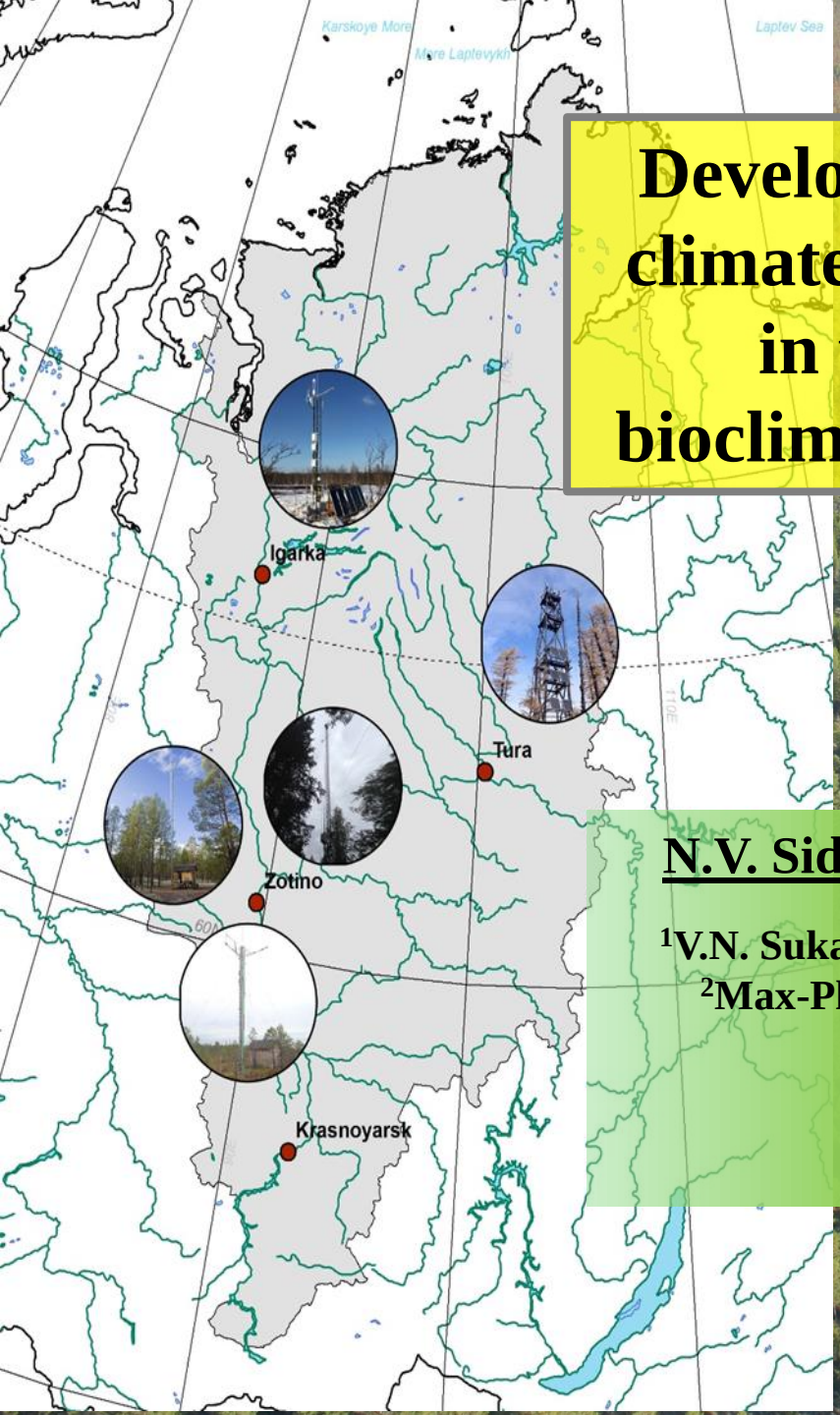
Develop a network of instrumental climate monitoring land ecosystems in the conditions of various bioclimatic zones of Central Siberia.



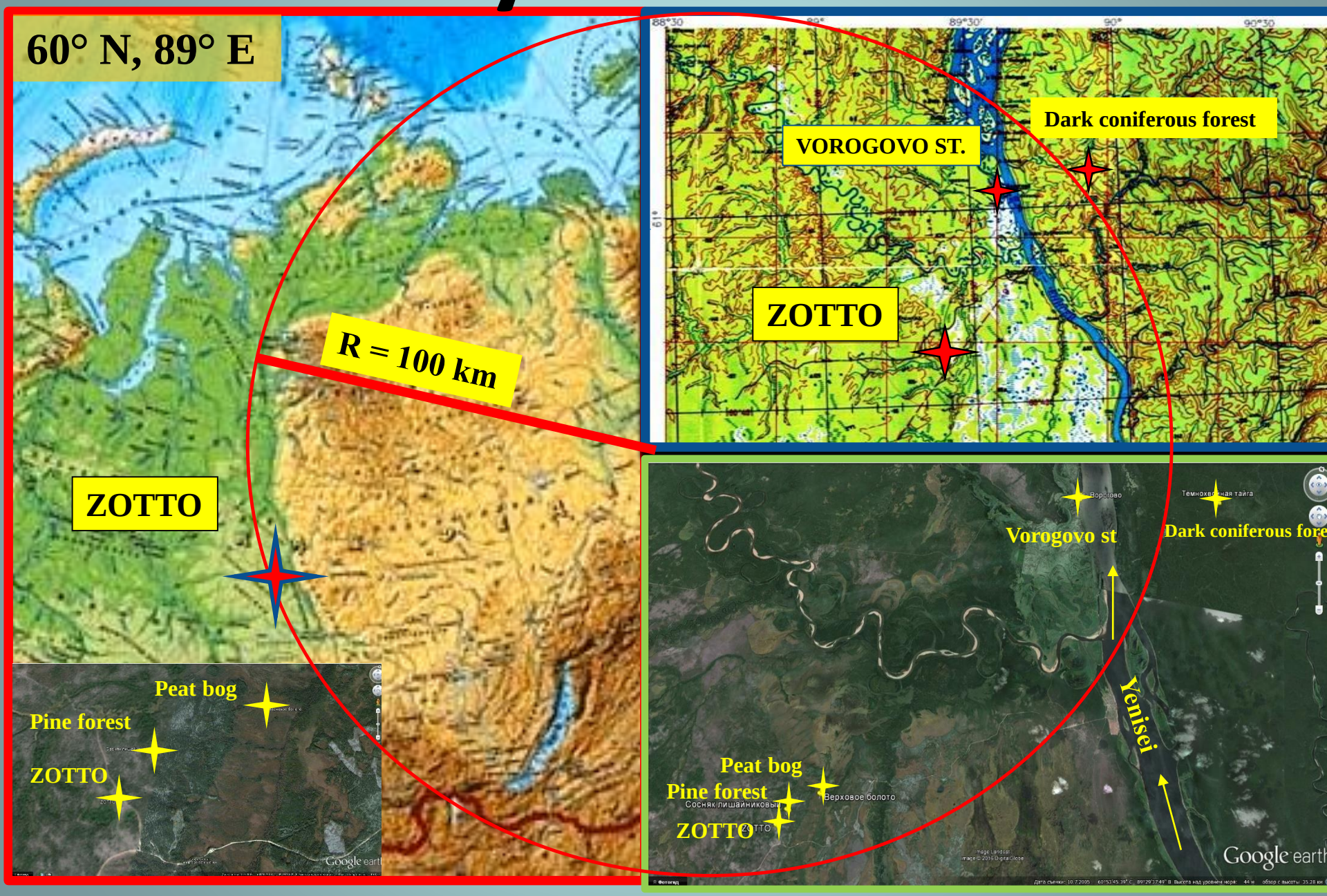
N.V. Sidenko[1], O. Kolle[2], A.V. Panov[1], M. Heimann[2]

[1]V.N. Sukachev Institute of Forest SB RAS, Krasnoyarsk, Russia
[2]Max-Planck-Institute for Biogeochemistry, Jena, Germany,

