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FINNISH METEOROLOGICAL INSTITUTE

GRUAN site: Sodankylä, Finland

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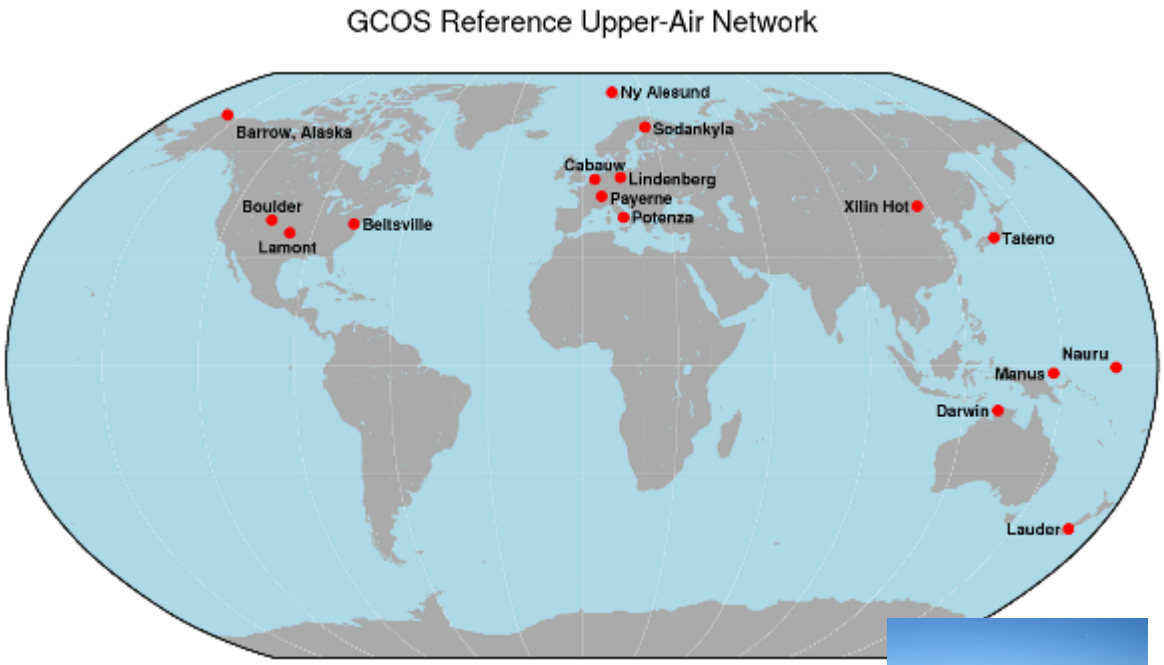
Finnish Meteorological Institute
Arctic Research Centre

Location

Sodankylä site is operated by the Finnish Meteorological Institute Arctic Research Centre (FMI-ARC). Location of the site is 67.4 °N, 26.6 °E, 179 m above mean sea level; station's WMO number is 02836. Participates in GRUAN, GAW, NDACC, TCCON, etc.



Outline

- Status of the observations
- CFH and RR01 flights
- Autosonde task

Sonde observations at Sodankylä

- Twice daily 00/12 UT: RS92 radiosondes launched on regular basis, software v. 3.64.1 in operational and research soundings. Operational soundings are made using the Vaisala autosonde system. Near simultaneous manual and autosonde soundings have been performed. Soundings have been submitted to the GRUAN database. Update in Feb 2013.

- ECC ozonesondes are launched on regular basis once per week and additional ozonesondes have been included in other soundings, for example CFH soundings and ozone campaign soundings. Ozone soundings have been submitted to GRUAN database using the GRUAN RS Launch client software. WMO O3 sonde-DQA is an ongoing activity.

Sonde observations at Sodankylä

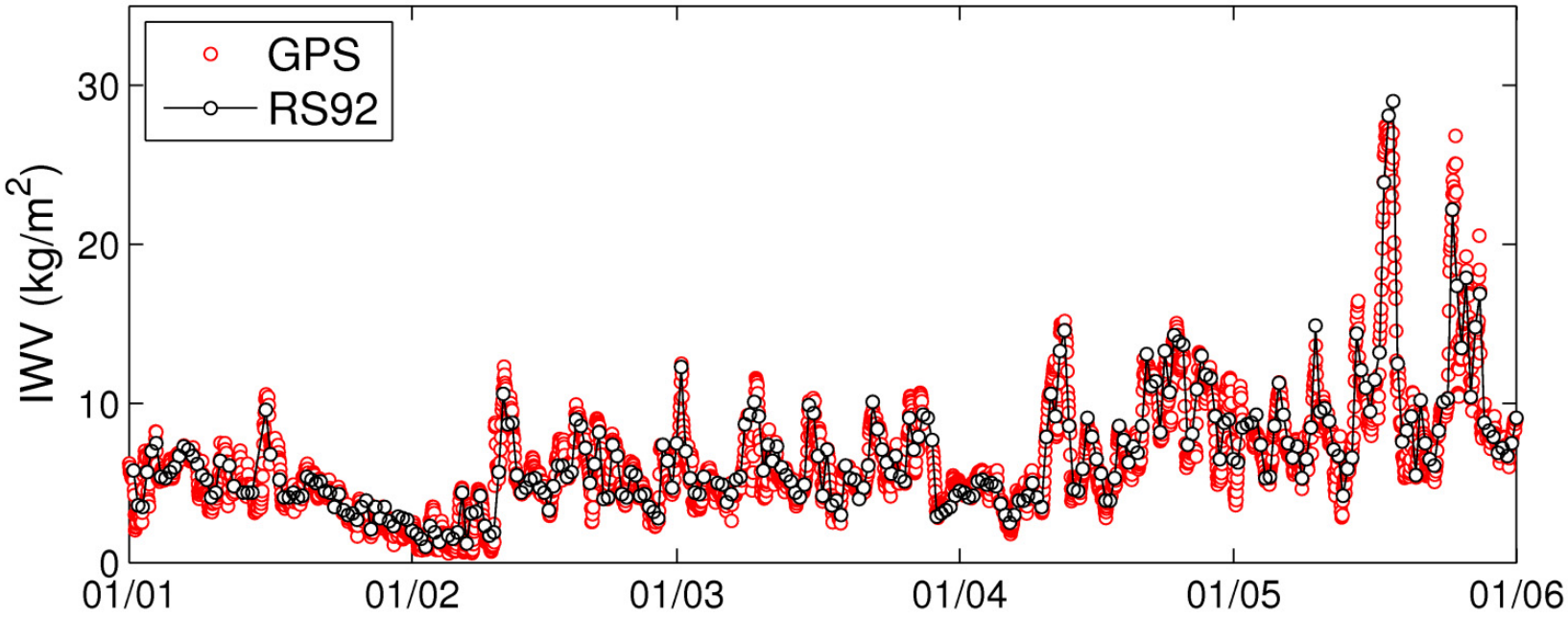
UTLS water vapor :

