The preliminary results of Boundary-layer measurements in Tiksi

A.Artamonov, I. Repina, A. Makshtas,
A. Grachev, T. Uttal, and R. Albee

OUTLINE

- Main goals of the tower researches
- History of the tower installation
- Tower measurements and data collection
- The preliminary results
- Further works

Step 1: Tower installation

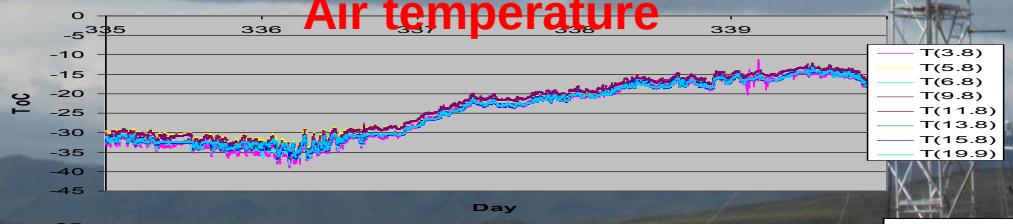
Step 2: Sensors installation

August 2010

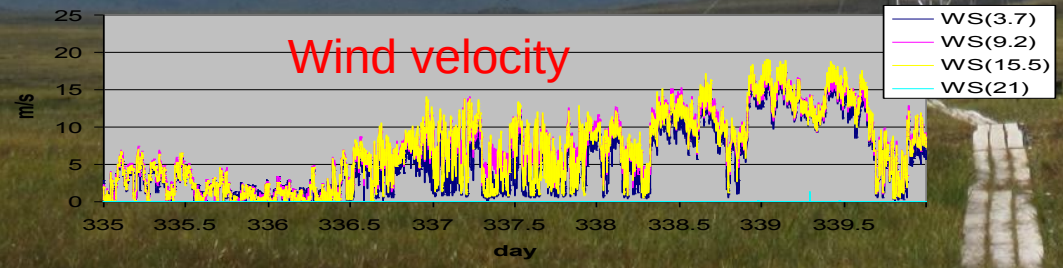
1	20M RTD	E	15M sonic
2	16M RTD	F	9M sonic
3	14M RTD	G	9M Licor CO2
4	12M RTD	H	3M sonic
5	10M T/RH	I	IR ground T
6	8M RTD	J	Snow depth
7	6M T/RH	K	Flux plate
8	4M RTD	L	Flux plate
9	2M T/RH	M	Soil temp
A	20M Wind vane	N	Soil probe
B	15M Wind vane		
C	9M Wind vane		
D	3M Wind vane		