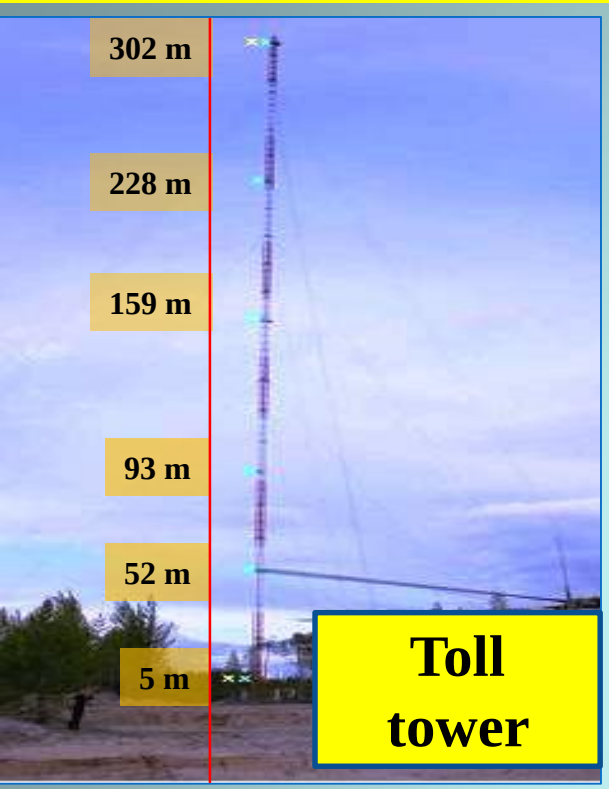
Email: nikita.v.sidenko@gmail.com

Tomsk, 2016

The study area



Measuring systems and equipment



Toll tower

Central Data Acquisition Unit

The laboratory complex

The micrometeorological towers to measure gas exchange of CO2 / CH4 «Eddy Covariance».

Peat bog	Pine forest	Dark coniferous forest

Ground station 1 (Ground forest)

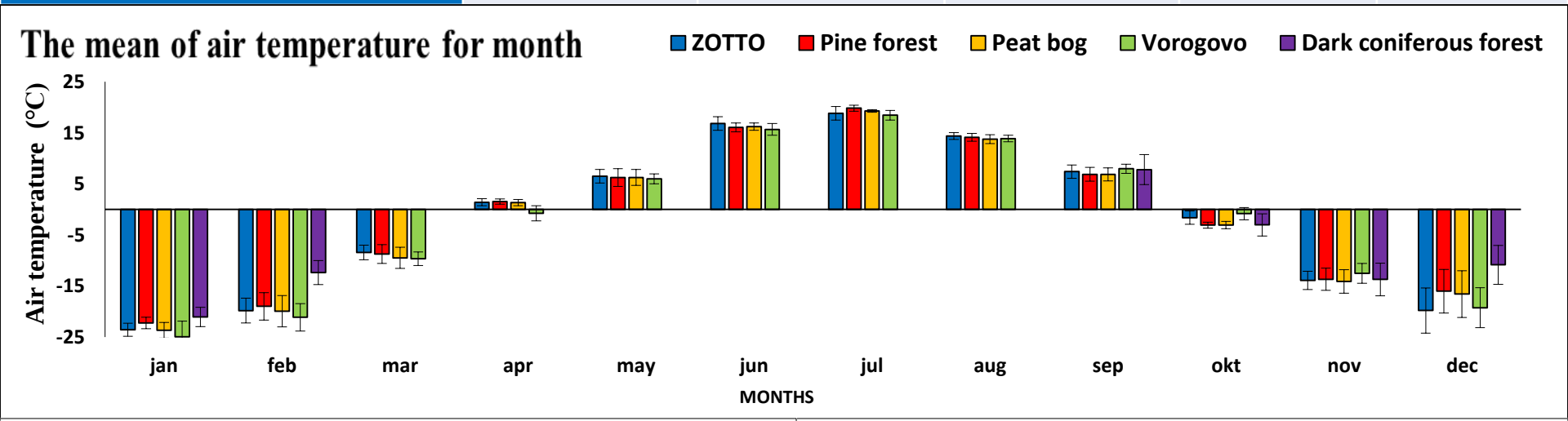
Ground station 2 (Ground bare)

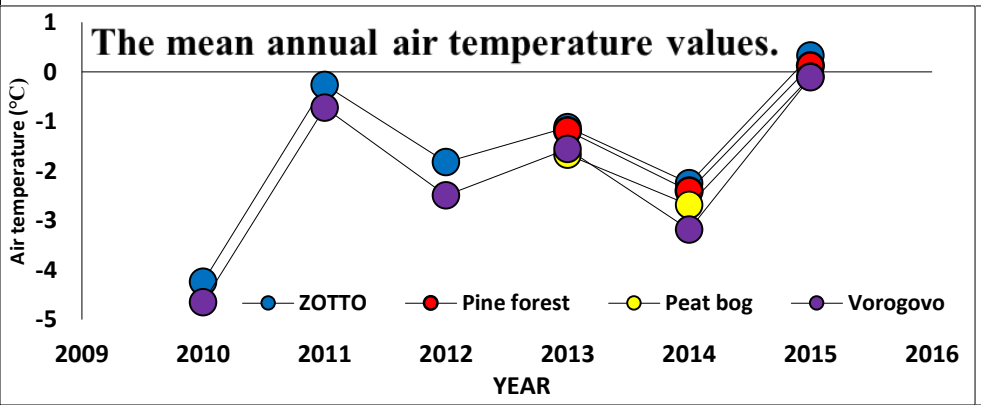
Sensors, measured variables, units and data period

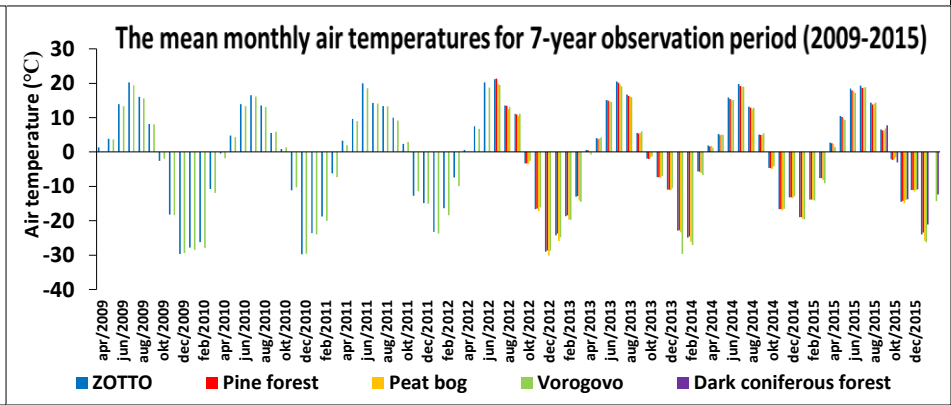
Pictures of sensors	Sensors	Variable	Unit	Data interval
	Ultrasonic-anemometer 3D	Wind speed wind direction	m/s deg	Toll Tower/30 m Eddy systems/10 m
	Pressure – Transmitter	Air pressure	hPa	Toll Tower/10 m Eddy systems/10 m
	Temperature and Humidity Sensor	Air temperature Relative humidity	°C %	Toll Tower/10 m Eddy systems/10 m
	Tipping bucket rain gauge (heated)	Precipitation	mm	Ground station/10 m Eddy systems/10 m
	Combined net radiometer	Short wave incoming radiation Short wave outgoing radiation Long wave incoming radiation Long wave outgoing radiation Incoming PAR Outgoing PAR	W/m²	Toll Tower/10 m Eddy systems/10 m
	Soil temperature sensor and Soil moisture probe	Soil temperature Soil moisture	°C %	Ground station/10 m Eddy systems/10 m

Air temperature

The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog	Vorogovo
Mean annual air temperature values (t °C)	2005 – 2015	-1,56 °C	-1,16 °C	-1,49 °C	-2,35 °C
	2013 – 2015	-1,01 °C	-1,16 °C	-1,49 °C	-1,62°C
Mean air temperature for July and January (t°C)	2005 – 2015	Jul +18,84 °C Jan -23,48 °C	Jul +19,85 °C Jan -21,82 °C	Jul +19,3 °C Jan -22,91 °C	July+18,45 °C Jan -24,77 °C
	2013 – 2015	Jul +19,88 °C Jan -22,06 °C	July+19,34 °C Jan -21,82 °C	Jul +19,12 °C Jan -22,91 °C	Jul +19 °C Jan -24,7 °C