- Cryogenic Frostpoint Hygrometer, CFH (6-12 /year)
- Fluorescent Advanced Stratospheric Hygrometer FLASH, including experimental versions of the instrument
- Flights of the new Vaisala climate research sonde RR01, which is currently in the development phase. This activity has been ongoing in 2012 - 2013.

Aerosol sondes

- Cloud and aerosol detection by COBALD sondes. CFH/COBALD flights have been performed.

IWV comparison: GPS vs RS92 in 2012

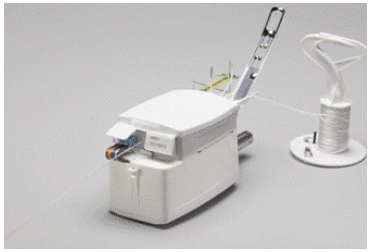


	GPS
Difference to sonde (%):	-3.3
Standard deviation (%) :	13.34
Number of pairs :	307

New developments at Sodankylä

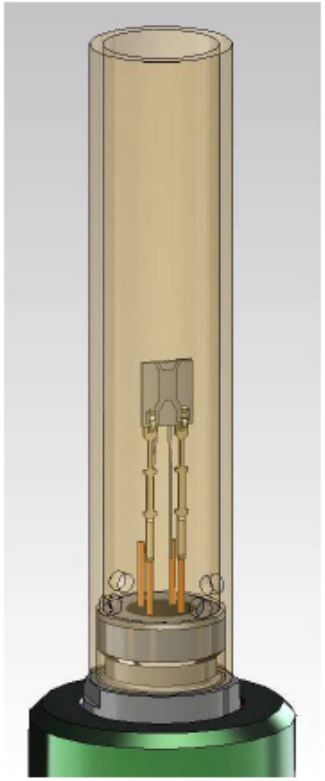
- Metek Cloud radar MIRA-36S in 2012
- HALO Doppler lidar Feb 2013
- 9 filter CIMEL CE-318 (340-1640nm) in March 2013
- Brewer #214 in Nov 2012
- MARL Lidar was refurbished in Nov 2012

Water vapor soundings: CFH and RR01



Extremely sensitive DRYCAP® humidity sensor

- Advanced capacitive sensor based on Vaisala DRYCAP® technology, originally developed for measuring ultra-dry gases in industrial applications.
- Measures water vapour pressure (Pw), which is then converted to frostpoint temperature.
- Highly sensitive sensor enables humidity measurements in upper troposhere and lower stratosphere: measuring range from -30 to -90 ℃ frostpoint temperature.
- Sensor is operated at elevated temperature resulting in faster response time.
- On-flight autocalibration procedure removes drift.



