Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

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

The GRUAN Observing Station Payerne - Switzerland

Rolf Philipona, Gilbert Levrat, Gonzague Romanens,
Arabella Mueller, Andreas Kräuchi

GRUAN activities

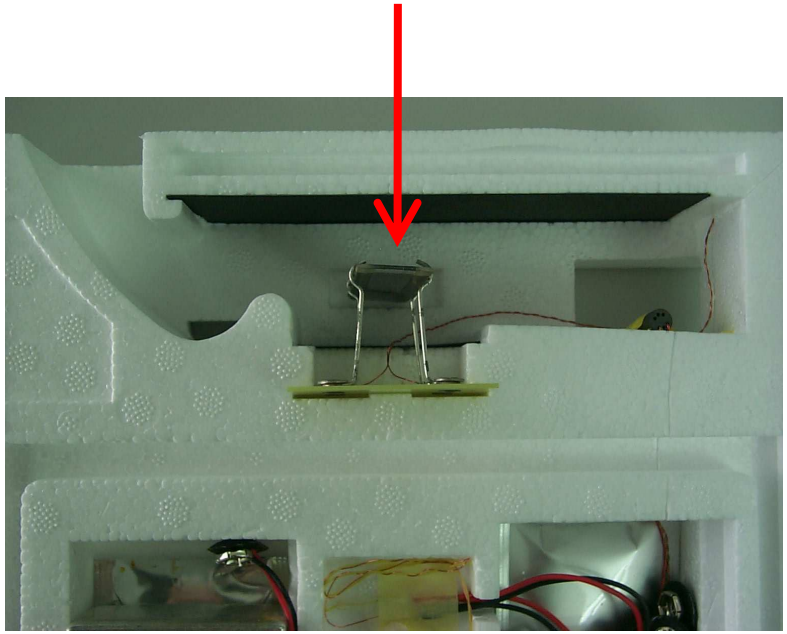
- New humidity sensor on SRS since Mai 2009
- Participation at Int. Radiosonde intercomparison in China
- New digital radiosonde SRS-C34 since January 2011
- GRUAN - reference and test soundings
- Controlled balloon sounding
- Lidar measurements – first results

Swiss analog Radiosonde SRS-400

Replacement of humidity sensor Mai 2009

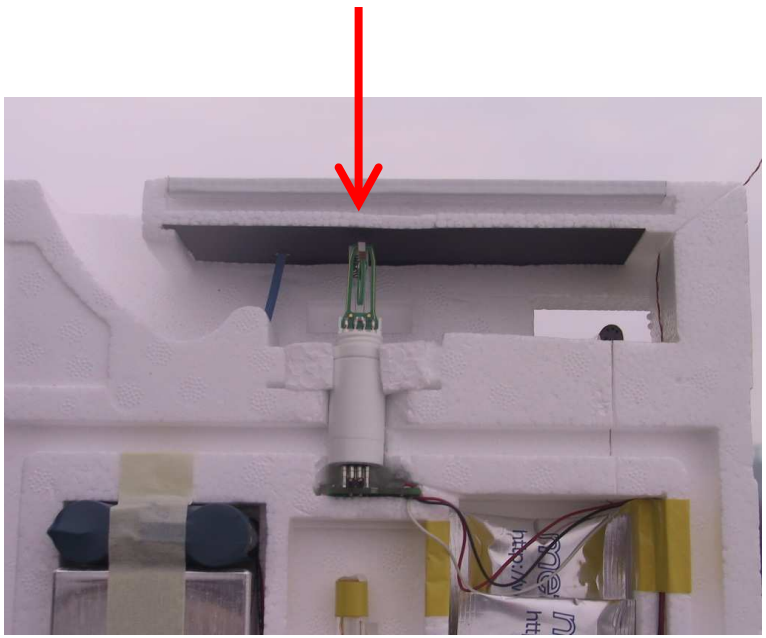
Old

VIZ/SIPPICAN
Resistive hygristor



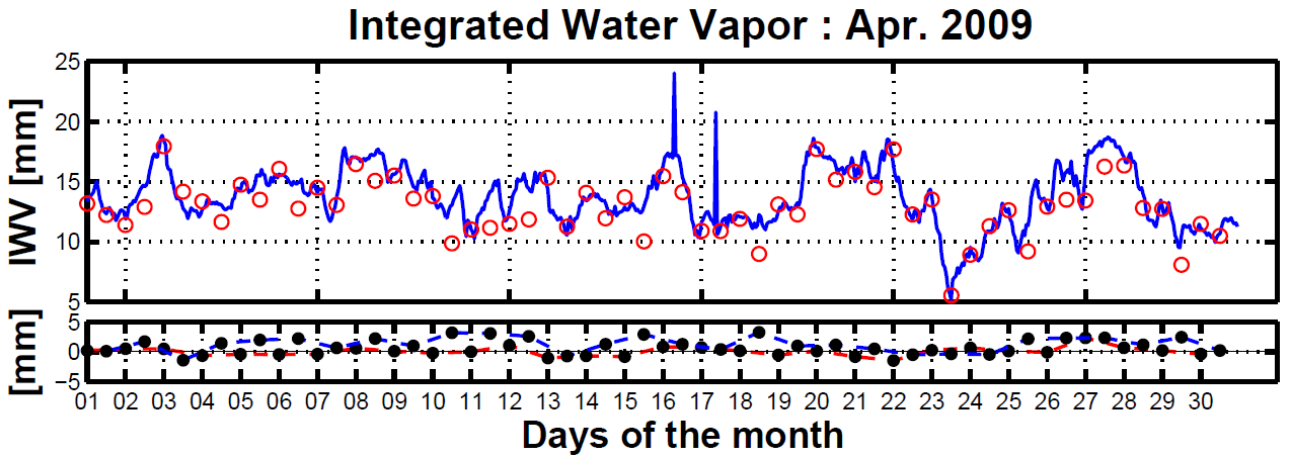
New

ROTRONIC HC2
Capacitive polymer thin film sensor



Relative Humidity VIZ versus ROT

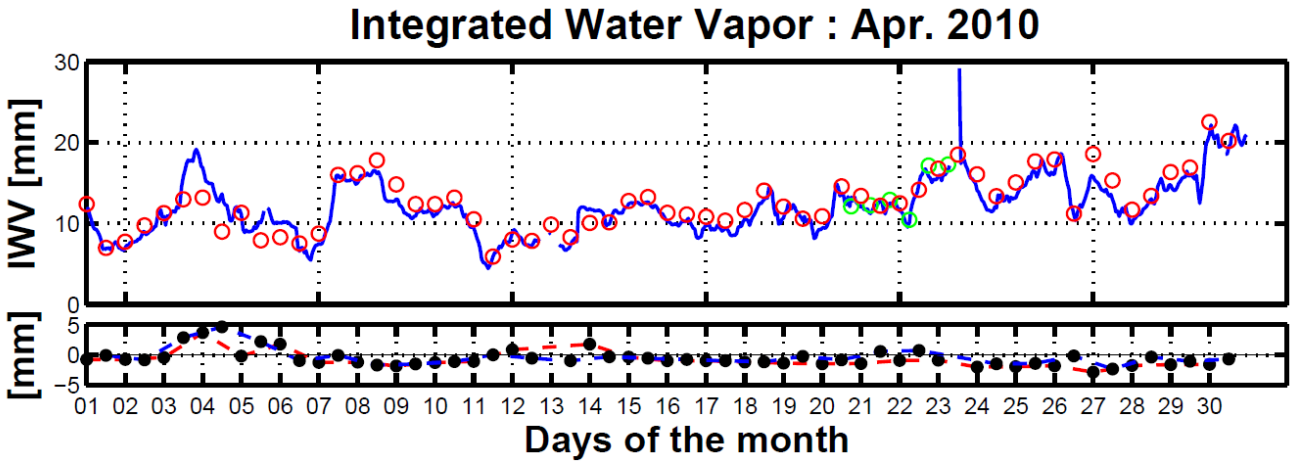
Integrated Water Vapor (IWV) measurement