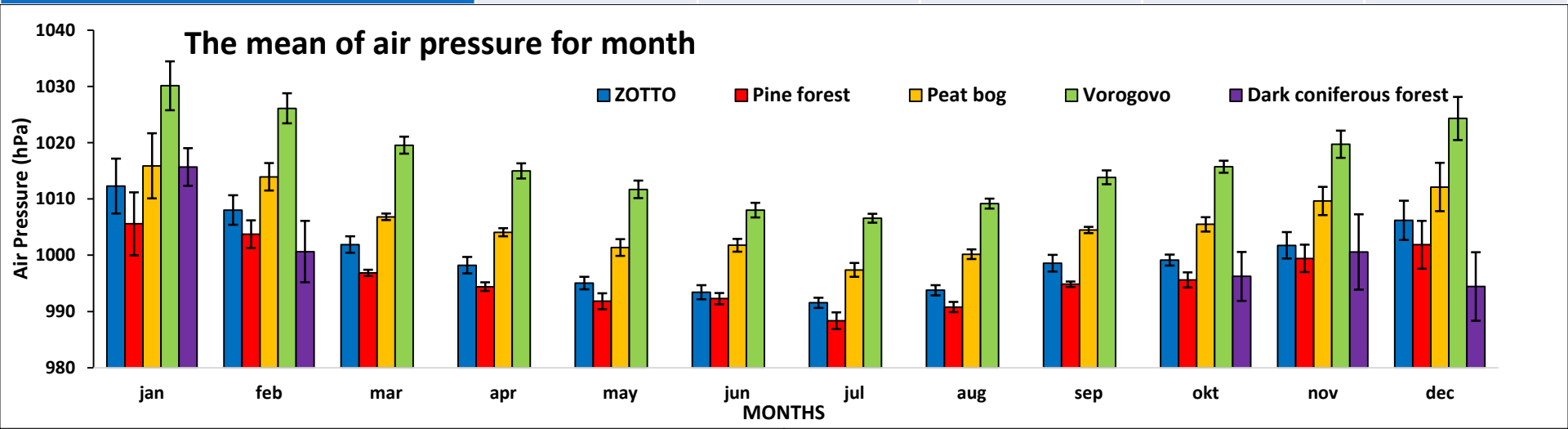


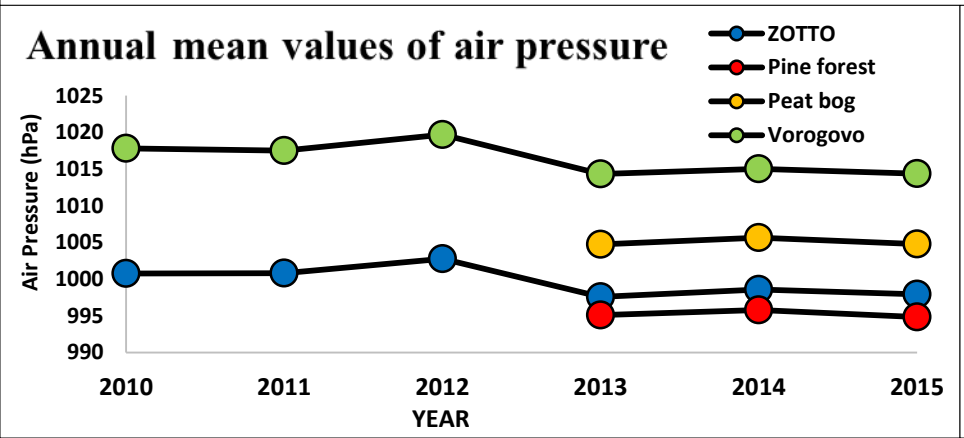


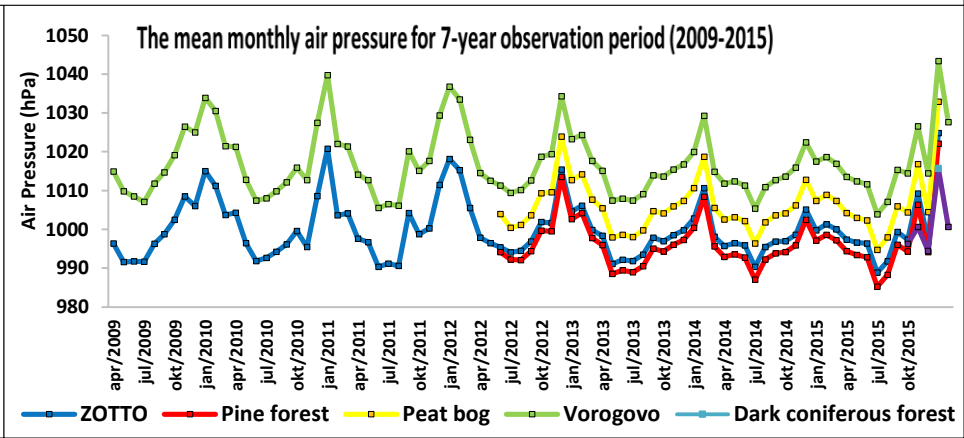


Air pressure

The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog	Vorogovo
Mean annual air pressure values (hPa)	2005 – 1015	999,73 hPa	995,22 hPa	1005,04 hPa	1016,35 hPa
	2013– 1015	998,02 hPa	995,22 hPa	1005,04 hPa	1014,57 hPa
Mean air pressure for July and January (hPa)	2005 – 1015	Jul 991,54 hPa Jan 1010,2 hPa	Jul 988,36 hPa Jan 1000,08 hPa	Jul 997,39 hPa Jan 1010,22 hPa	Jul 1006,58 hPa Jan 1028,79 hPa
	2012– 1015	Jul 990,38 hPa Jan 1002,41 hPa	Jul 987,08 hPa Jan 1000,08 hPa	Jul 996,37 hPa Jan 1010,22 hPa	Jul 1005,57 hPa Jan 1020,23 hPa