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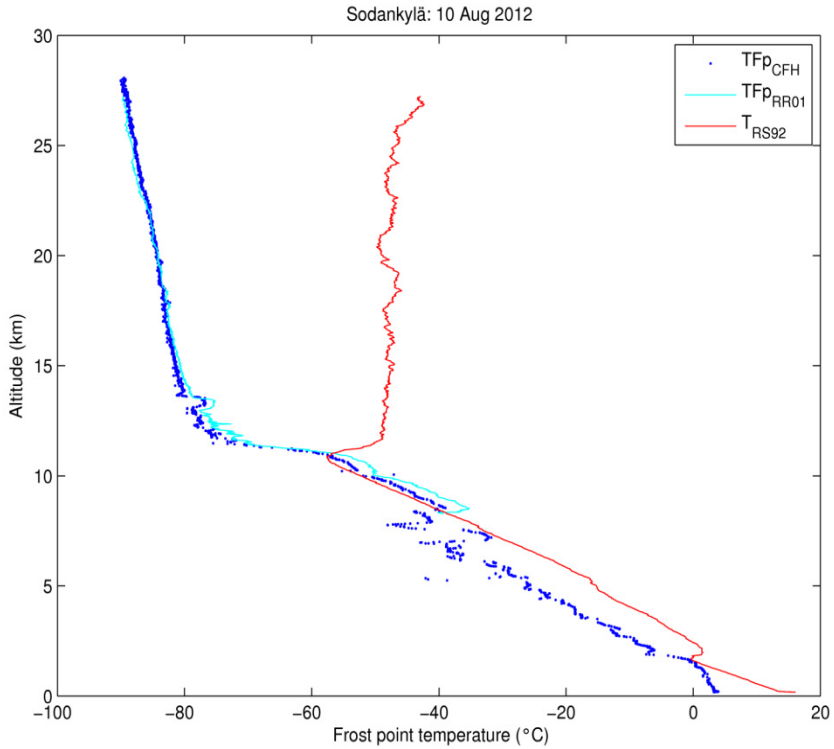
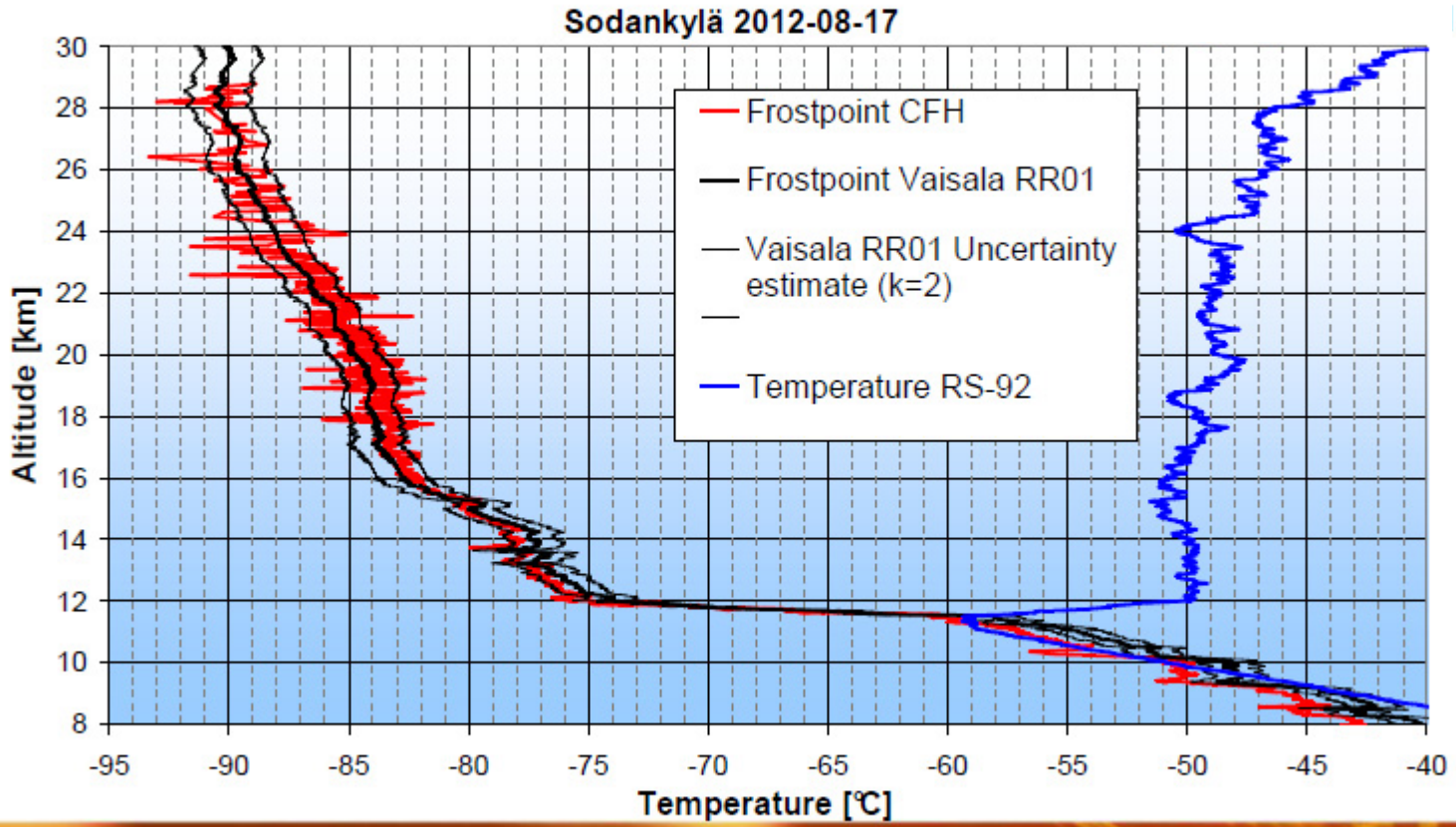
From Turtiainen et al., 2012

Observations: Sodankylä



Comparison sounding with CFH

RR01 uncertainty estimates included



VAISALA

Uncertainty includes calibration, storage, sounding uncertainty (*Figure courtesy Survo et al., 2013).*

Auto-launcher performance

Radiosonde Task on RS92 auto-launcher : Kivi, Karppinen (Sodankylä), Madonna (Potenza), Kizu (Tateno), Masatomo Fujiwara, Hannu Jauhiainen, Michael Sommer

Stations: Sodankylä, Jokioinen, Kushiro, Matsue, Minamidaitojima, Shionomisaki, Wajima, Potenza

