2016

- Information on error distribution: mean, stddev and Gaussianity (Shapiro-Wilks test, p-value)

- Seperated by day/night

- First, incomplete results, work in progress
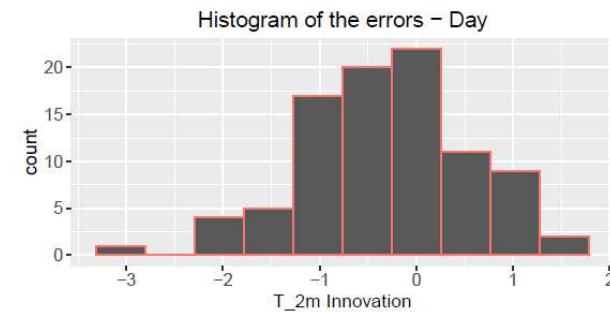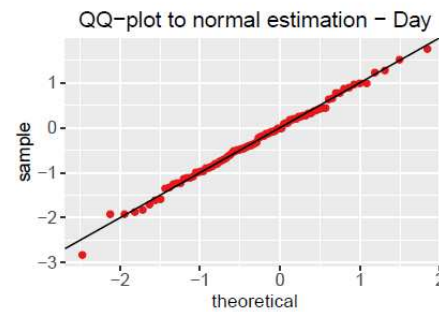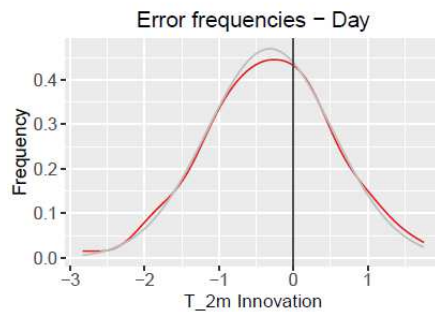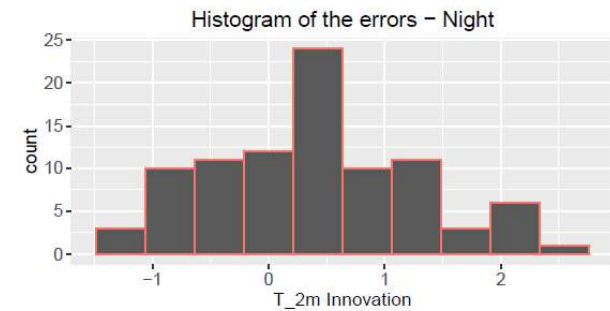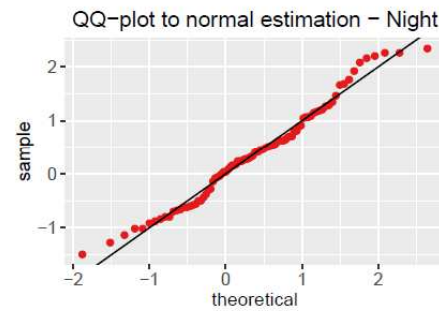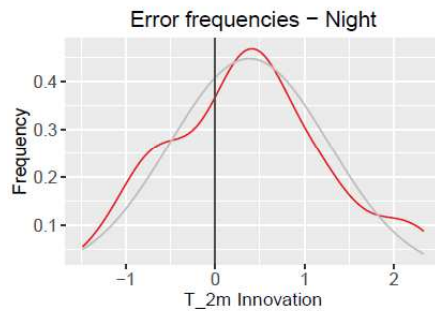
- Few examples of error distributions

Error Distribution of PSI Würenlingen

T_2m Innovation error analysis for station PSI
Time period from 2015−12−01 to 2016−02−29
Station height : 336m. Difference between heights : −29.7m