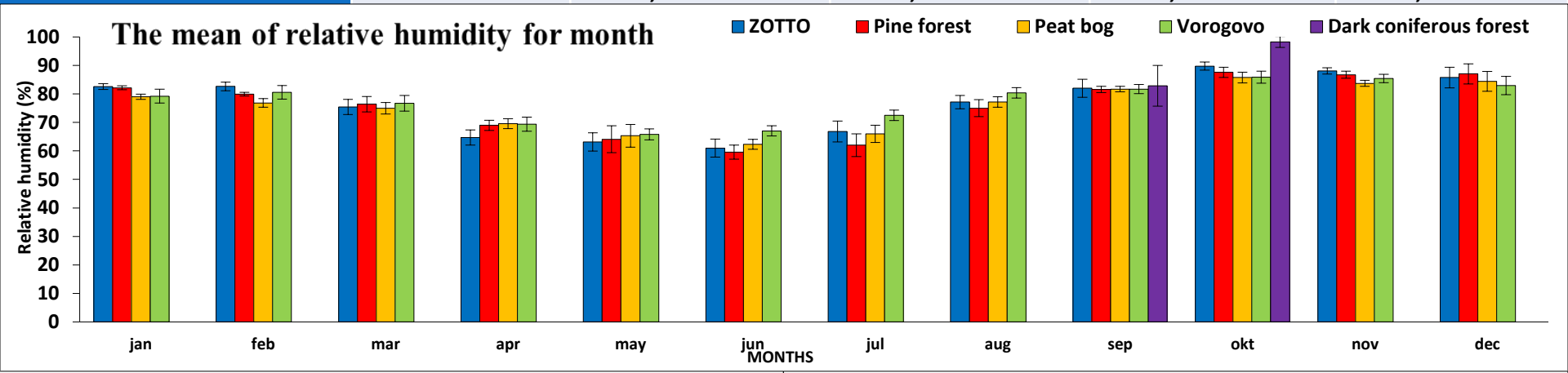


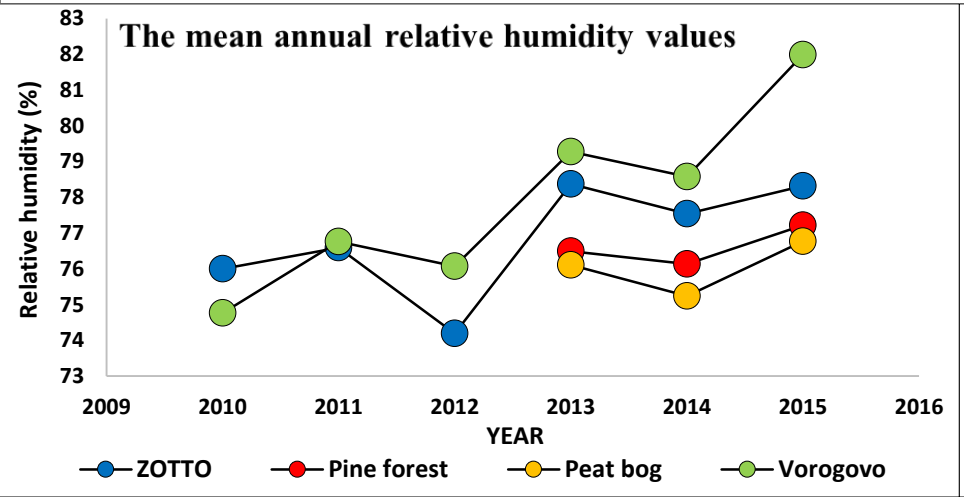


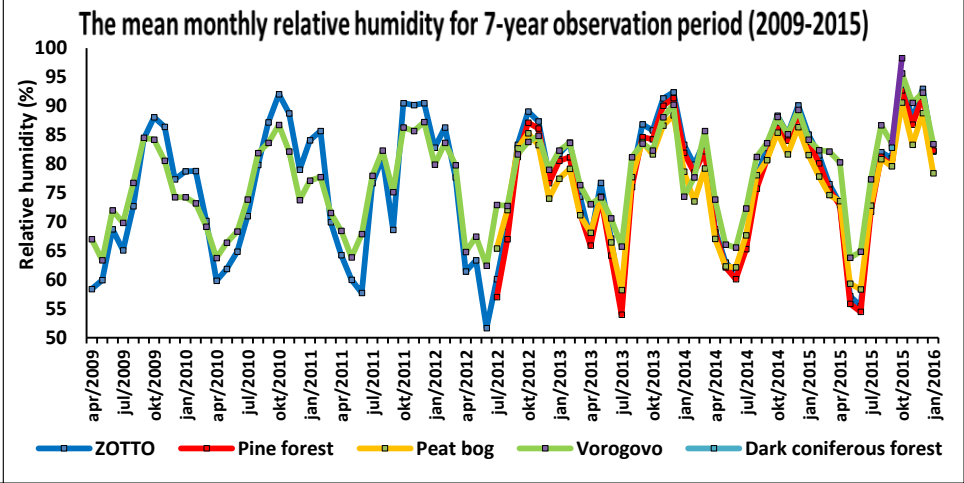


Relative humidity

The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog	Vorogovo
The mean annual relative humidity values (%)	2005 – 1015	76,83 %	76,61 %	76,03 %	77,26 %
	2013– 1015	78,07 %	76,61 %	76,03 %	79,94 %
The mean relative for July and January (%)	2005 – 1015	Jul 66,78 % Jan 82,62 %	Jul 62,01 % Jan 82,1 %	Jul 66,03 % Jan 79,23 %	Jul 72,51 % Jan 78,81 %
	2013– 1015	Jul 64,88 % Jan 83,38 %	Jul 63,66 % Jan 82,1 %	Jul 66,23 % Jan 79,23 %	Jul 71,81 % Jan 80,28 %