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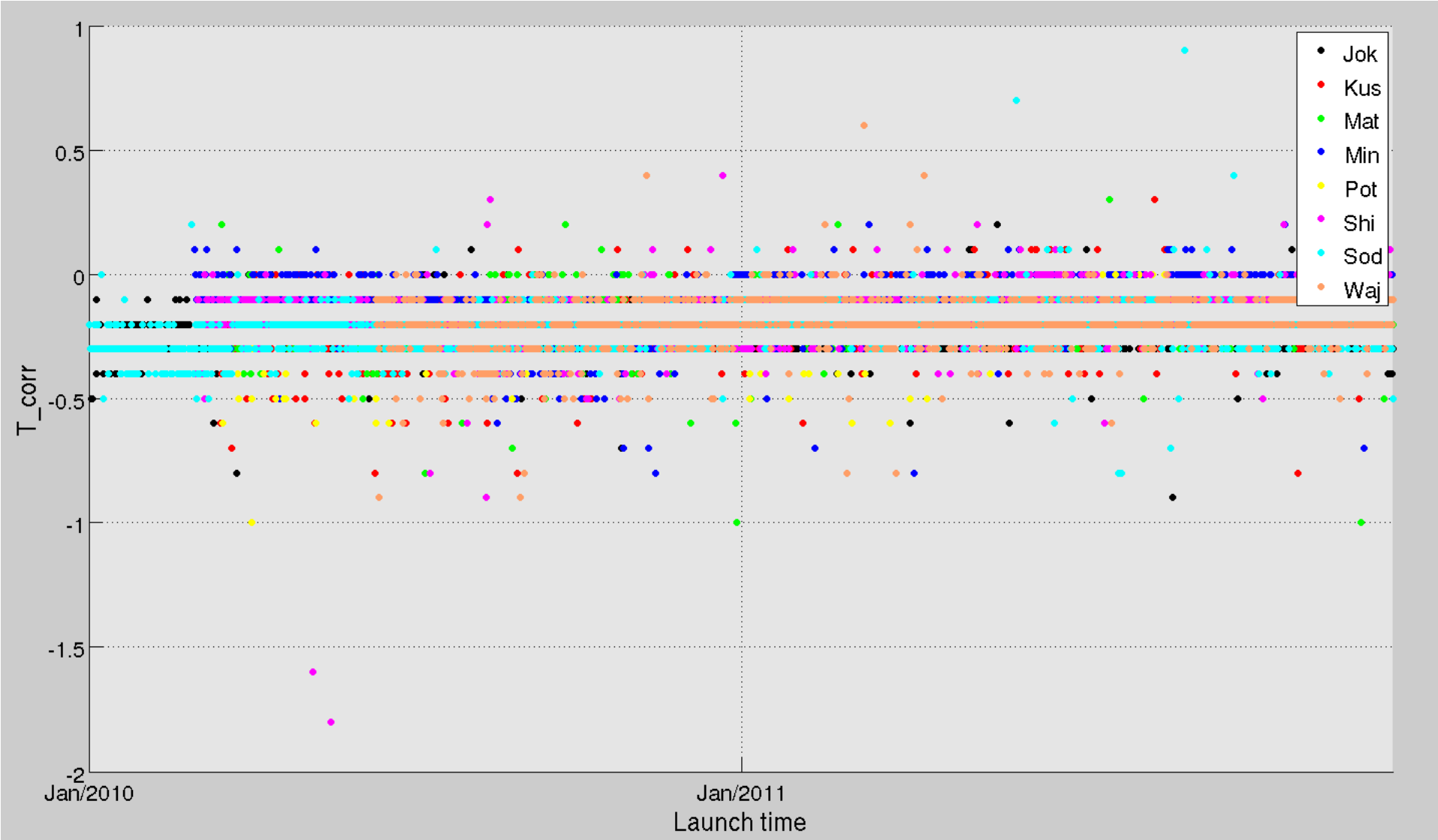
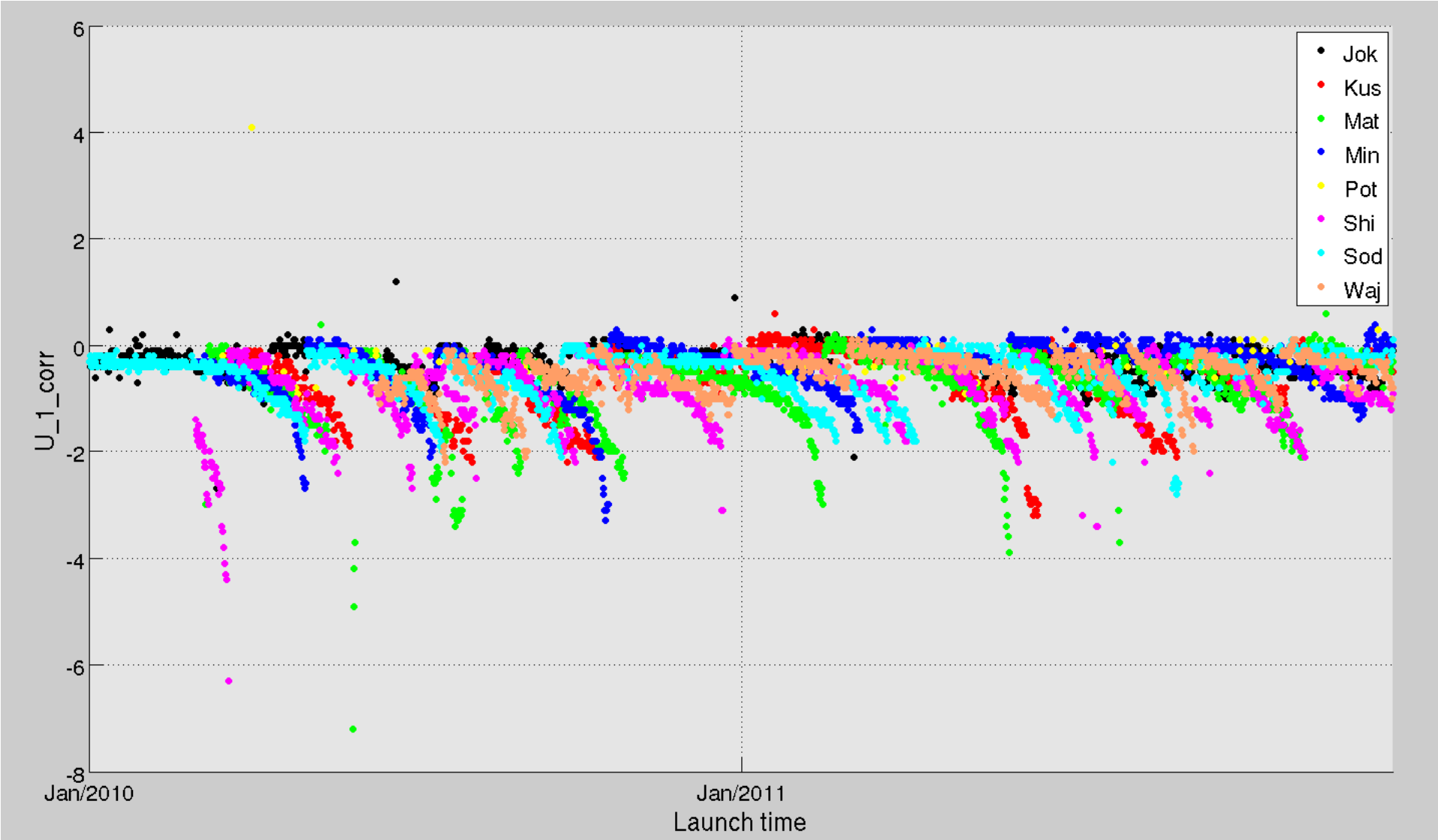
Autosonde