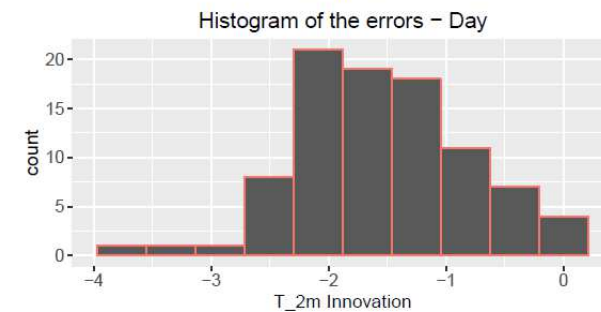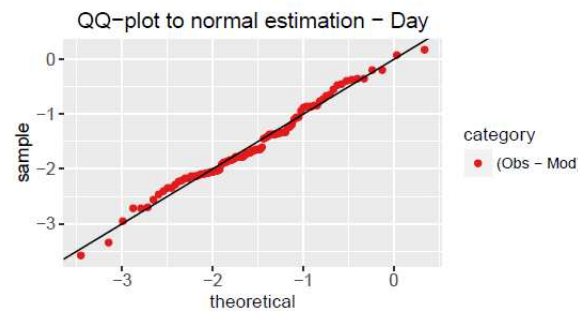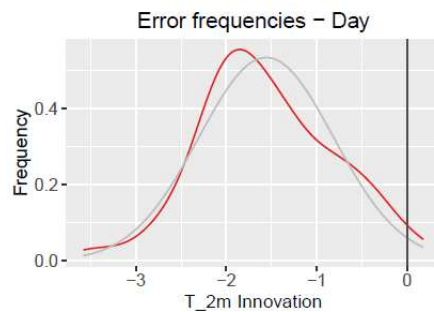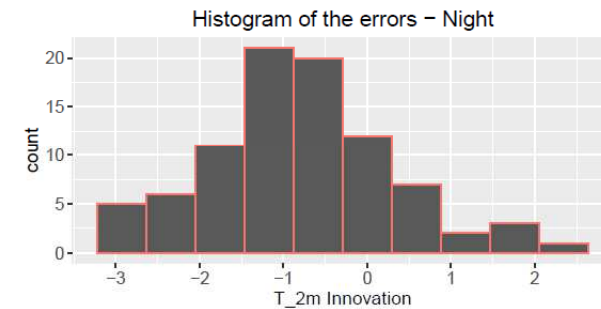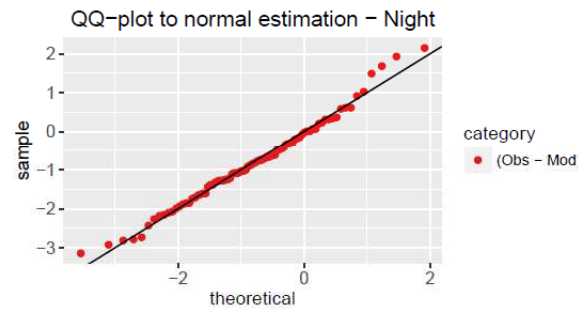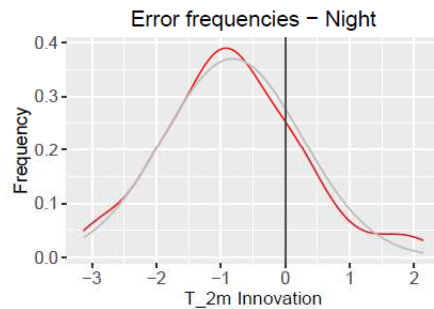|	MeanError	StDv	RMSE	NObs	ProbaNOTGaussian
Night	0.382	0.889	1.27	1092	0.8359
Day	−0.314	0.849	1.27	1092	0.0123

Error Distribution of Monte Rosa Plattje

T_2m Innovation error analysis for station MRP
Time period from 2015−12−01 to 2016−02−29
Station height : 2887m. Difference between heights : 1.5m