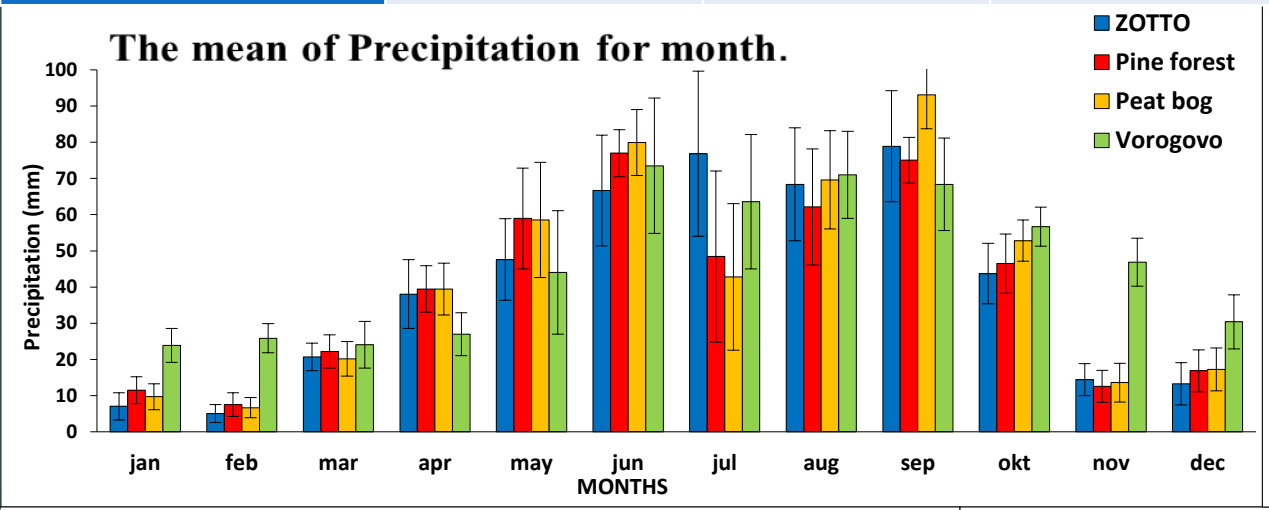


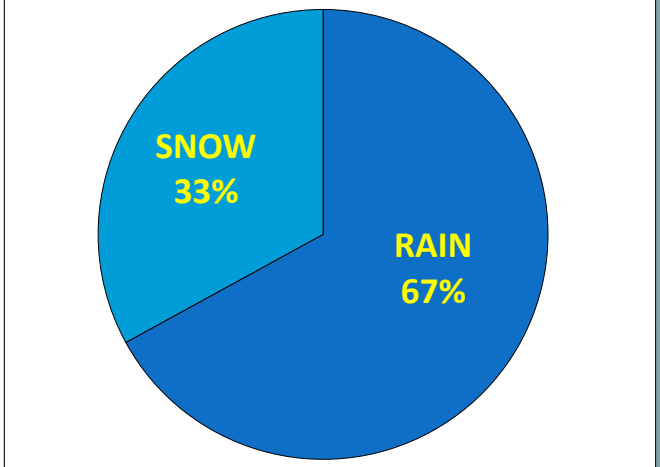


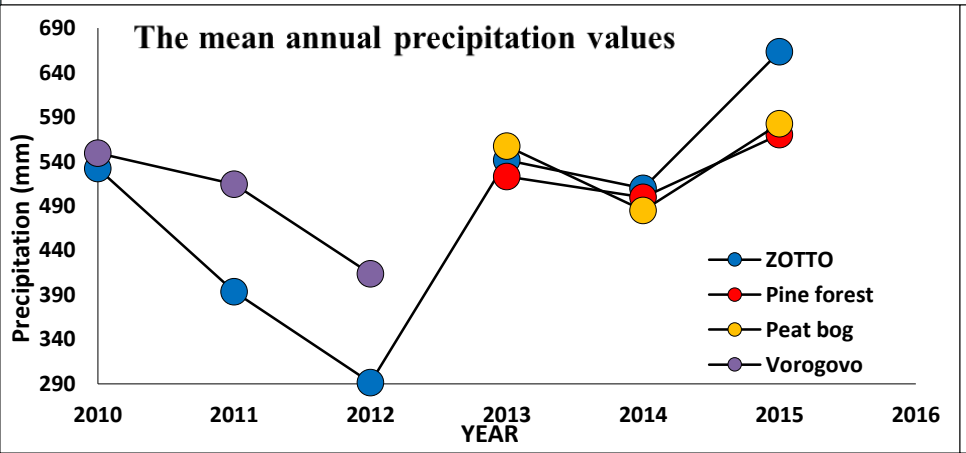


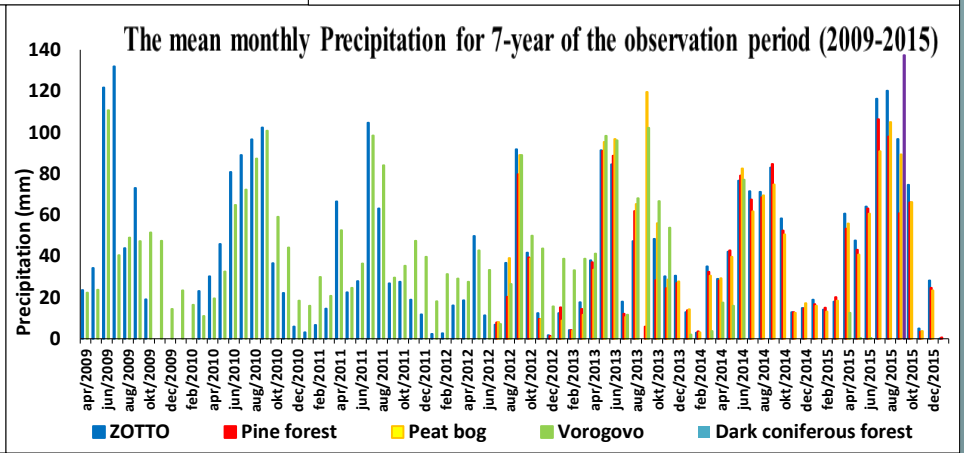
Precipitation

The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog	Vorogovo
Mean annual precipitation mm	2005 – 2015	488,67 mm	531,1 mm	541,63 mm	555,8 mm
	2013– 1015	571,67 mm	531,1 mm	541,63 mm	648,53 mm (2013r.)
Condition of precipitations mm	2005 – 2015	snow - 154,6 mm rain - 334,07 mm	snow - 168,84 mm rain - 362,27 mm	snow - 174,43 mm rain- 367,2 mm	snow - 240,47 mm rain - 315,33 mm
	2013 – 2015	snow - 188,6 mm rain - 383,07 mm	snow - 168,84 mm rain - 362,27 mm	snow - 174,43 mm rain - 367,2 mm	snow - 272,33 mm rain -376,2 mm (2013r.)



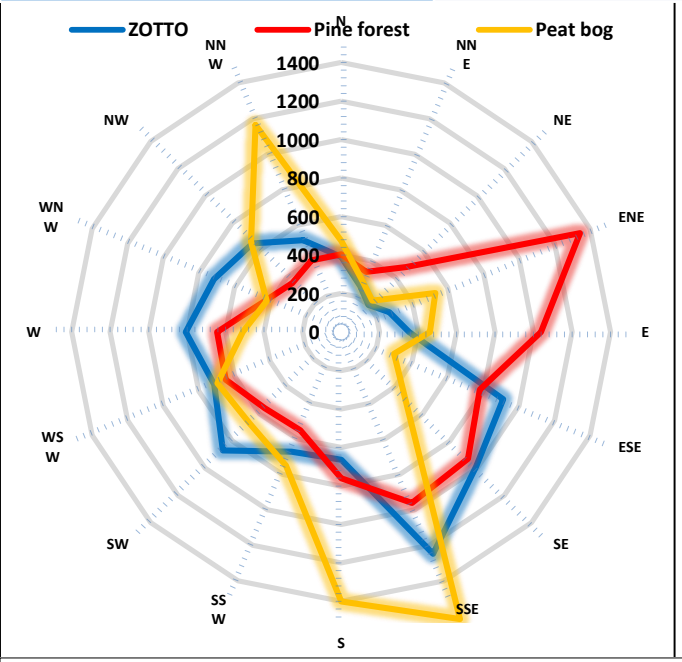


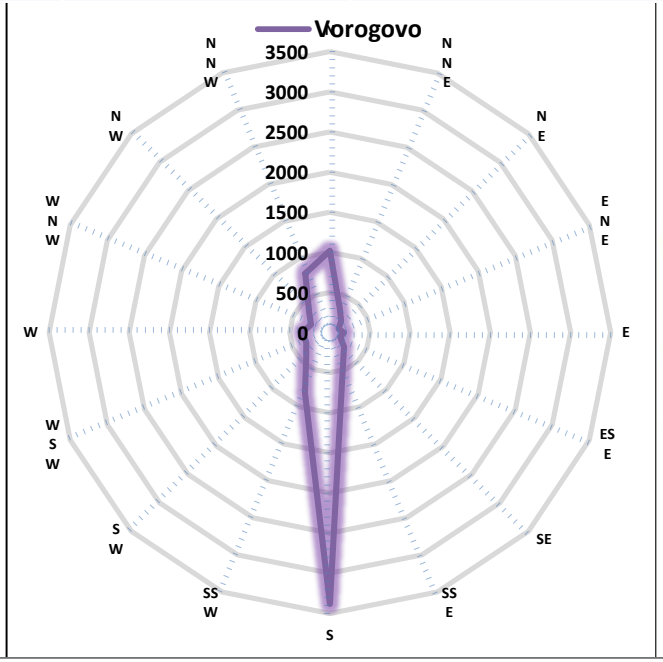


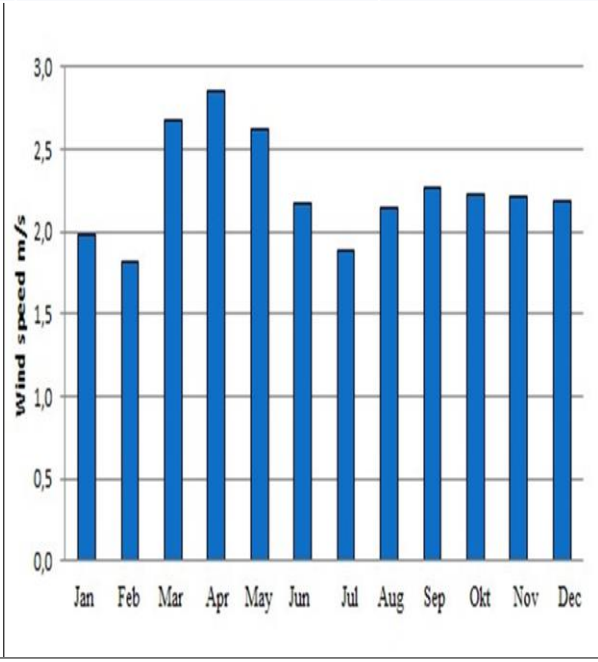


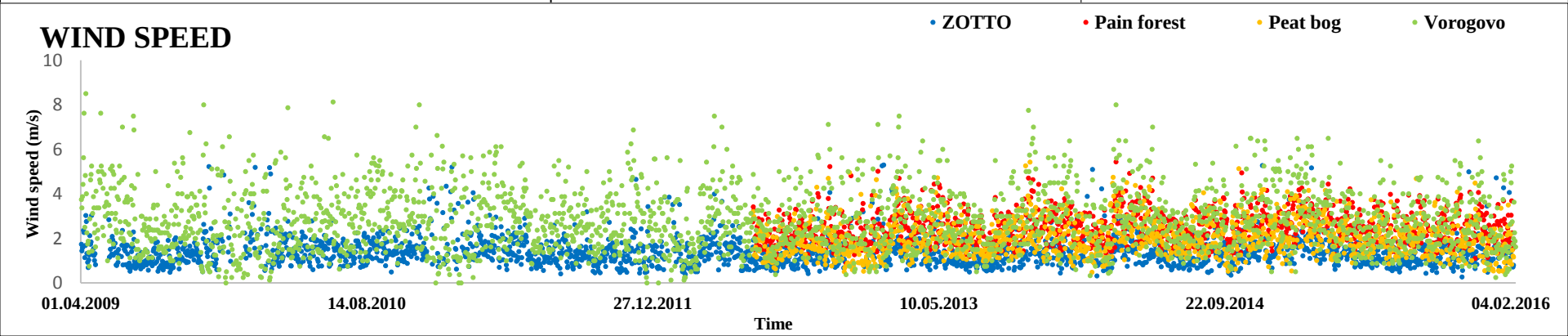
Wind speed and Wind direction

The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog	Vorogovo
Wind direction	2005 – 2015	SSE, SE, W	ENE, SSE, w	SSE, NNW	S
Wind speed	2005 – 2015	1-2 m/s	2-3 m/s	2-3 m/s	2-3 m/s