Old

VIZ

GPS



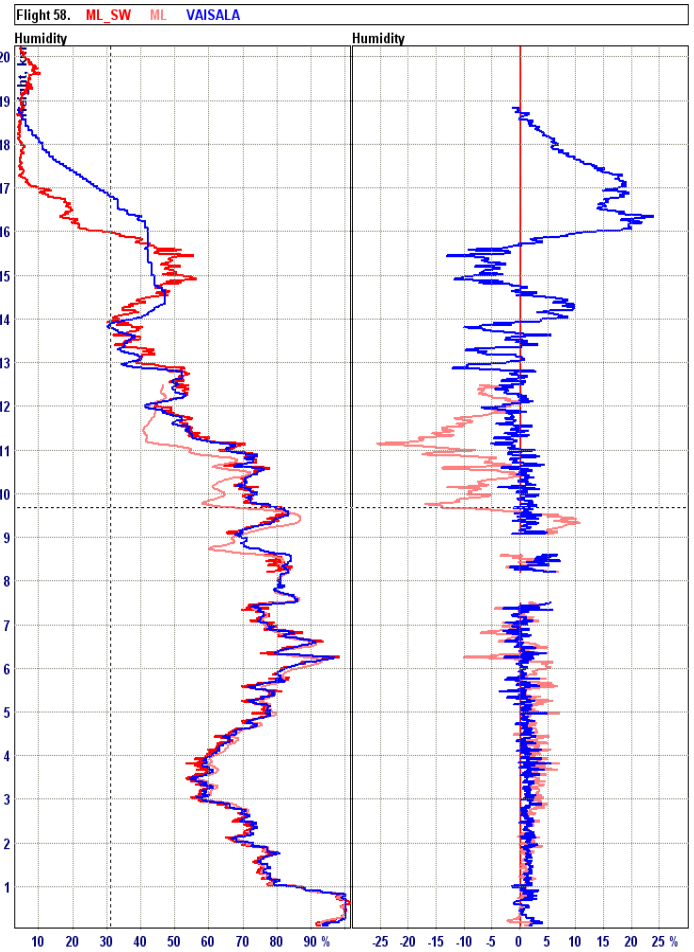
New

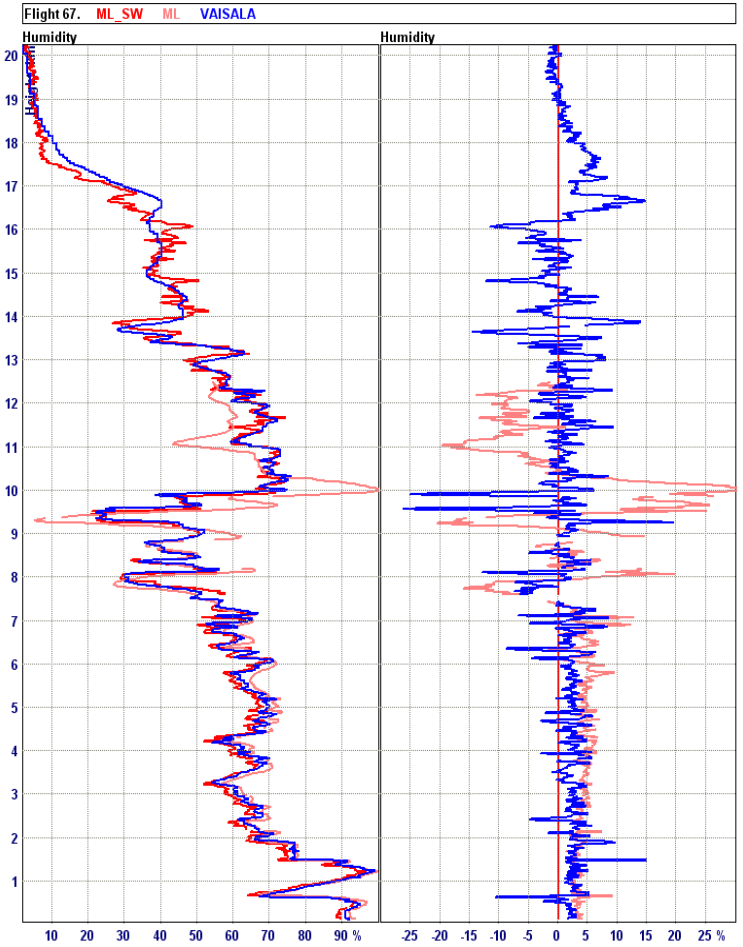
ROT

GPS

Relative Humidity at Yangjang CHINA

HC2 and RS92 versus SnowWhite





Swiss digital Radiosonde SRS-C34

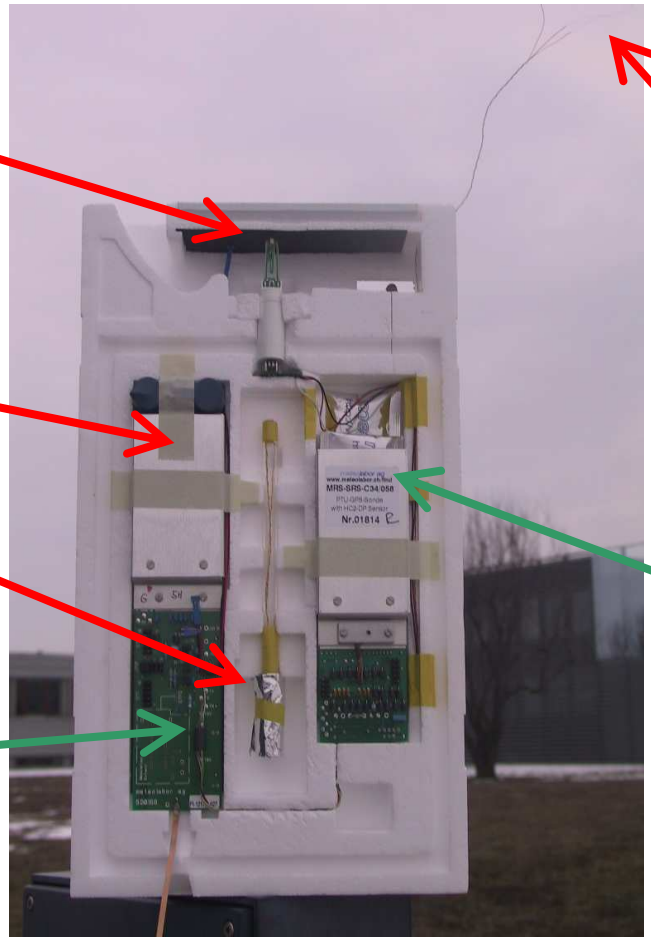
Operational 2011 – daily 00/12 LST

Swiss digital radiosonde SRS-C34 developed by MeteoLabor using GPS for pressure and wind

