



## Different temperature and humidity responses to the clear-cut and the gap in a Scots pine forest: a study case in Central Poland

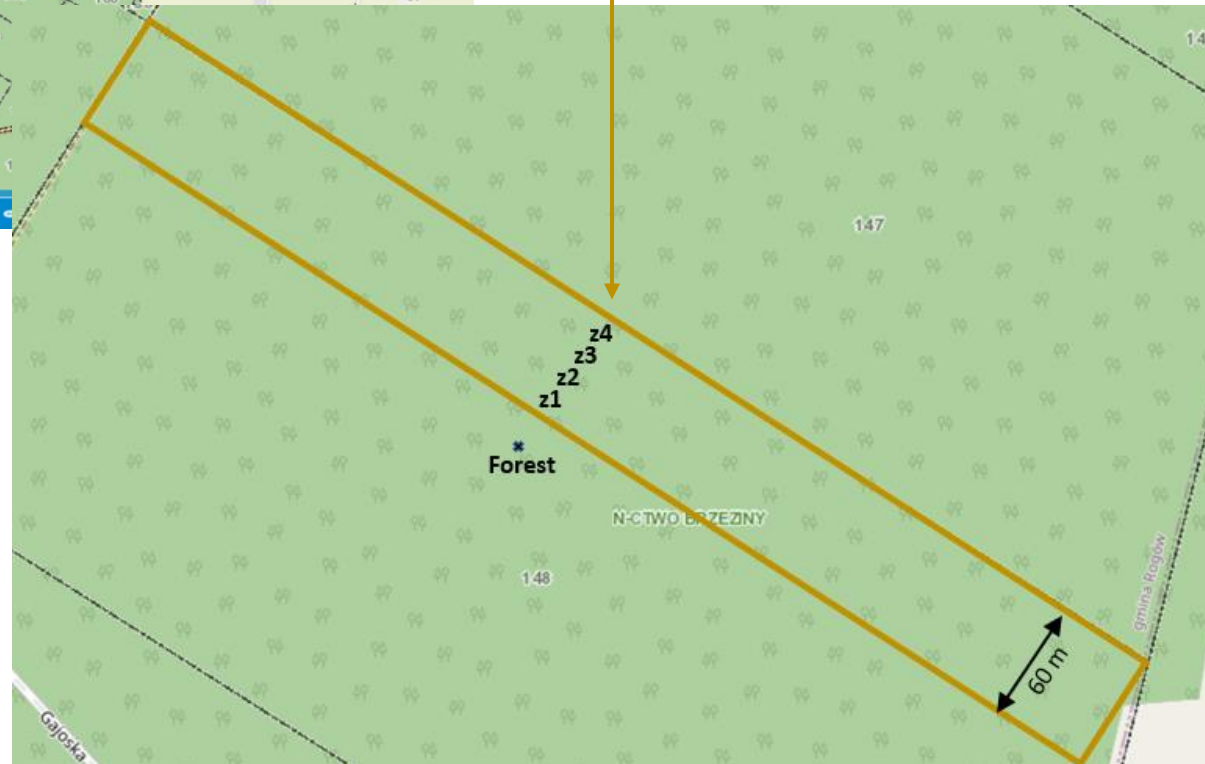
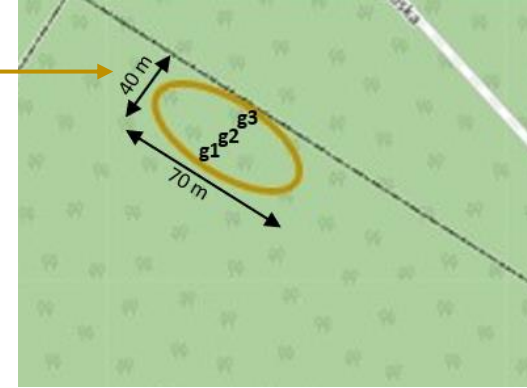
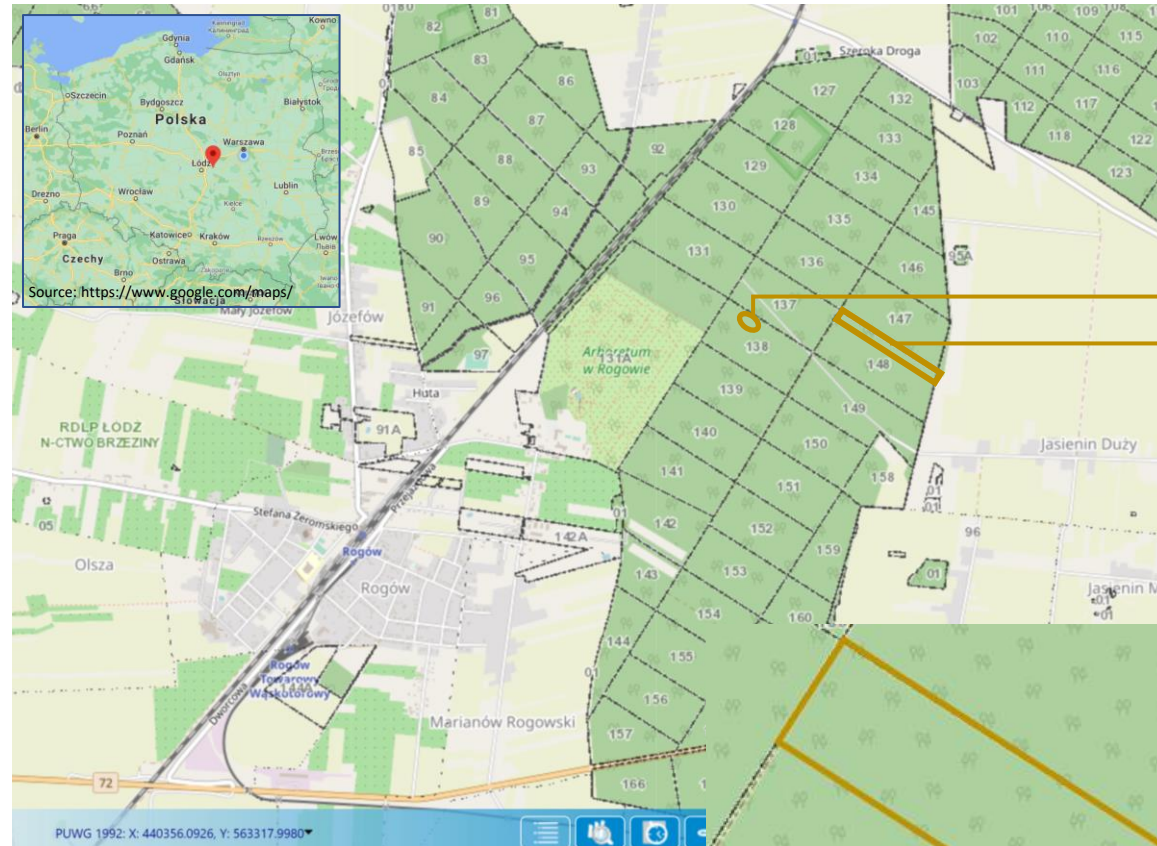