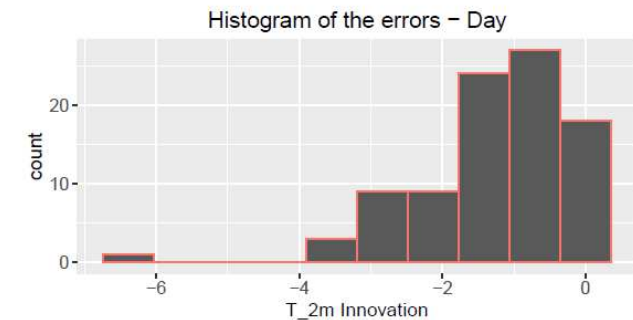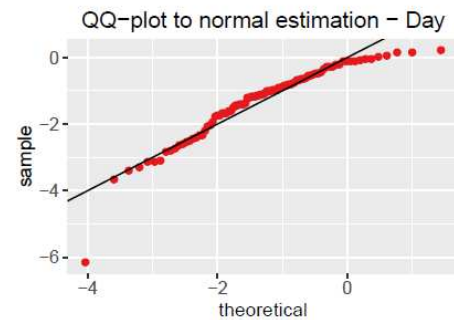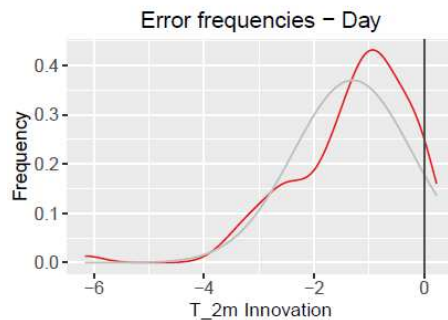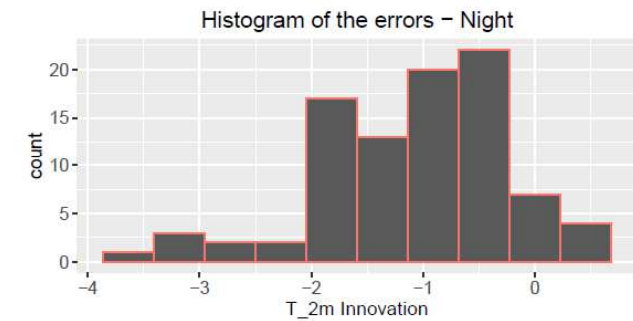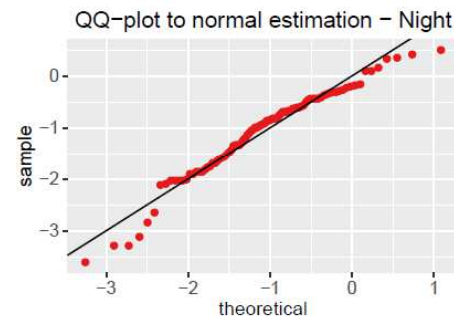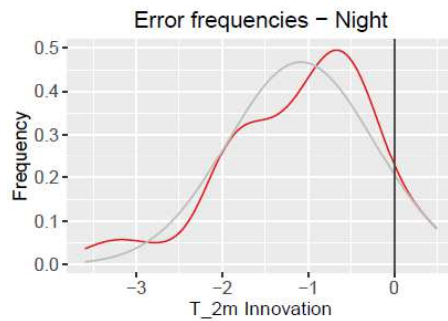|	MeanError	StDv	RMSE	NObs	ProbaNOTGaussian
Night	−0.815	1.078	1.52	1018	0.517
Day	−1.559	0.746	1.93	1078	0.614

Error Distribution of Säntis

T_2m Innovation error analysis for station SAE
Time period from 2015−12−01 to 2016−02−29
Station height : 2494m. Difference between heights : 600.4m

	MeanError	StDv	RMSE	NObs	ProbaNOTGaussian
Night	−1.08	0.853	1.47	1092	0.993
Day	−1.30	1.078	1.59	1092	1.000

Error Distribution of Giswil
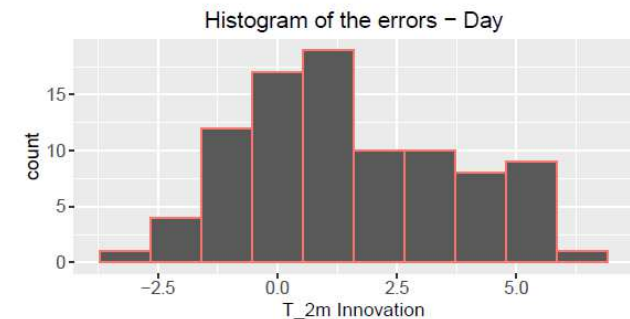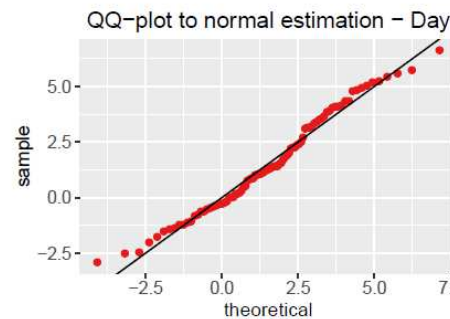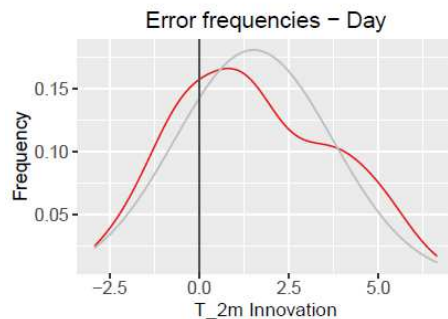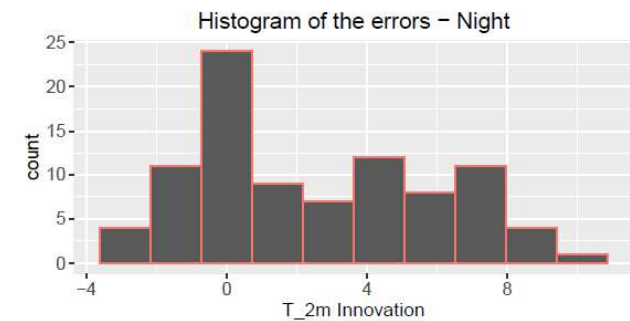