Temperature:	Thermocouple
Humidity:	ROTRONIC HC2 capacitive sensor
Altitude/Pressure:	GPS
Wind Speed/Dir.:	GPS

Swiss digital Radiosonde SRS-C34

Temperature - Humidity - Pressure sensors



Rotronic HC2
capacitive sensor

GPS

Water
Hypsometer

Transmitter
400 Mhz

Thermocouple
(Copper - Constantan)

(wire Ø 0.05 mm)

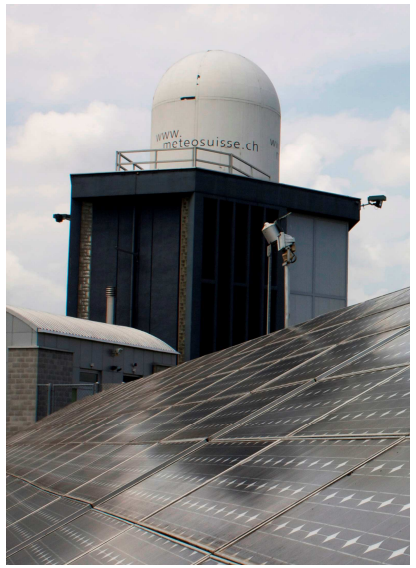
Electronique
Interface

Telemetry

Swiss analog Radiosonde SRS-400

BASORA control system for SRS-400

Secondary radar system which tracks the radiosonde and receives the PTU data from the radiosonde transmitter

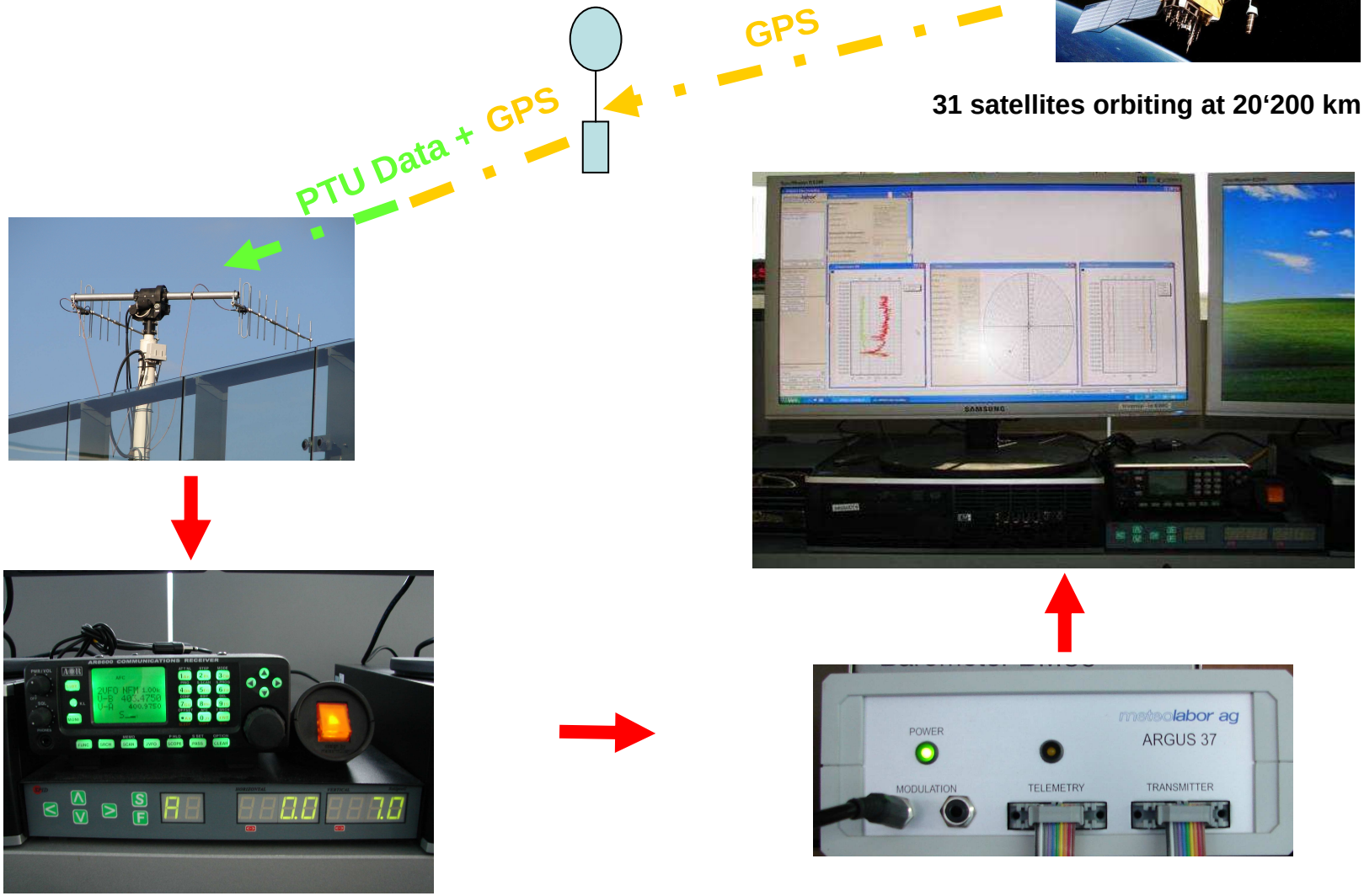


Basora 1 Basora 2

Swiss digital Radiosonde SRS-C34

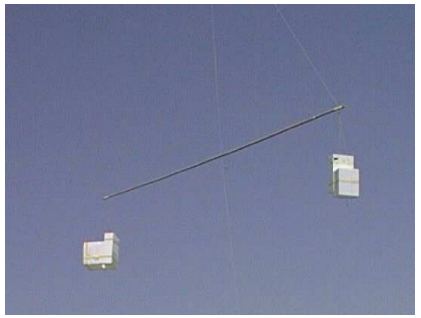
ARGUS 37 control system for SRS-C34

31 satellites orbiting at 20‘200 km



Swiss digital Radiosonde SRS-C34

Versatility of SRS-C34



SRS-C34 + Ozone sonde

Oxidation of potassium iodide by ozone in an aqueous solution

SRS-C34 + SnowWhite (dew/frost point hygrometer)

Detection of dew or frost on gold mirror by diode light beam

SRS-C34 + FLASH (Fluorescent Advanced Stratospheric Hygrometer)

Photodissociation of H_2O molecules with Lyman Alpha light source and detection of the fluorescence of excited OH radicals

SRS-C34 + COBALD (backscatter sonde)

Light flash from Xenon lamp at 490 and 940 nm and measurement of backscattered light from ice crystals or aerosols

GRUAN - reference and test soundings

(1 x weekly)
Vaisala RS92 (nighttime)
parallel sounding with operational SRS-C34 (DigiCORA MW31)

(1 x monthly)
SnowWhite dew/frost point hygrometer (nighttime)
parallel sounding with SRS-C34 and RS92