Text in File	Meaning
Y3417063	The serial number of the sonde
P	Primary or spare sonde (p / s)
2003-10-09	The loading date of the sonde
10:38:12	The loading time of the sonde
RS92-SGP	The type of the sonde
402.87	The frequency of the sonde
2300	Balloon filling volume [l]
170	Gas cassette in start
170	Gas cassette at the end
Totex	Balloon description
800	Balloon weight [g]
8	The tray number
JR	Comments of the loader
2003-10-10	The launch date
02:30:00	The launch time
0.8	P correction in GC
0.2	T correction in GC
-1.7	U (1) correction in GC
-1.5	U (2) correction in GC
998.6	Surface weather P
-1.3	Surface weather T
99	Surface weather U
354	Surface weather wind direction [deg]
5.4	Surface weather wind speed [m/s]
6058	Total sounding time [S]
4.3	Minimum sounding pressure
36017	Maximum sounding height [m]
356	Average ascent rate [m/min]
505.9	Minimum filling value [l/min]
510.1	Maximum filling value [l/min]
507.6	Average filling value [l/min]
16.7	Inside temperature at launch [deg C]
37	Inside humidity at launch [%]
1	Total time on the tray [d]
Increasing pressure	Termination reason (see below)

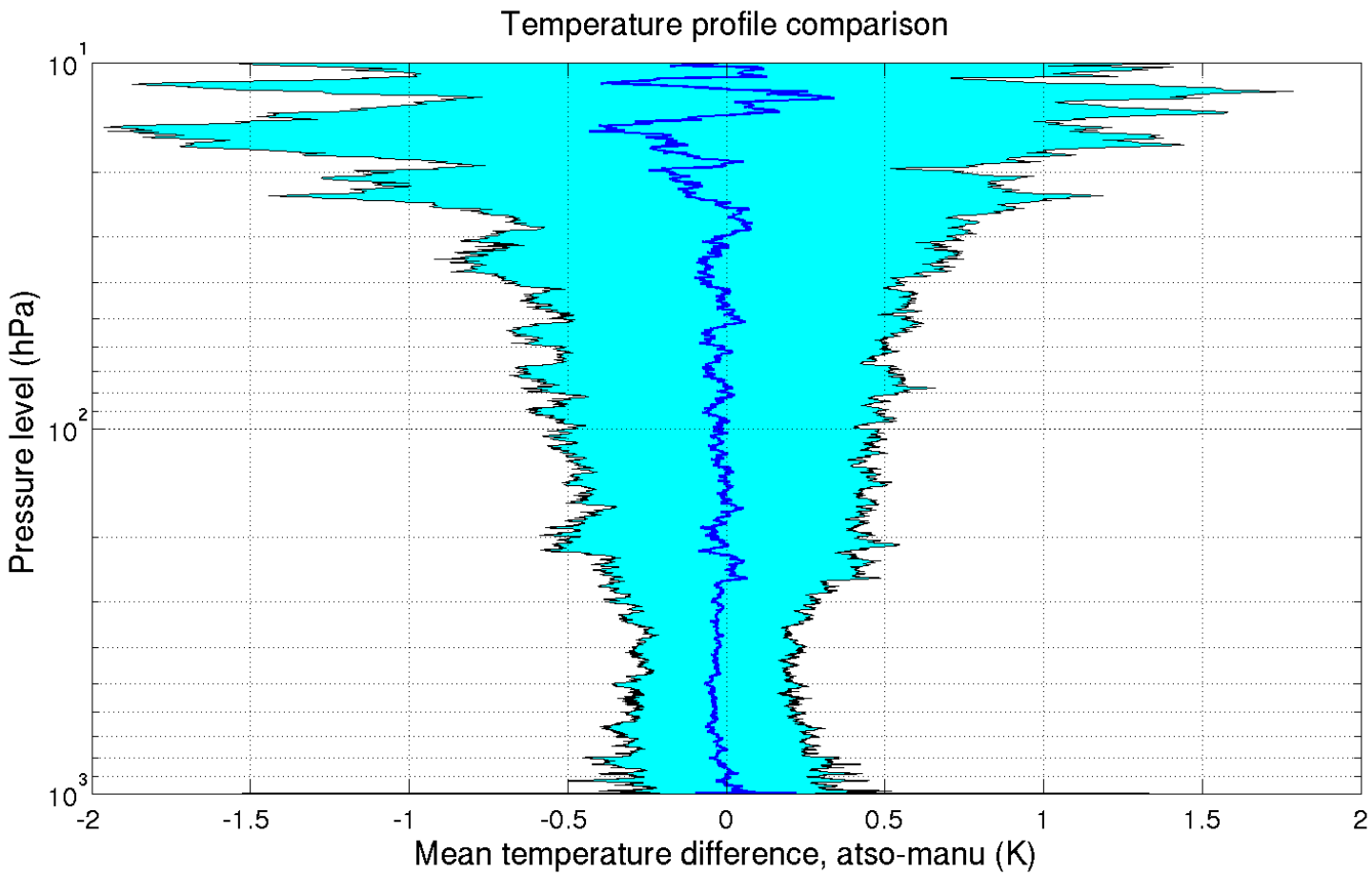


Temperature at GC

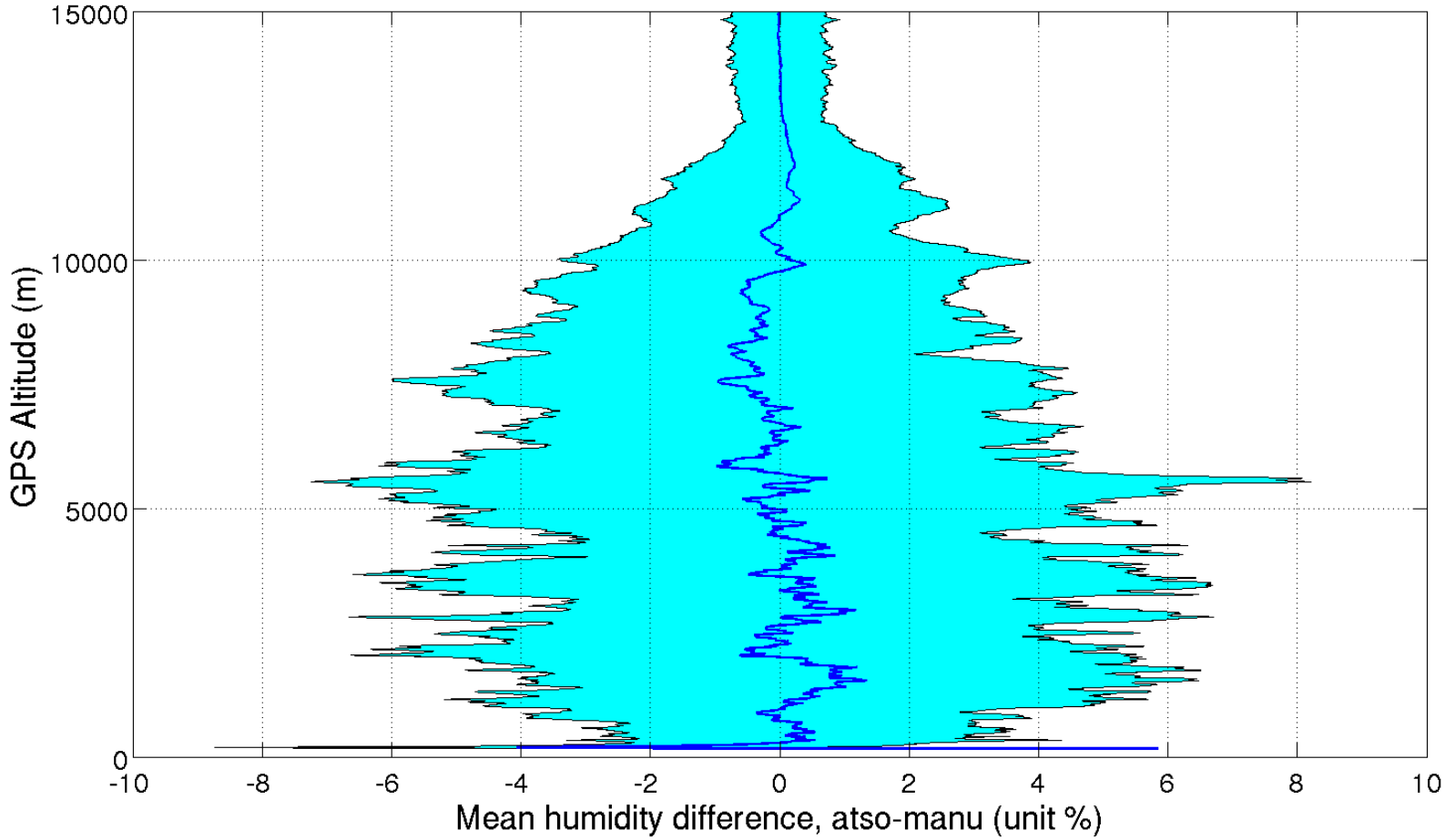

6
4
2
0
-2
-4
-6
-8
U_1_corr
Jan/2010
Jan/2011
Launch time
Jok
Kus
Mat
Min
Pot
Shi
Sod
Waj