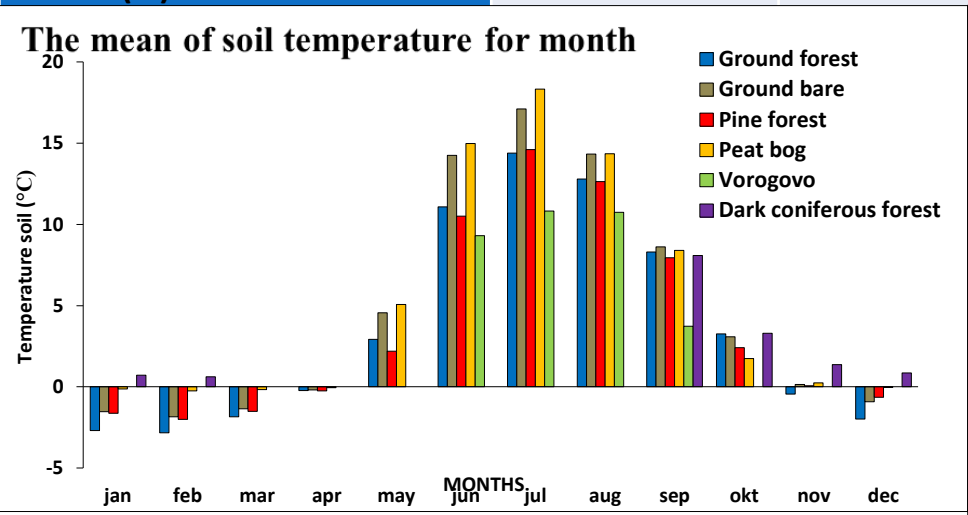


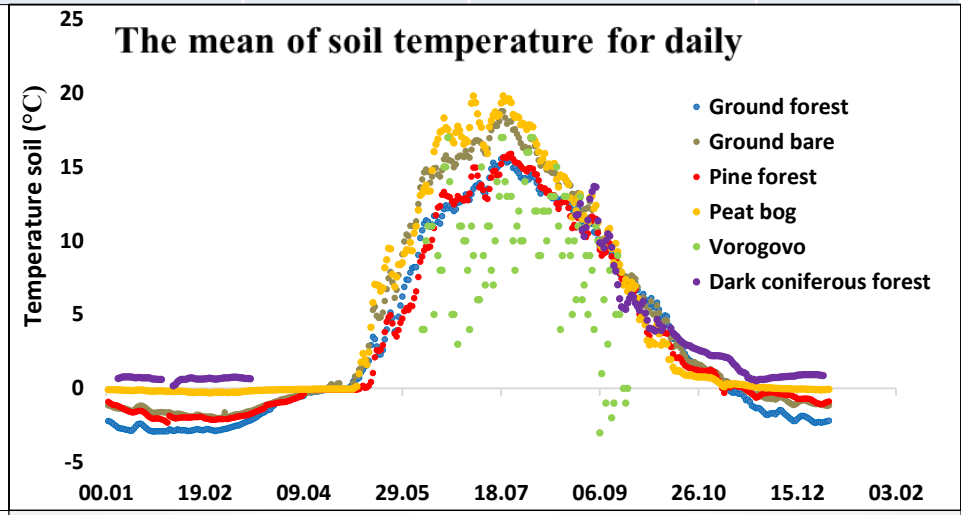


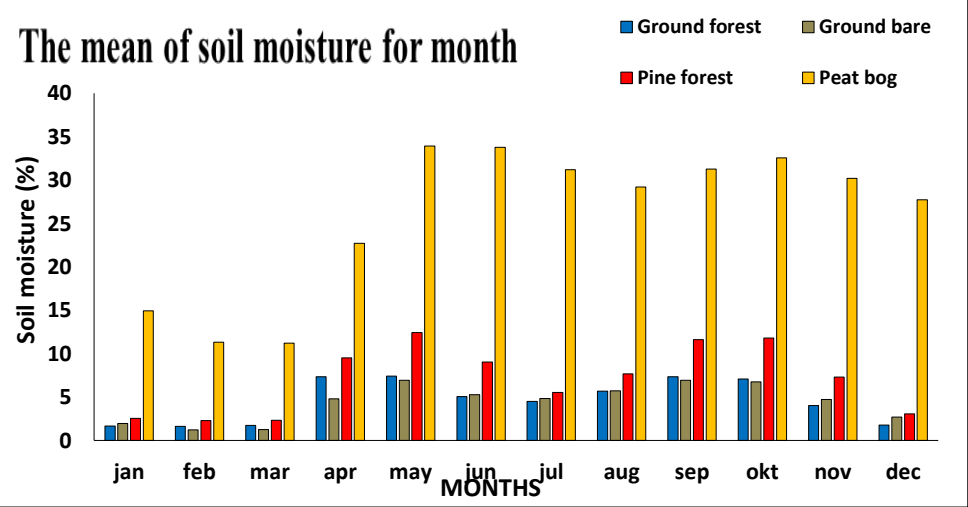


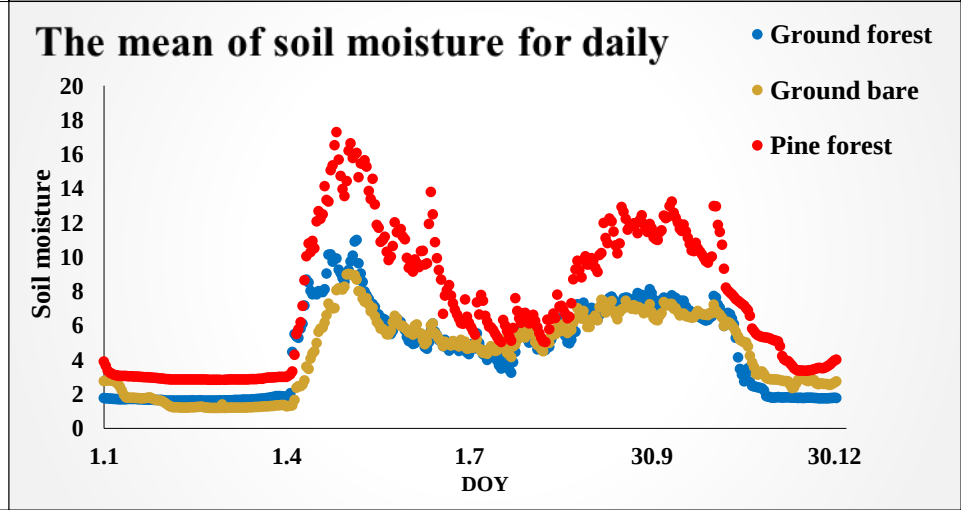
Soil temperature and soil moisture

The values	Observation Period (YEAR)	Ground forest	Ground bare	Pine forest	Peat bog
Mean annual soil temperature values (t °C)	2010 – 1015	3,5 °C	4,6 °C	-	-
	2013– 1015	3,9 °C	4,8 °C	3,7 °C	5,2 °C
Mean annual soil moisture values (%)	2010 – 1015	4,6 %	4,4 %	-	-
	2013– 1015	5,2 %	4,8 %	6,2%	24,6 %