(2 - 4 times per year)
FLASH and SnowWhite dew/frost point hygrometer
parallel sounding with SRS-C34 and RS92
(SHOMING project UNI Bern)

(3 - 6 times per year)
COBALD and SnowWhite dew/frost point hygrometer
parallel sounding with SRS-C34 and RS92
(collaboration with ETHZ)

Controlled balloon sounding

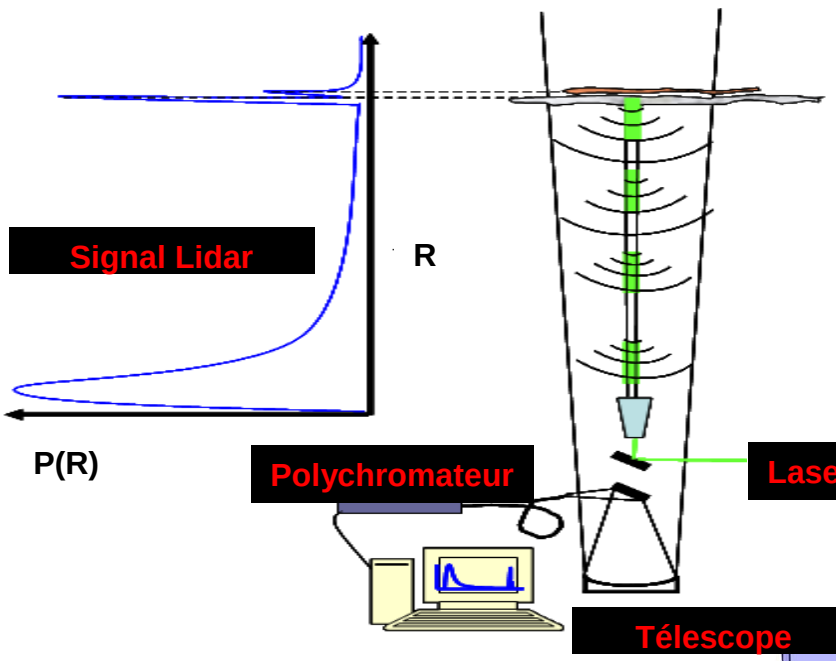
Controlled balloon sounding

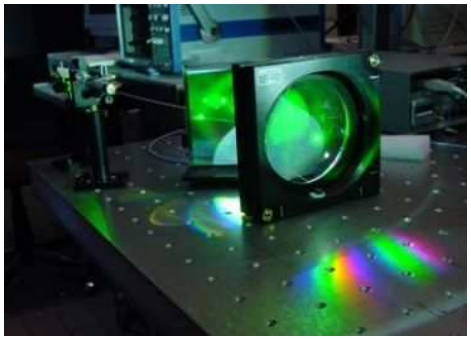
Controlled balloon sounding

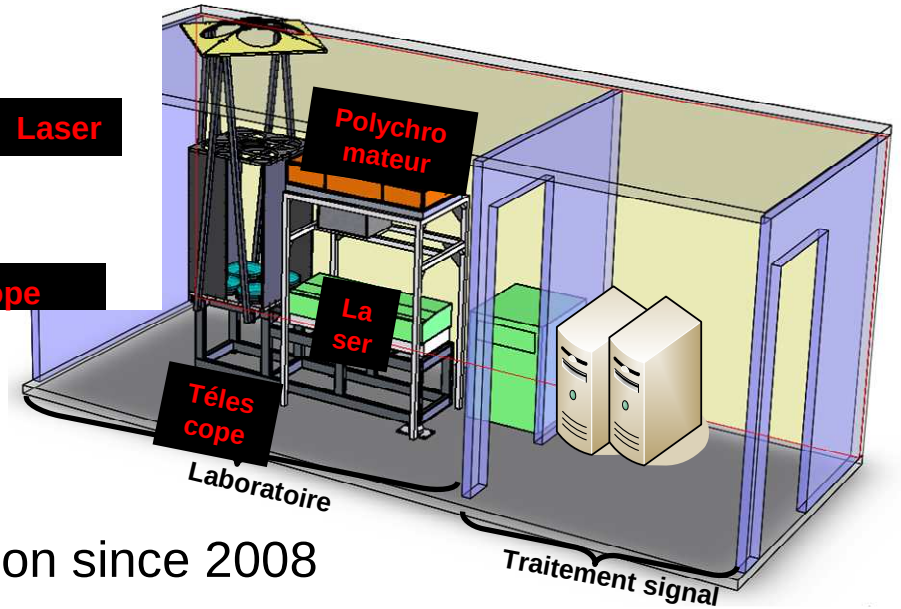
- Predefined sounding altitude
- Controlled ascent and descent speed
- Swing suppression and quiescent profiling during ascent and descent
- Minor control over impact location
- GPS tracking and position transmission by cell phone