U1 at GC

Autosonde vs. Manual soundings

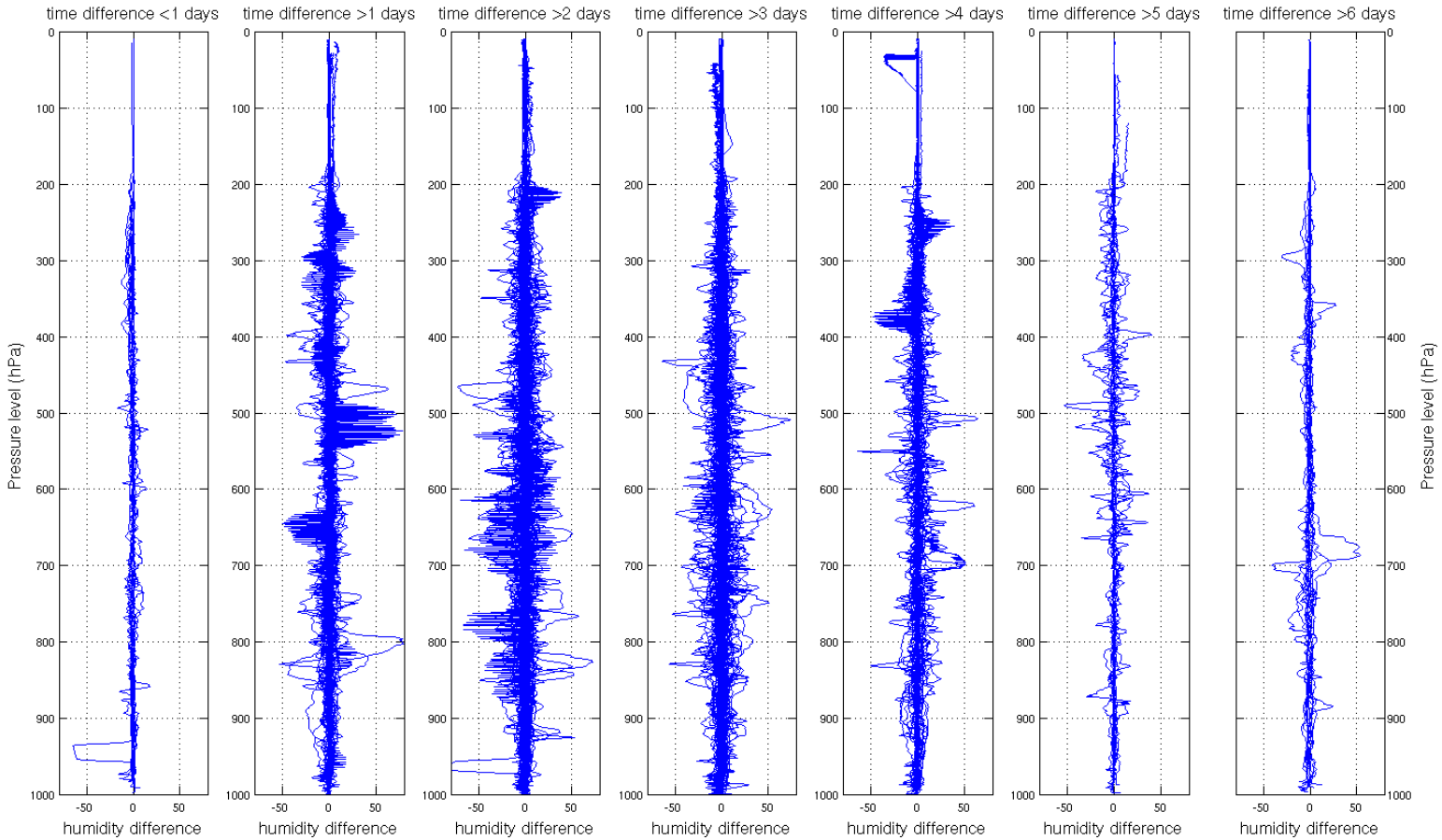


Autosonde vs. Manual soundings



Autosonde vs. Manual soundings

<1d >1d >2d >3d >4d >5d >6d



Humidity difference

Autosondes

- Metadata from autosonde stations have been collected
- Parallel soundings were analyzed, they suggest no significant biases in temperature and humidity
- Variations of time period between ground check and launch time did not influence the comparison results