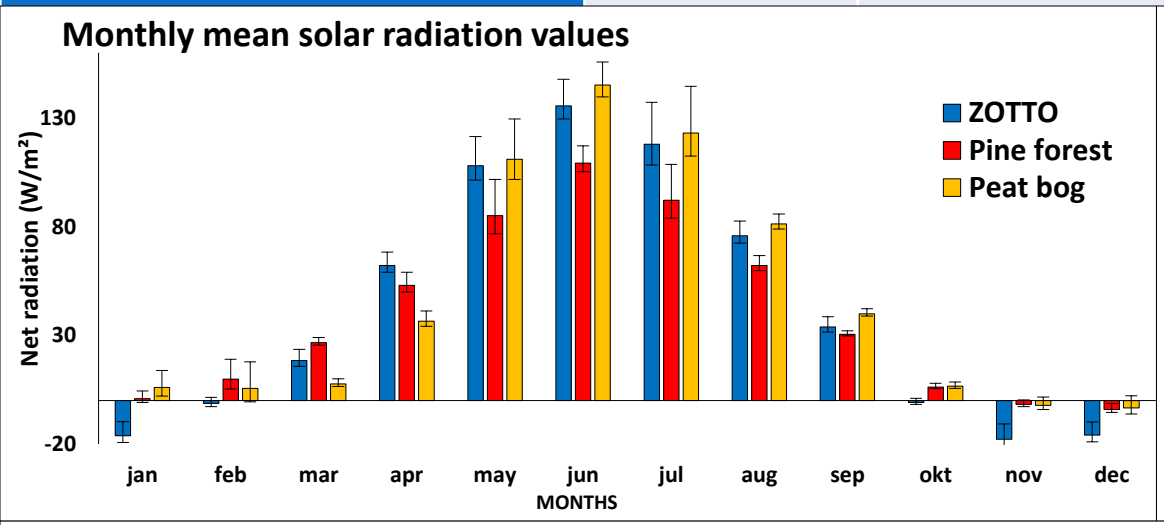


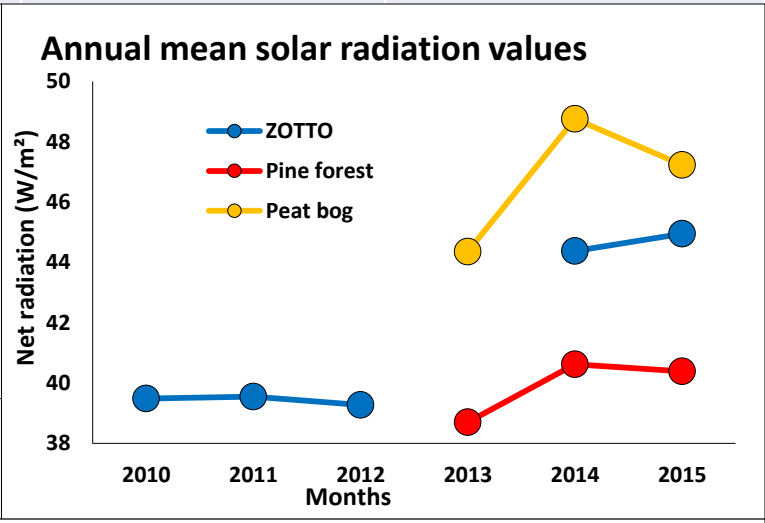


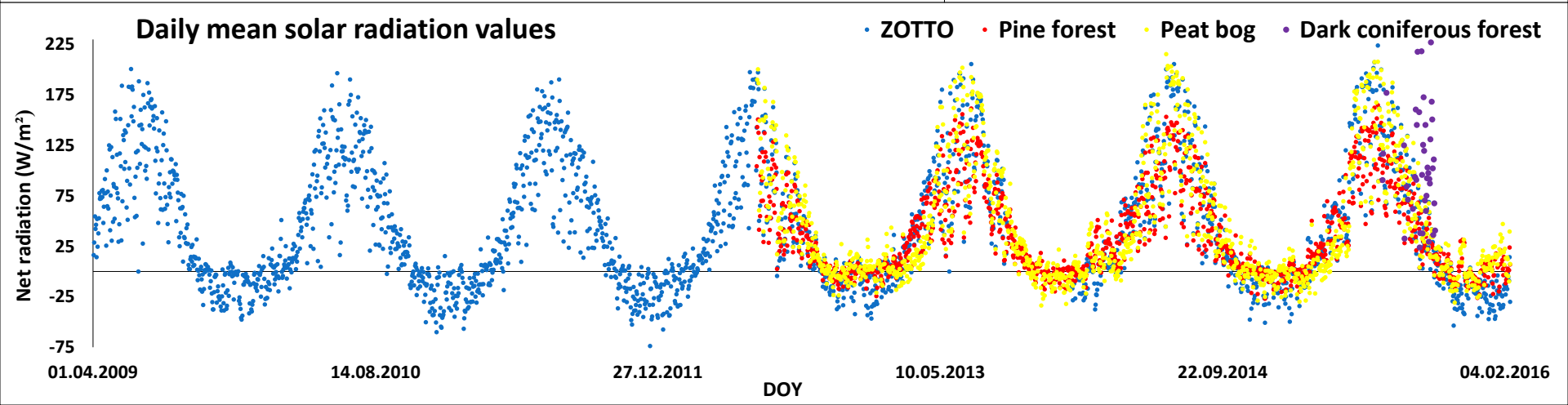


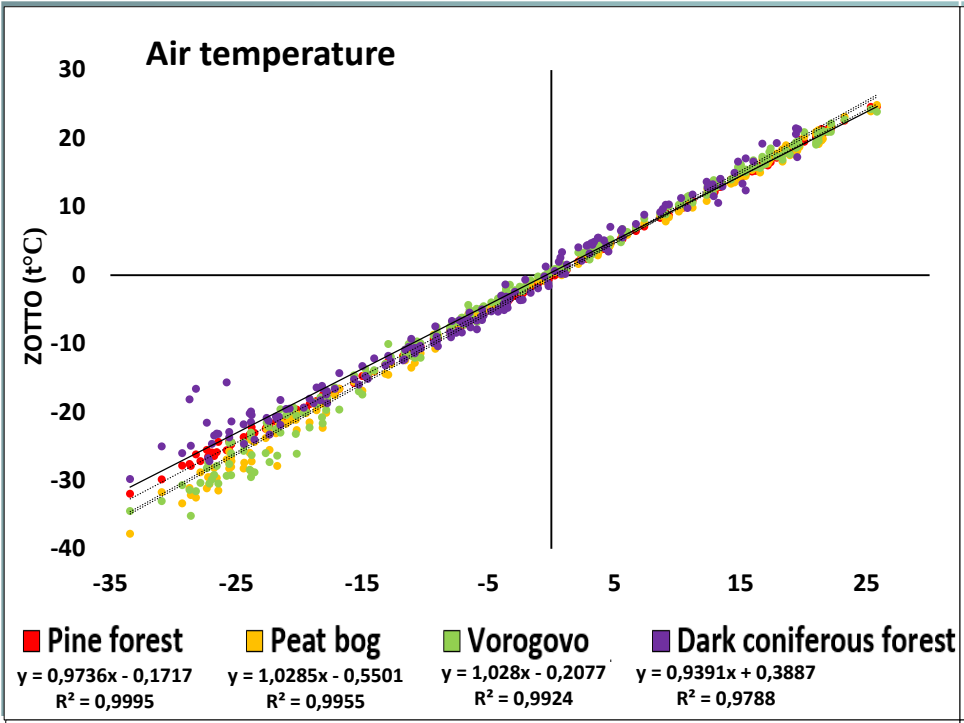
Solar radiation

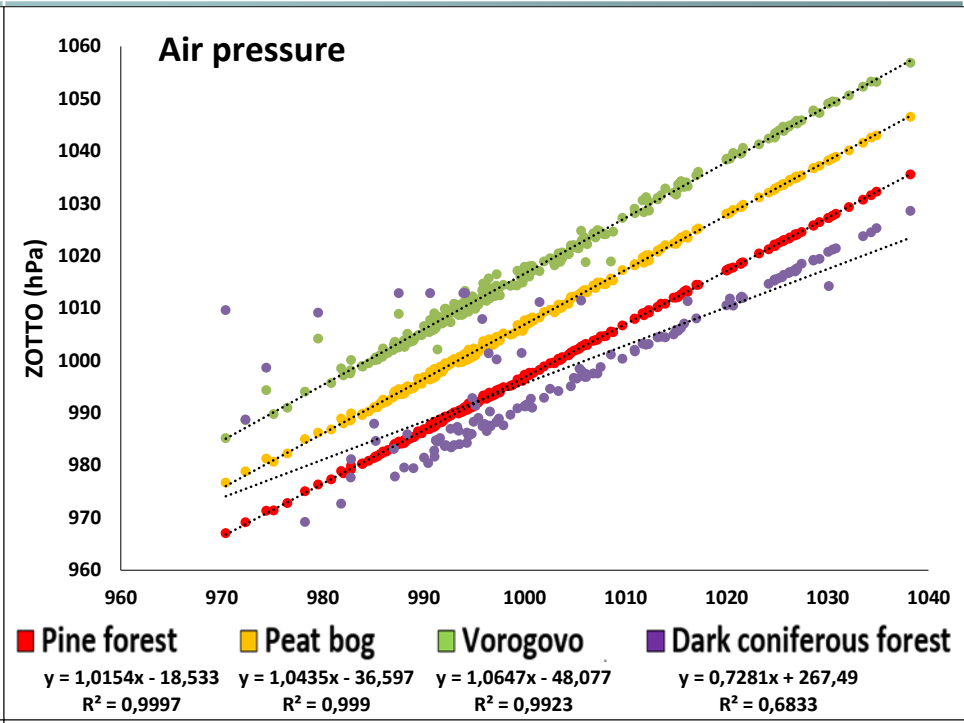
The values	Observation Period (YEAR)	ZOTTO	Pine forest	Peat bog
Radiation balance (W/m²)	2010 – 1015	42,1 W/m²	-	-
	2013– 1015	44,7 W/m²	39,9 W/m²	46,8 W/m²
Photosynthetically active radiation Incoming/Outgoing (µmol/m²/s)	2010 – 1015	227,9/28,5 µmol/m²/s	-	-
	2013– 1015	230,5/28,8 µmol/m²/s	97,6/10,4 µmol/m²/s	98,2/23,8 µmol/m²/s

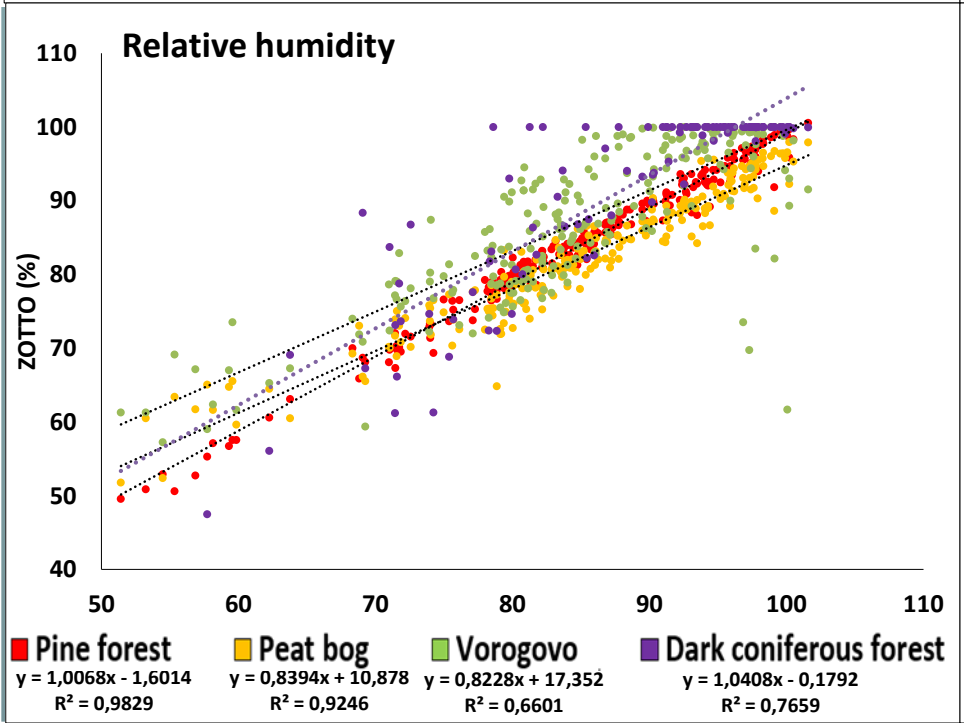


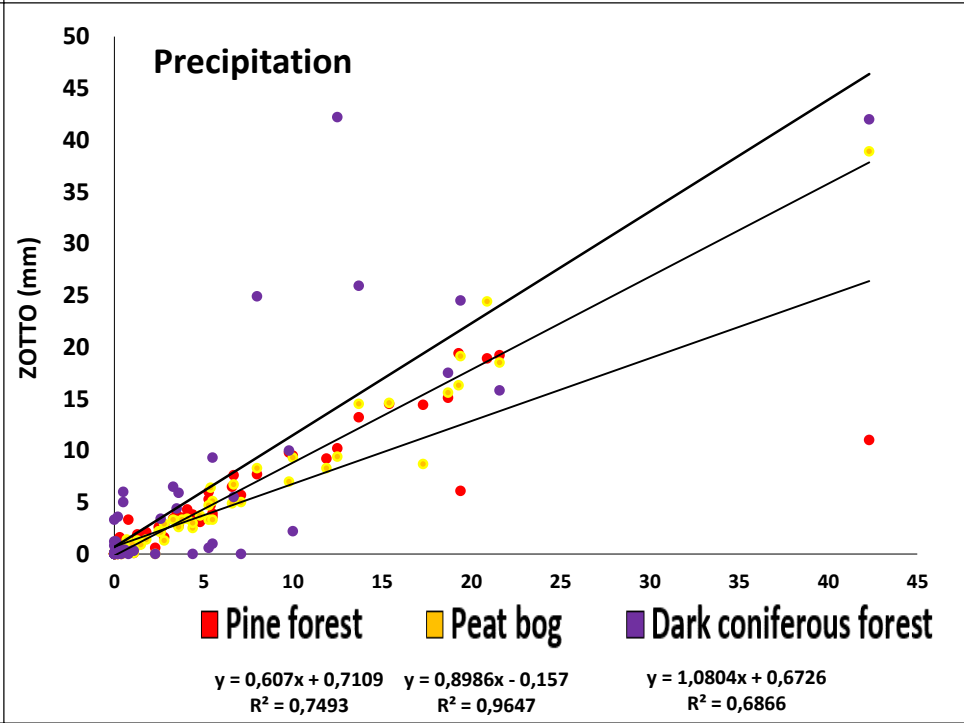





Air temperature
ZOTTO (t°C)
30
20
10
0
-10
-20
-30
-40
-35
-25
-15
-5
5
15
25
Pine forest
y = 0,9736x - 0,1717
R² = 0,9995
Peat bog
y = 1,0285x - 0,5501
R² = 0,9955
Vorogovo
y = 1,028x - 0,2077
R² = 0,9924
Dark coniferous forest
y = 0,9391x + 0,3887
R² = 0,9788


Air pressure
ZOTTO (hPa)
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
960
970
980
990
1000
1010
1020
1030
1040
Pine forest
y = 1,0154x - 18,533
R² = 0,9997
Peat bog
y = 1,0435x - 36,597
R² = 0,999
Vorogovo
y = 1,0647x - 48,077
R² = 0,9923
Dark coniferous forest
y = 0,7281x + 267,49
R² = 0,6833


Relative humidity
ZOTTO (%)
110
100
90
80
70
60
50
40
50
60
70
80
90
100
110
Pine forest
y = 1,0068x - 1,6014
R² = 0,9829
Peat bog
y = 0,8394x + 10,878
R² = 0,9246
Vorogovo
y = 0,8228x + 17,352
R² = 0,6601
Dark coniferous forest
y = 1,0408x - 0,1792
R² = 0,7659


Precipitation
ZOTTO (mm)
50
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40
45
Pine forest
y = 0,607x + 0,7109
R² = 0,7493
Peat bog
y = 0,8986x - 0,157
R² = 0,9647
Dark coniferous forest
y = 1,0804x + 0,6726
R² = 0,6866

MPI-BGC Jena

ЛАБОРАТОРИЯ биогеохимических циклов в лесных экосистемах

ZOTTO