Water Vapor Raman Lidar RALMO

Lidar for water vapor and temperature profiling



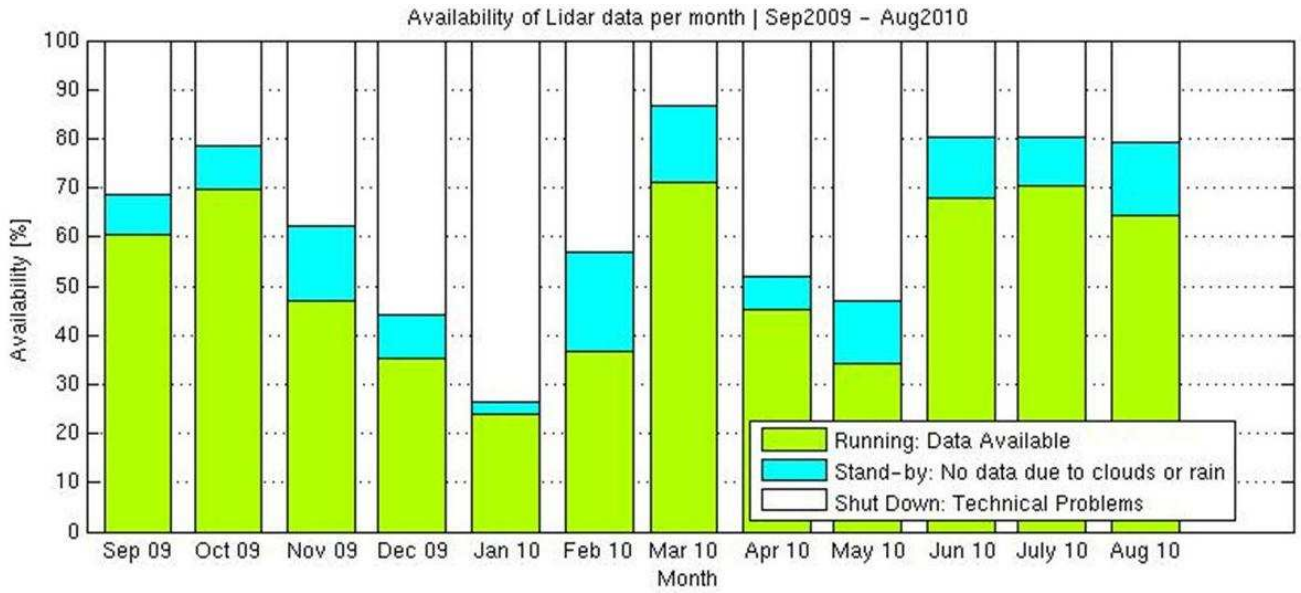


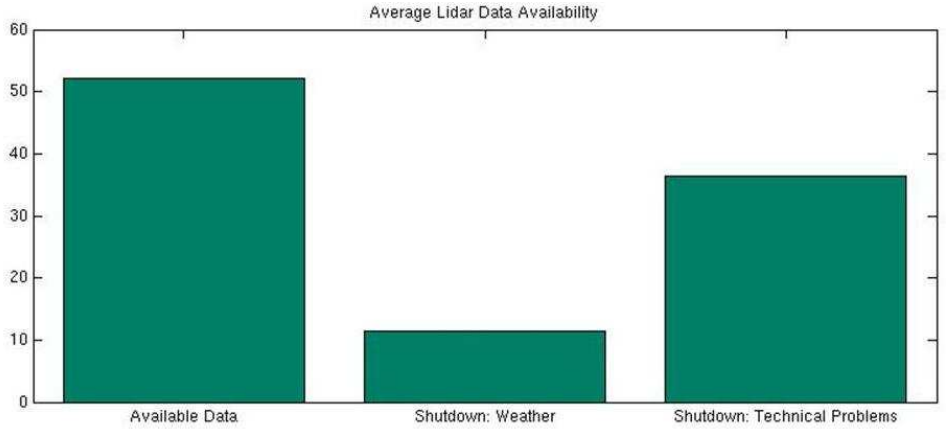


- Fully automatic and in operation since 2008
- Validation in progress

Water Vapor Raman Lidar RALMO

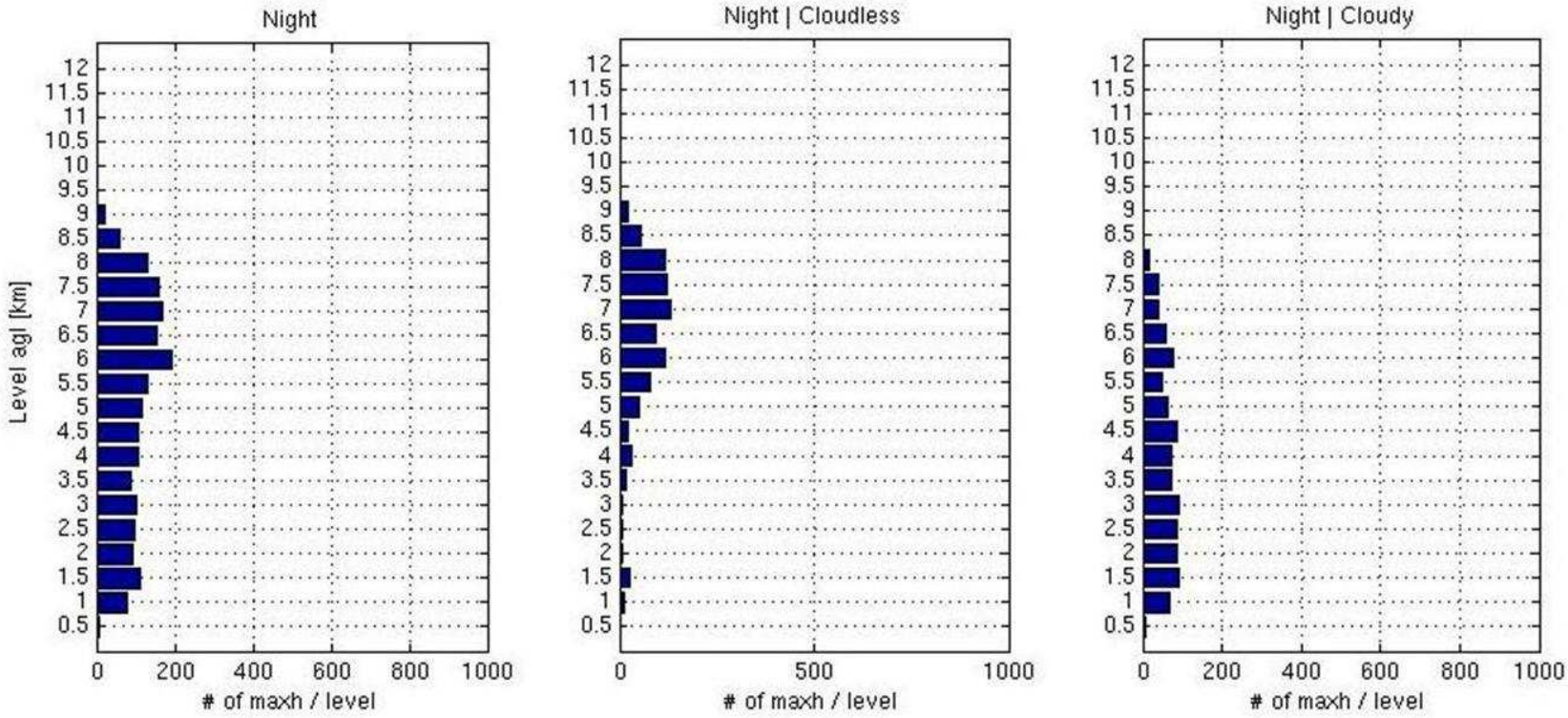
Humidity measurements availability Sep09 – Aug10