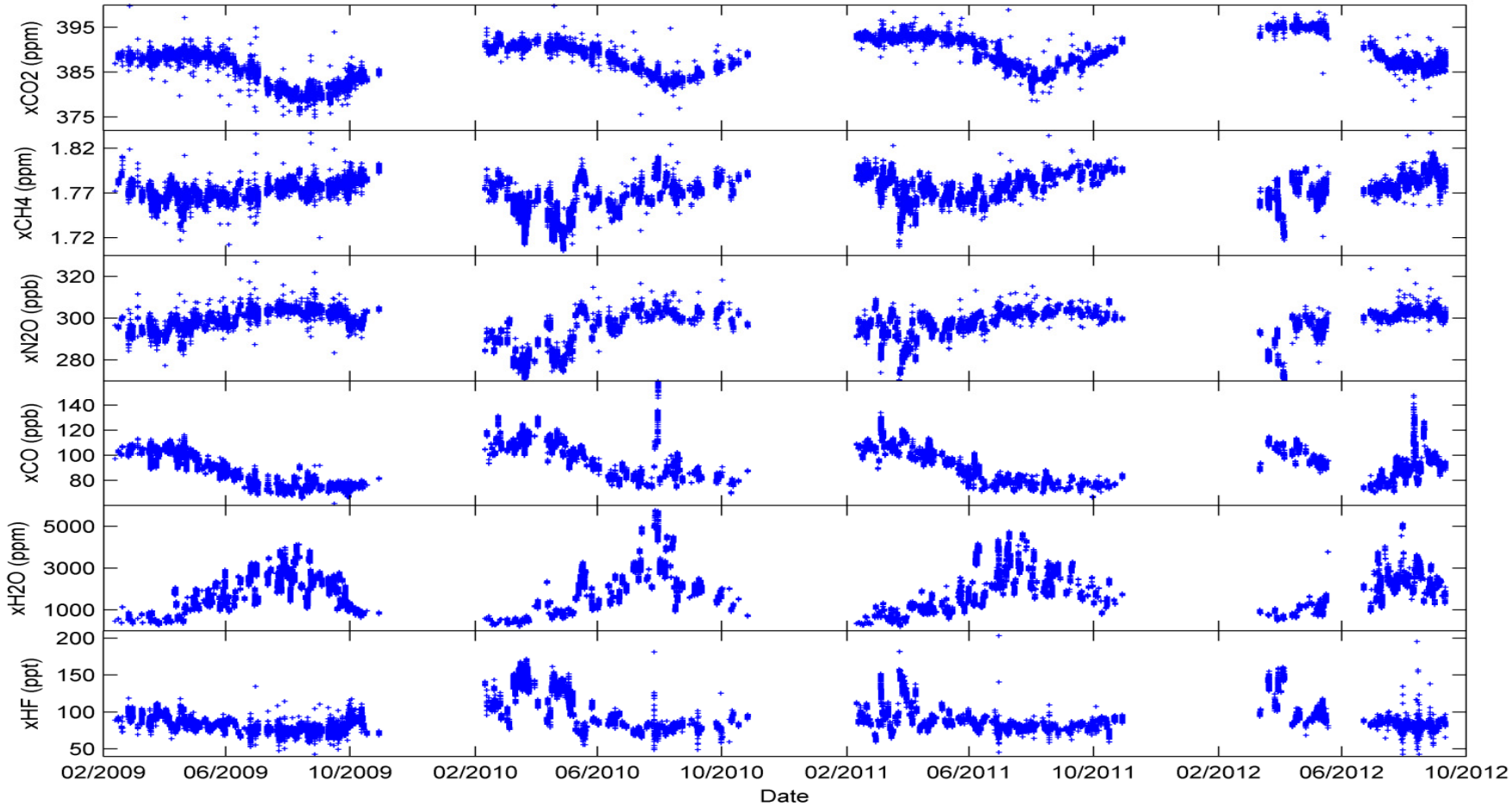
Summary

- Status of the observations, balloonborne observations (RS92, ozone, CFH, RR01), new developments at the station.
- CFH and RR01 comparisons
- Autosonde assessment ongoing

Plans and perspectives

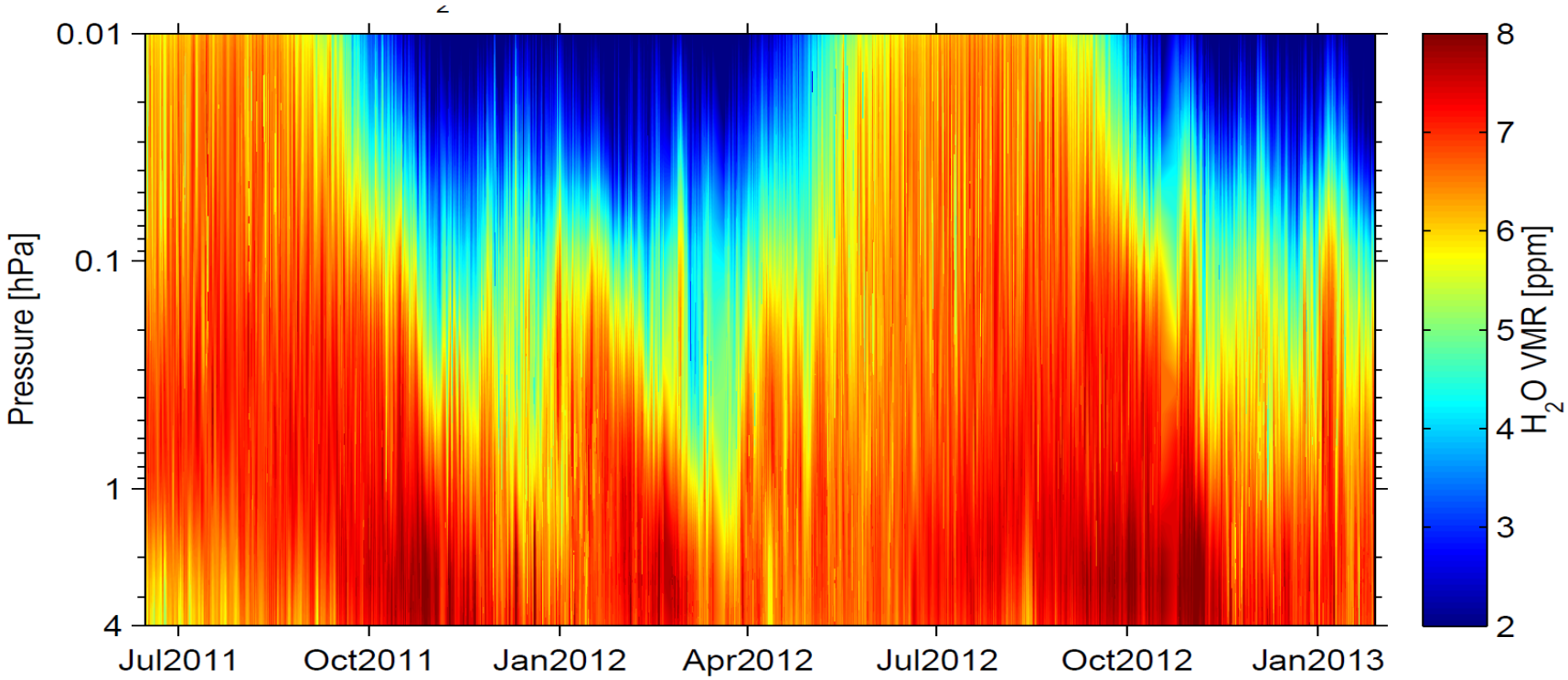
- Autosonde assessment
- CFH/RS92 flights, LAPBIAT data
- Continue RR01 flights in Sodankylä
- CFH/COBALD flights in polar vortex
- IWV comparisons: GPS, MW, FTS, sondes
- Ozonesonde DQA
- Submissions to the GRUAN database

FTIR observations 2009-2012



TCCON algorithms used in data retrieval

Stratospheric water vapor by MIAWARA-C



Data processed by Brigitte Tschanz and Corinne Straub, Institute of Applied Physics, University of Bern