Step 3: Beginning of the work: April, 23, 2011

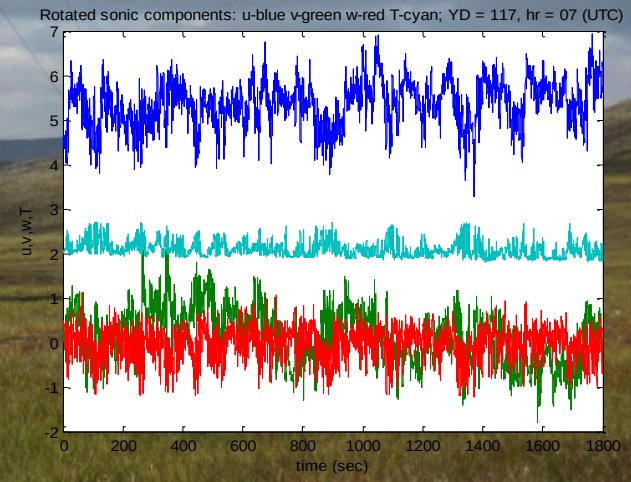
Air temperature



Wind velocity



Turbulence characteristics



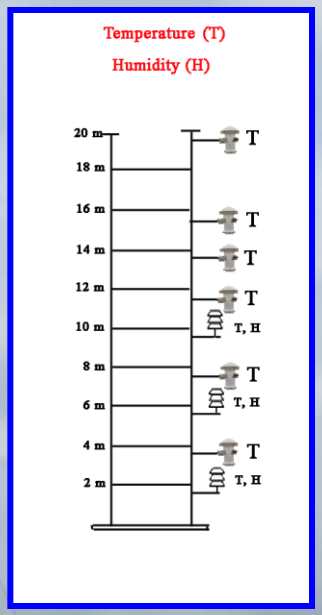
Main goals of measurements

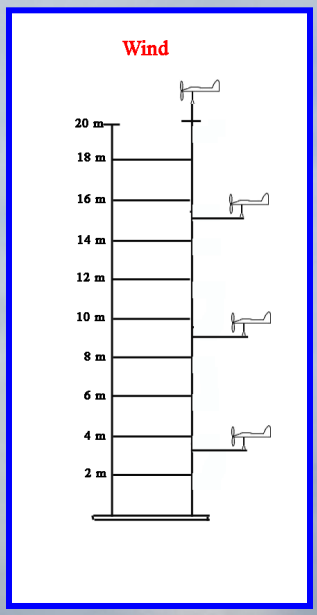
- Year round monitoring of heat, water vapor, momentum, and carbon dioxide and the temperature of the soil active layer. Comprehensive analysis of observational data, aims to study the interannual and seasonal variability of the energy - gas exchange processes of the surface and the atmosphere in their relationship with large-scale atmospheric processes.
- Atmospheric boundary layer studies under different background conditions, including strong stability condition.
- Developing of the parameterization for turbulent fluxes calculation for climate model.
- Comparing with data of similar measurements on the existing network of Arctic atmospheric observatories, as well as with specialized data of experiments conducted in the Arctic basin.

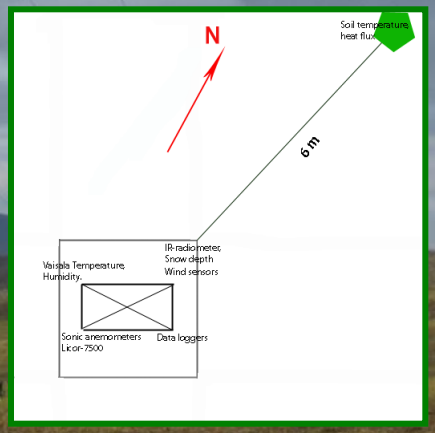
Atmospheric Boundary Layer Measurements:

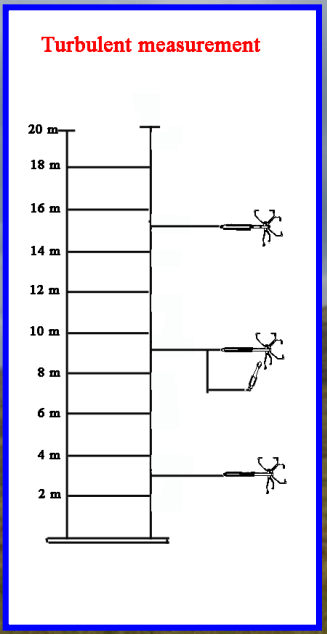
The main parameters to be measured :
(from 0 to 20 meters)

1. Air temperature profile
2. Wind velocity and direction profile
3. Air humidity profile
4. Air pressure
5. Radiation budget
6. Surface condition (temperature, snow cover)
7. Heat flux through surface
8. Permafrost temperature from 0 to 1.2 meter
9. Fluctuations of wind velocity, temperature, H_2O and CO_2 concentrations.