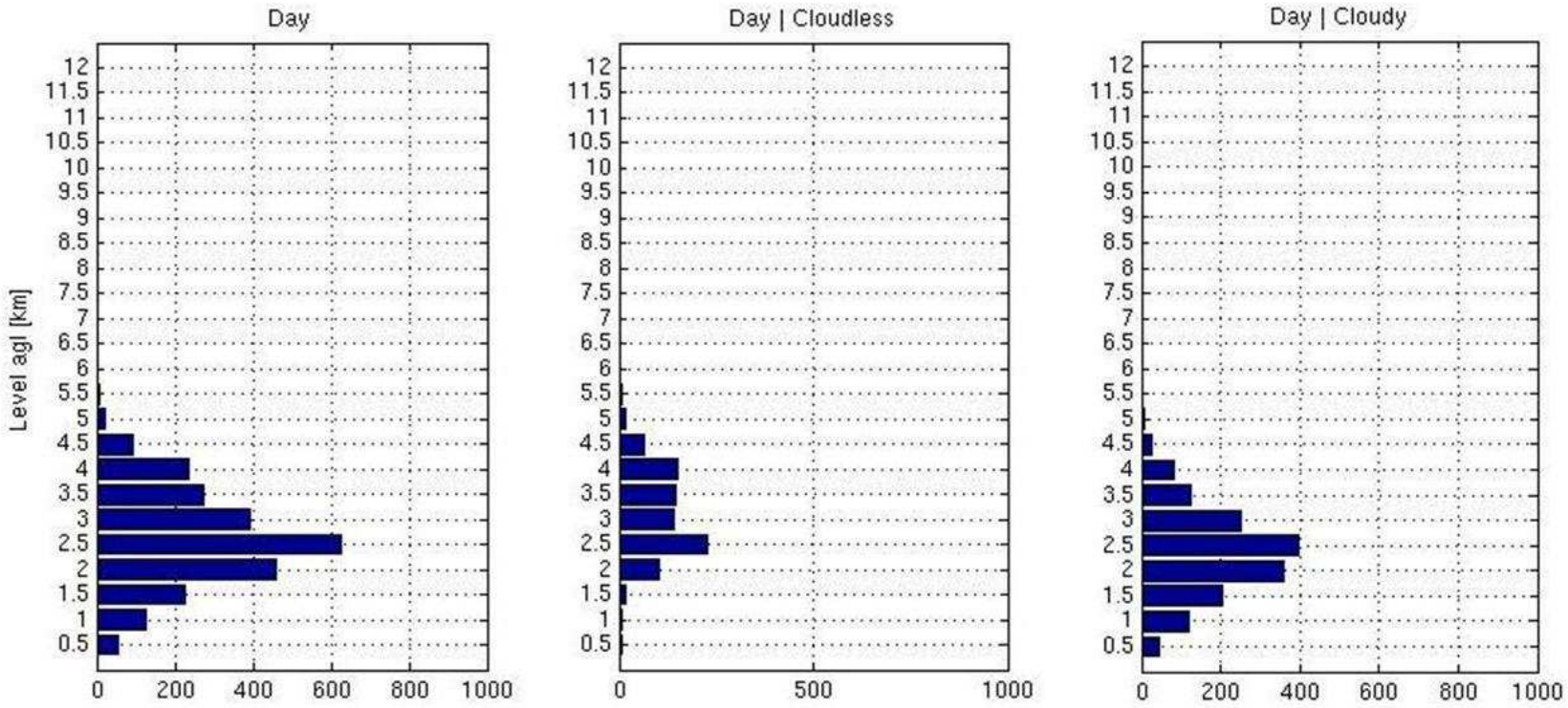
Water Vapor Raman Lidar RALMO

Maximum altitude during Night Sep09 - Aug10



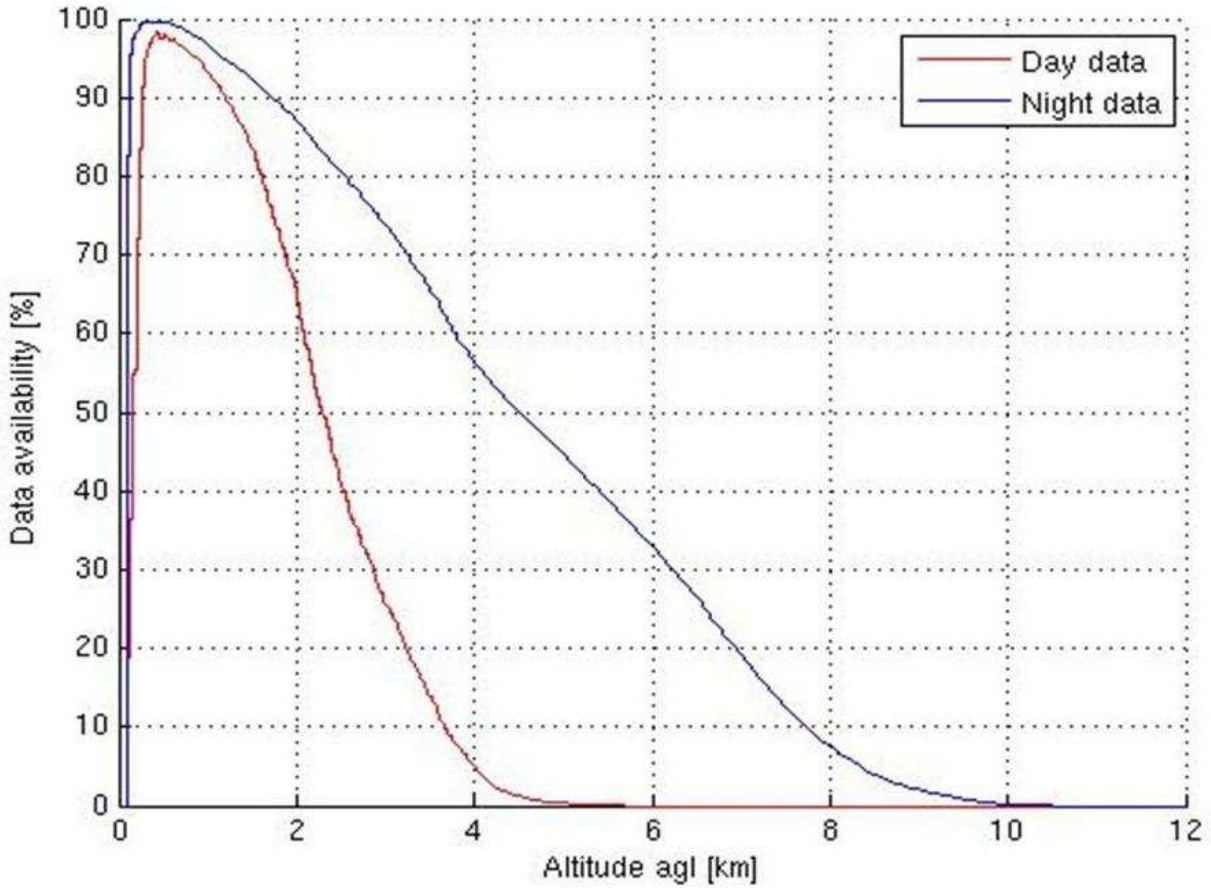
Water Vapor Raman Lidar RALMO

Maximum altitude during Day Sep09 - Aug10



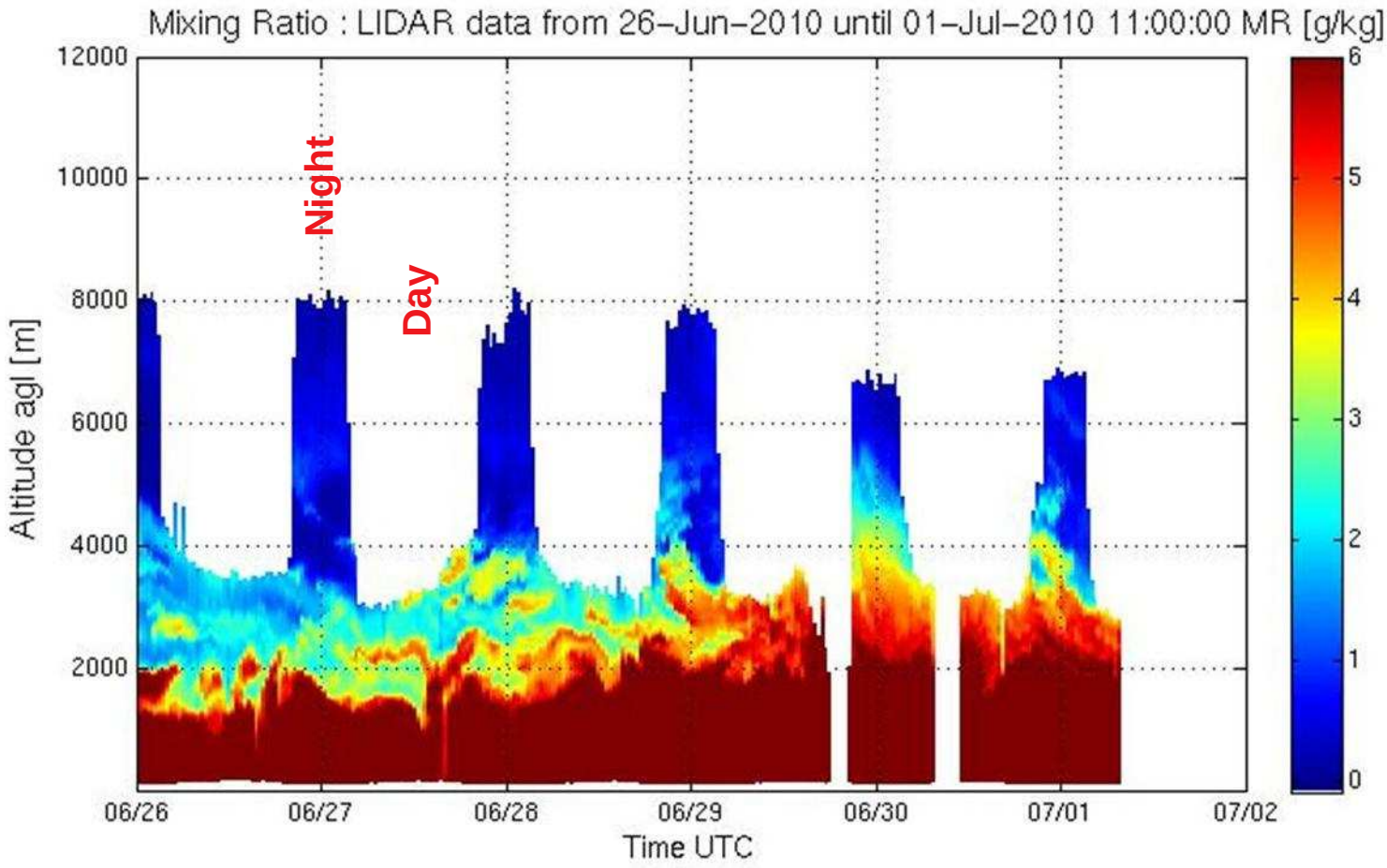
Water Vapor Raman Lidar RALMO

Availability Night / Day decreases with altitude