T_2m Innovation error analysis for station GIH
Time period from 2015−12−01 to 2016−02−29
Station height : 472m. Difference between heights : −40m

	MeanError	StDv	RMSE	NObs	ProbaNOTGaussian
Night	2.55	3.31	3.91	1092	1.000
Day	1.52	2.21	2.84	1092	0.859
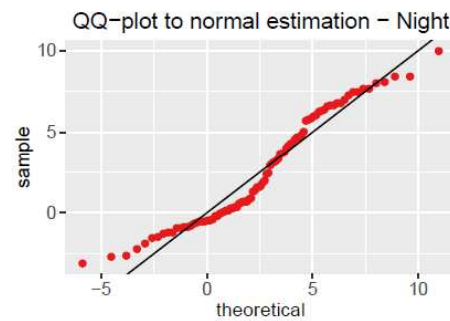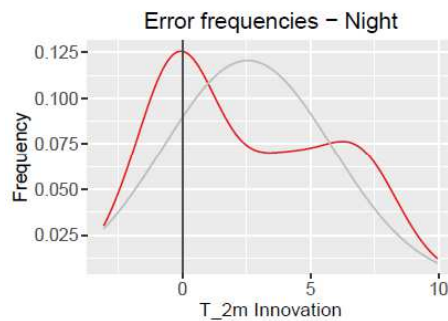
Error vs Height Difference |HSURF-Topo|