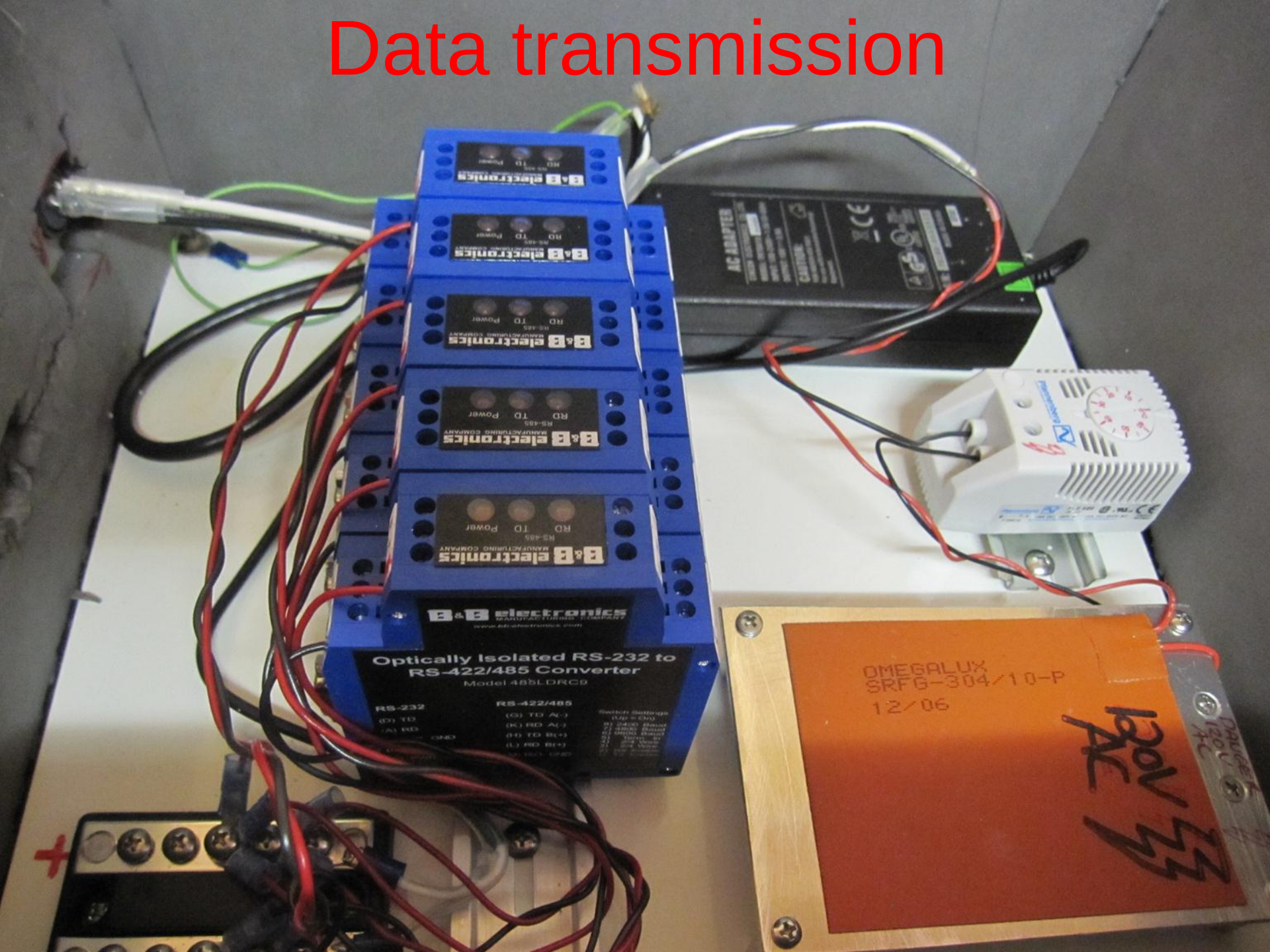




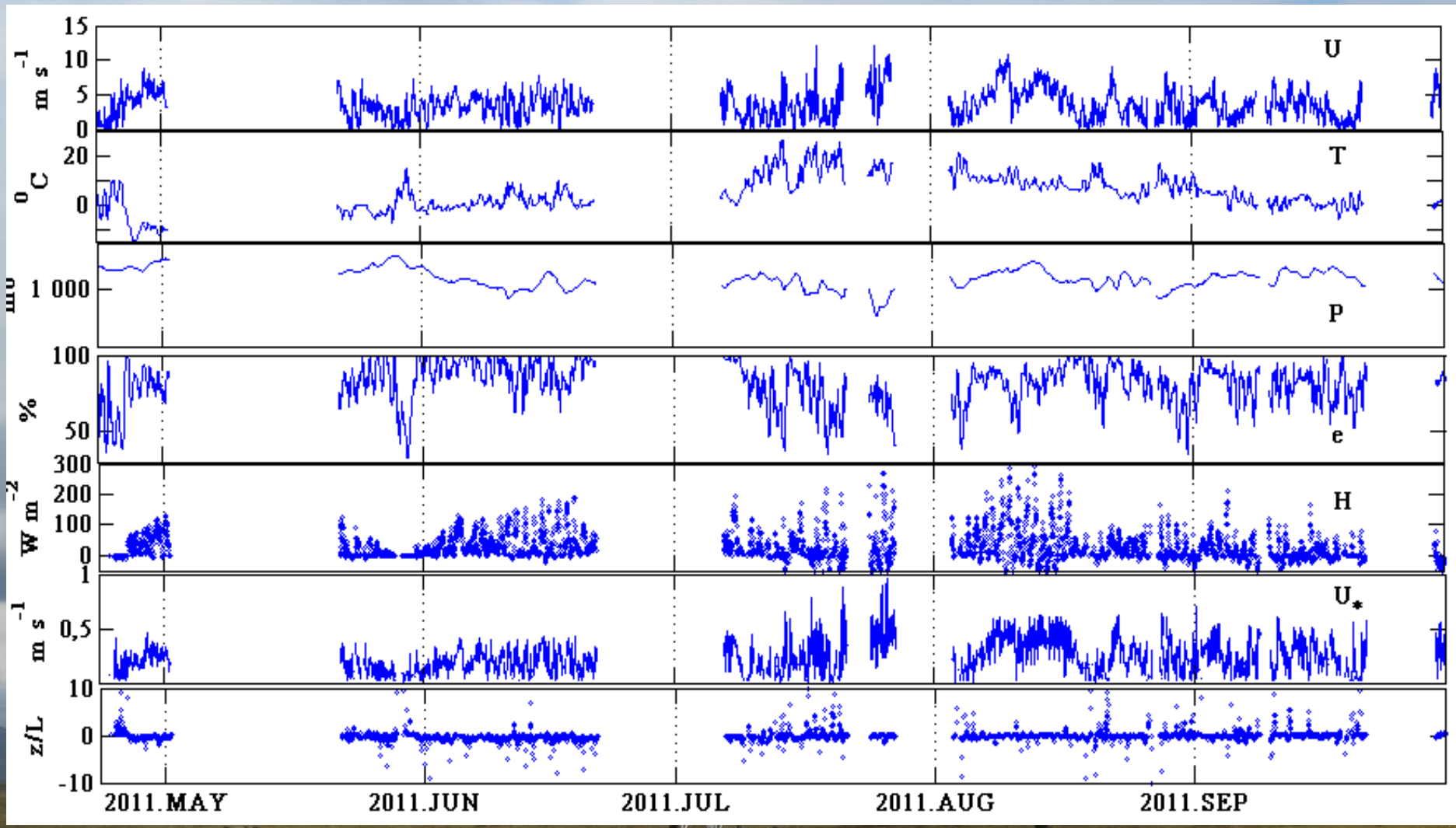




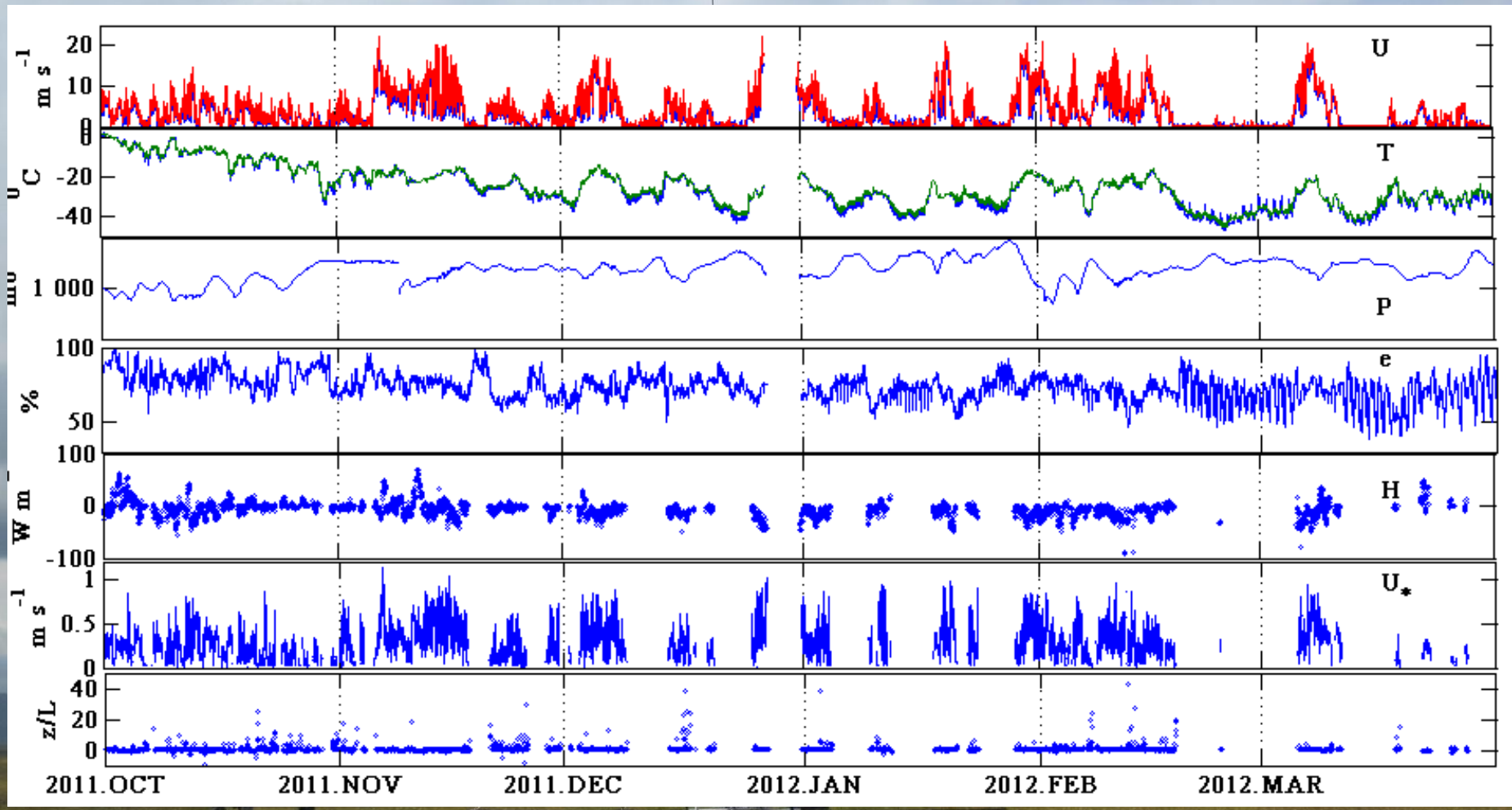
Data transmission



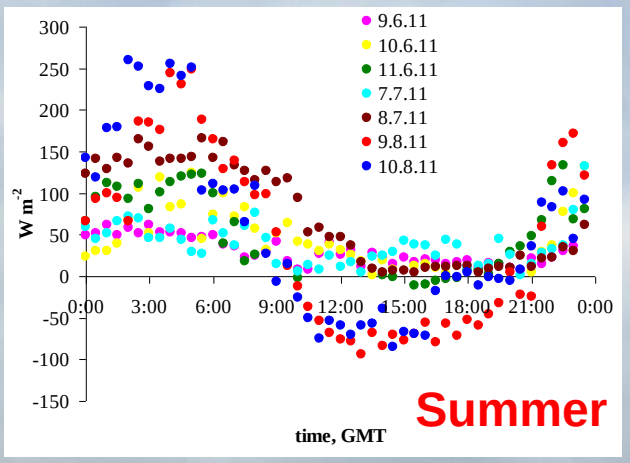
Heat flux and frictional velocity from profile measurements
Summer season

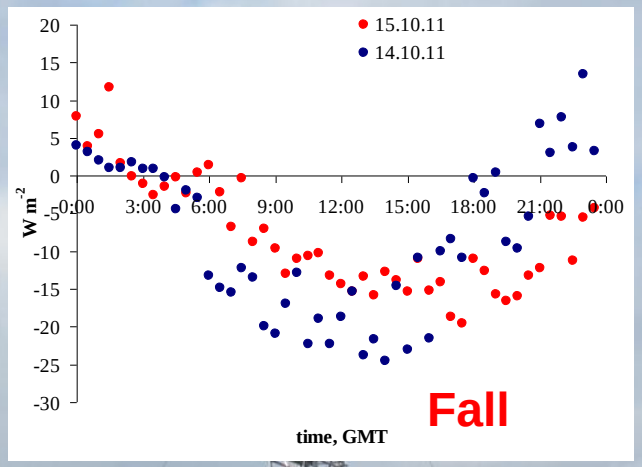


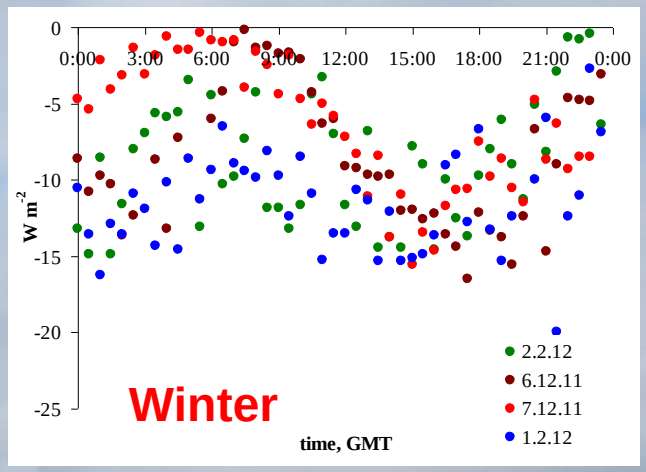
Heat flux and frictional velocity from profile measurements
Winter season



Sensible heat fluxes diurnal variation for different seasons







Measurements were made at 4 and 16 m above the surface. Turbulent heat flux was calculated from gradient method on two level. Positive values of heat flux correspond to the unstable (convective) conditions and vice versa.

Further works:

1. Develop recommendations for service of the tower complex of instruments on the results of testing under various meteorological conditions

2. Change-over of the tower complex of instruments from test to stacionary mode. Clarification of the instruments calibration constants. Completion of the data transmission organisation through communication channels. Technical supervision of the tower instruments condition.

3. The organization of real time data processing and analysis. Quality data control.


Thank for you amazing attention