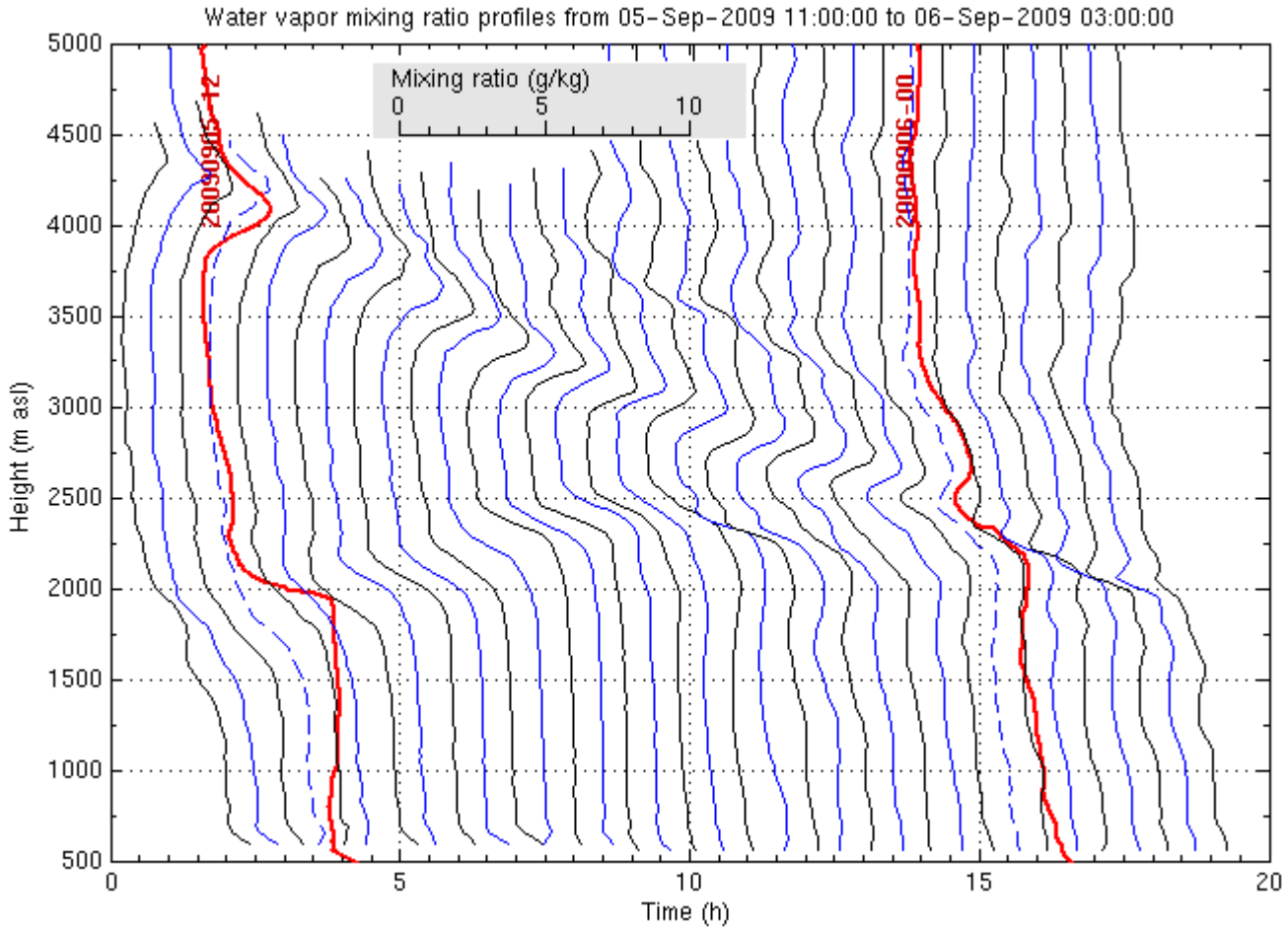
Water Vapor Raman Lidar RALMO

Humidity profile measurements June 2010



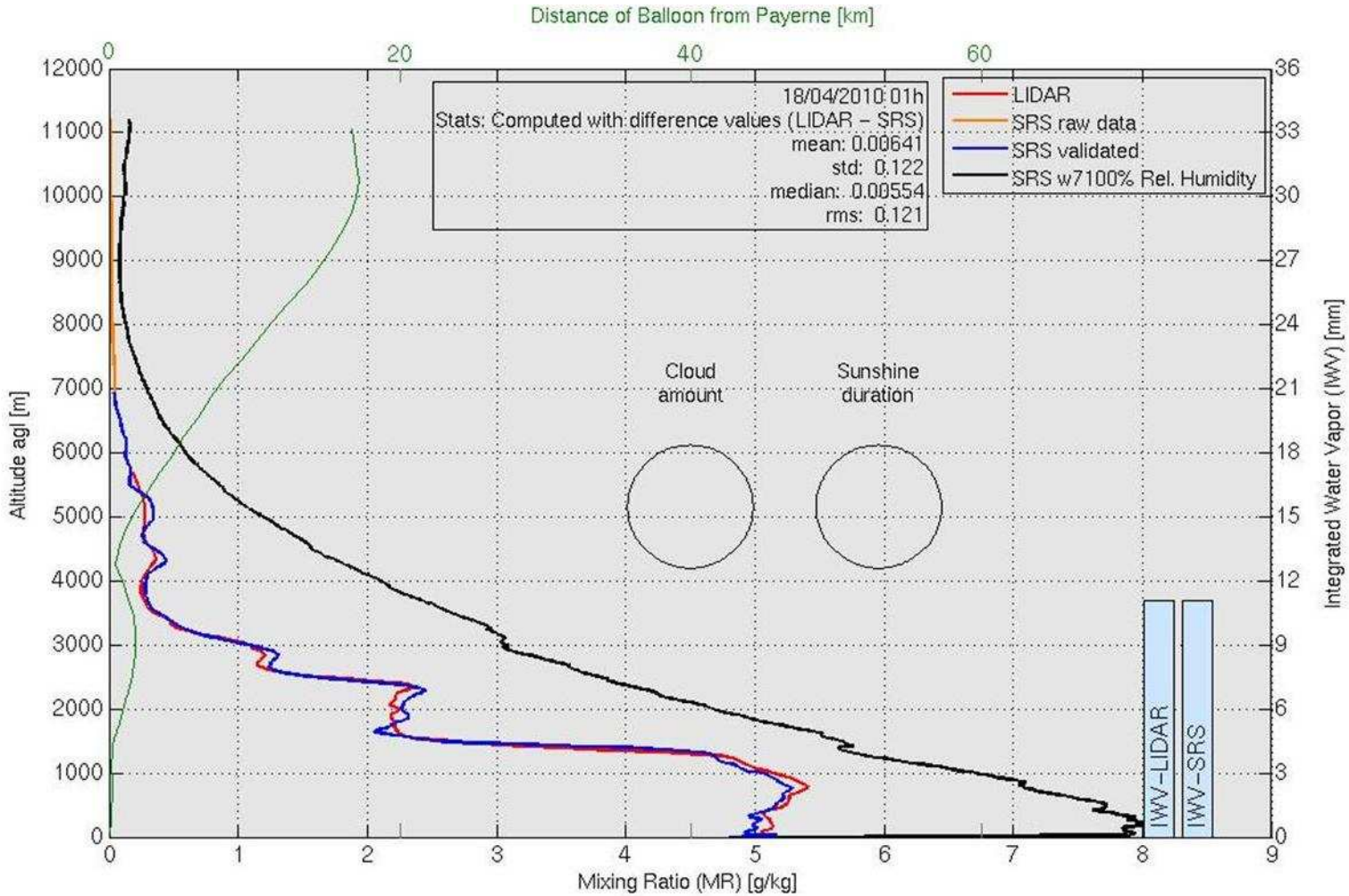
Water Vapor Raman Lidar RALMO

Humidity profiles every half hour



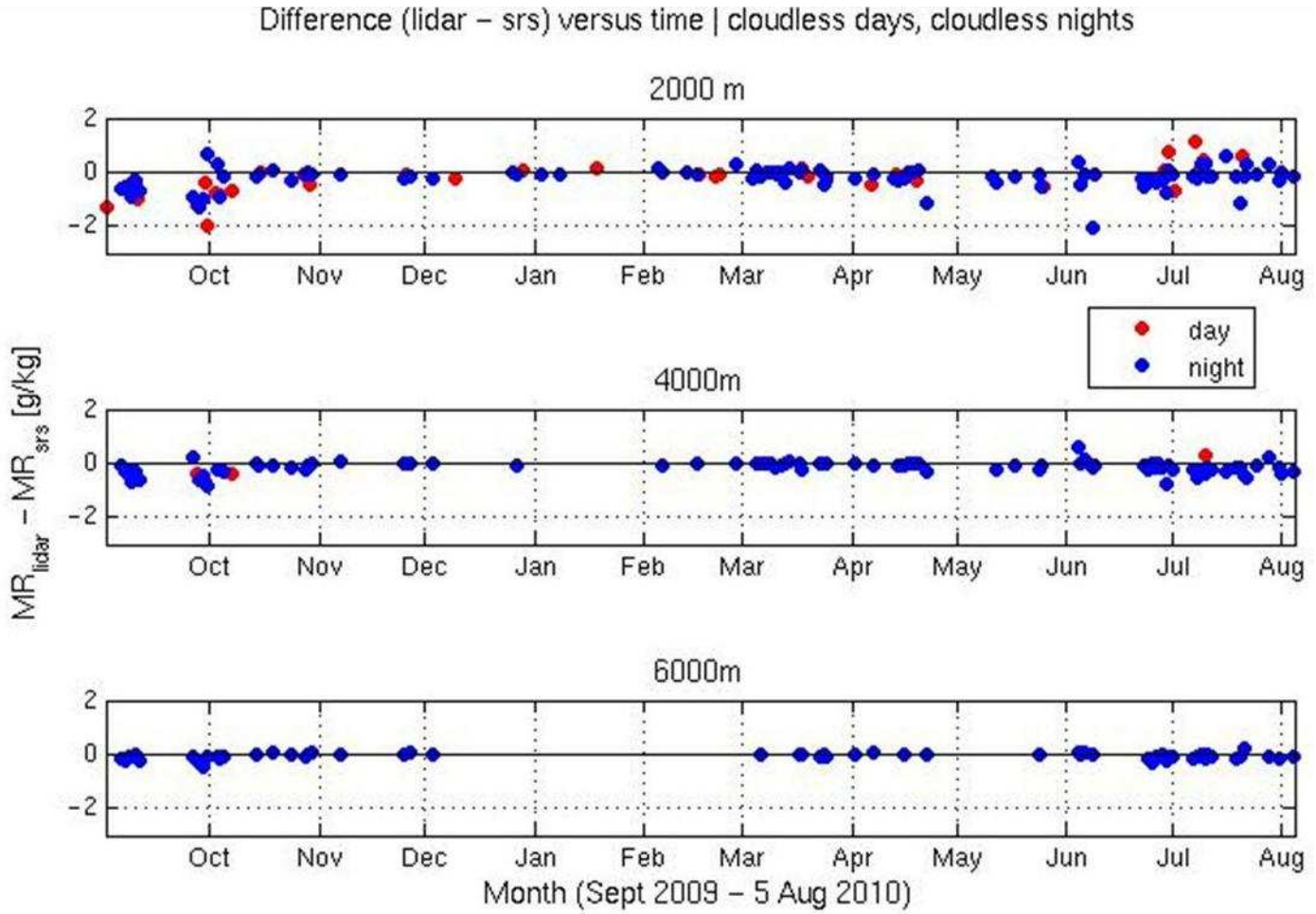
Water Vapor Raman Lidar RALMO

Lidar and SRS-400 humidity profile



Water Vapor Raman Lidar RALMO

Mixing ratio Lidar – SRS at different altitudes



Summary

The analog radiosonde SRS-400 has been replaced
by the digital sonde SRS-C34

Humidity measurement have been improved with a
capacitive polymer thin film sensor but need further improvement

Controlled balloon sounding for upward and downward profile sounding

Lidar measurements are being analyzed and processed
and compared to radiosondes