T_2M DAY BIAS

T_2M DAY STD

T_2M DAY RMSE

T_2M DAY P-VALUE

Further remarks

- Per station statistics shows a large heteorgeneity in the error distributions of T_2M for COSMO-2 in winter
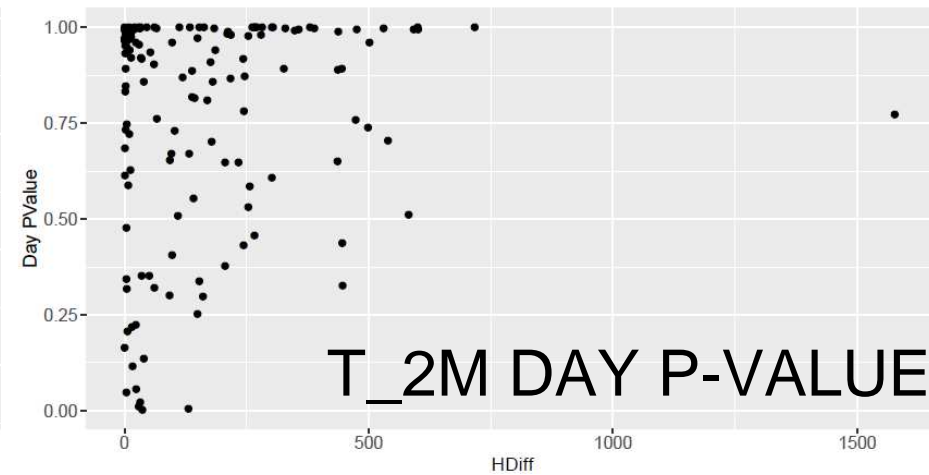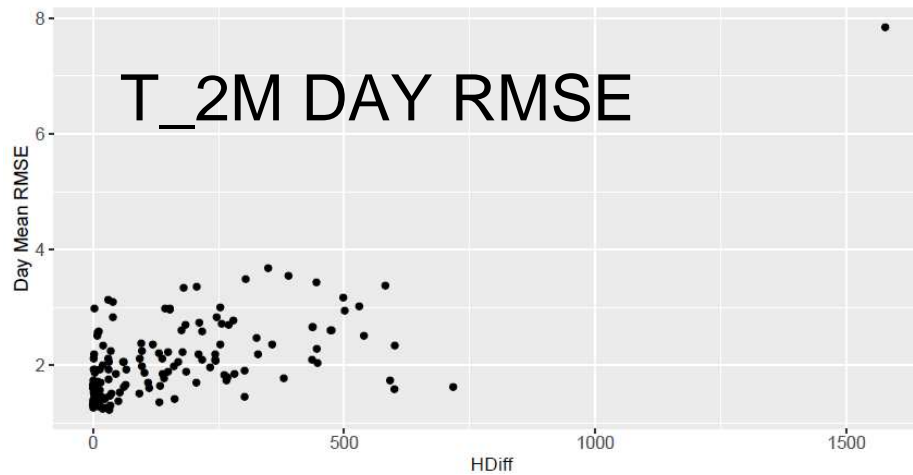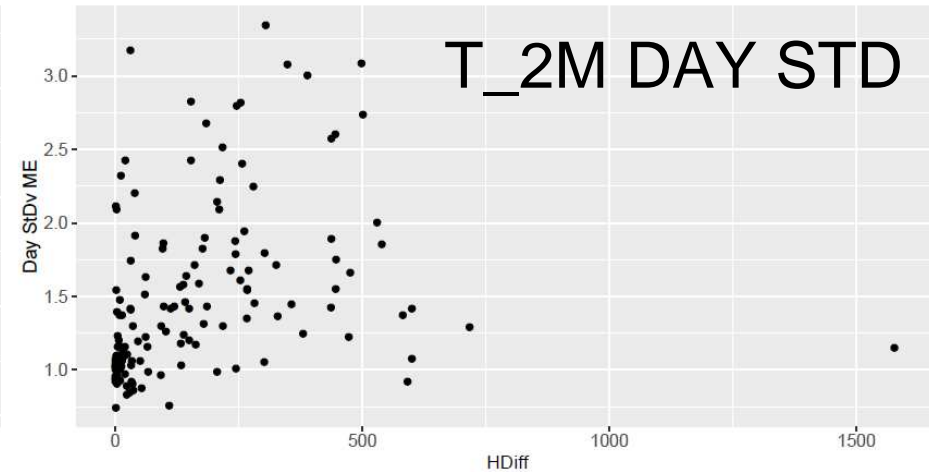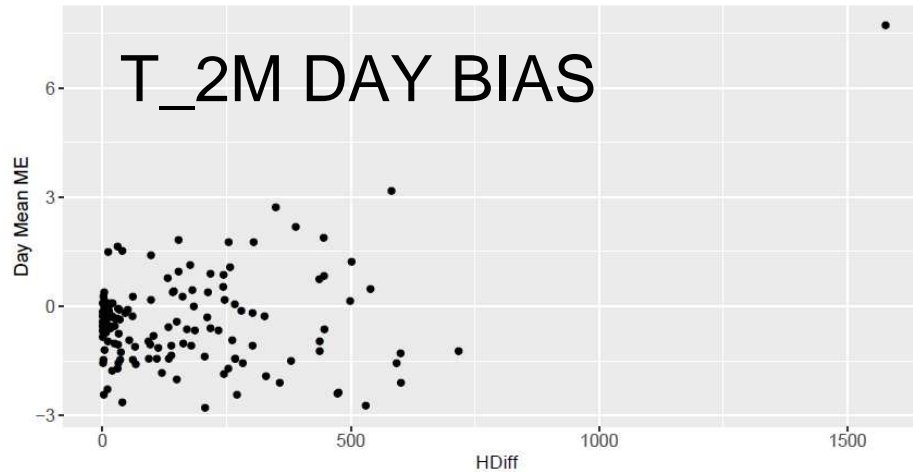
- Height difference between HSURF and topo does not seem to be the best criterion to distinguish representative from non-representative stations

- What criterion should be chosen for a station selection via black list? StdDev? p-value?

- Do we need a bias correction? How?

- Other NWS (e.g. MeteoFrance and MetOffice) assimilate T_2M and TD_2m since several years with good impact and without special measures, let's do it also in COSMO!

Outlook for T_2M and TD_2M Assimilation

- Introduce SPPT and SMP perturbations in opr KENDA

- Passively assimilate T_2M and TD_2M, more in-depth O-B statistics

- Test assimilation of T_2M and TD_2M

  - Localization length

  - Number of obs (different quality)

  - Only day vs. day and night

  - Summer vs Winter

- What to do in winter? Too little spread, SPPT and SMP do not help!

- Additive inflation based on past forecast differences?

Outlook

- Assimilation of T_2M and TD_2M

- Deterministic analysis with $\Delta x=1.1$km

- Assimilation of MODE-S observations

- Assimilation of more remote-sensing observations (Radar, Lidar, Radiometer, Satellites)

- Internship starting 1.1.2017