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The research was carried out in Rogów Forest Experimental Station (51.827023°N, 19.922315°E) on a clear-cut with a width of 60 m and on a gap (of an ellipsoid shape; 40×70 m). The measurements were carried out in two series: spring–summer, in the period when the height of the sun during the day conditioned inflow of direct solar radiation to any surface (May–August 2006), and autumn, when direct radiation was limited by neighboring stands (October–November 2006).

The aim of the study was to determine the spatial variation of air temperature (t), vapour pressure (e), relative humidity (RH), vapour pressure deficit (VPD) on the clear-cut and gap as well as to compare the spatial distribution of air temperature and humidity conditions on both areas.

# Research plots



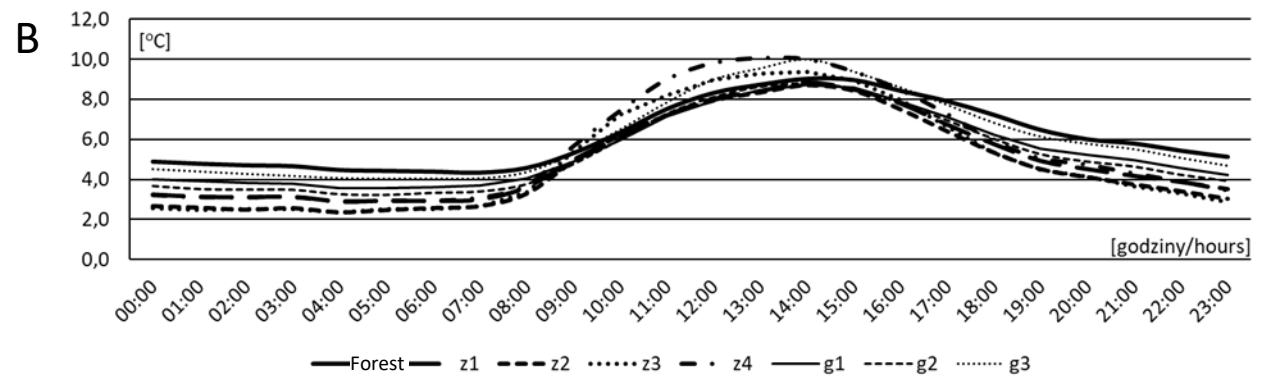
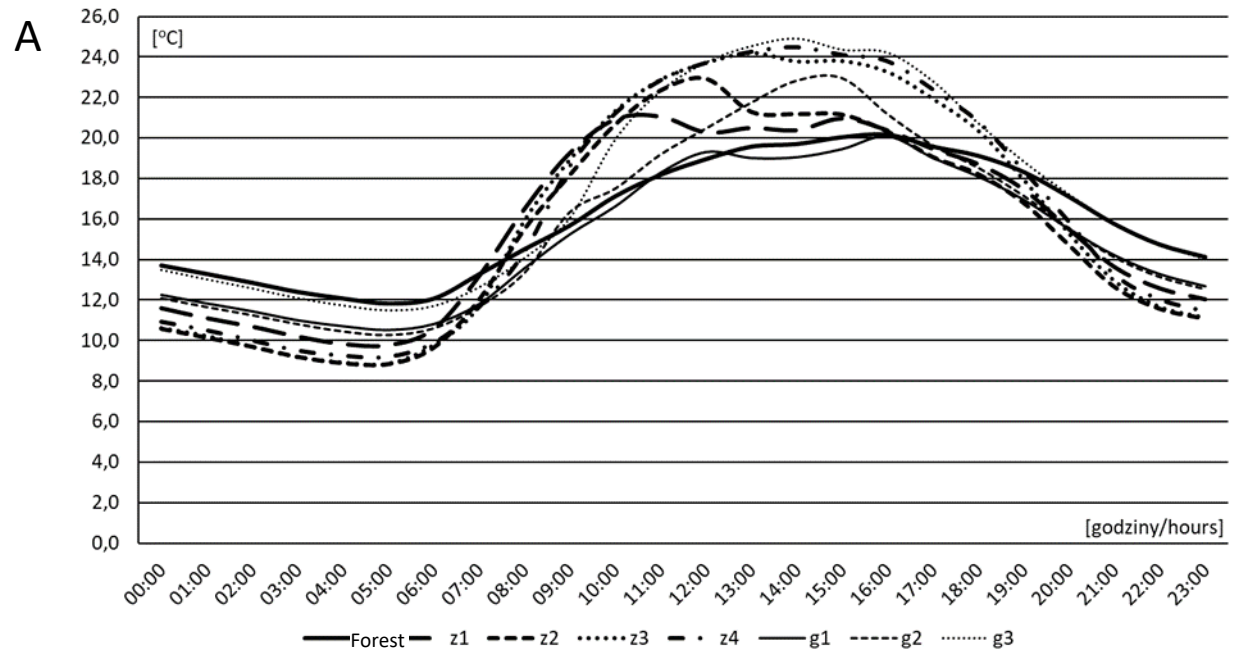
Source: <https://www.bdl.lasy.gov.pl/porta/mary-en>

Average (t) and extreme values, standard deviations (SD) of air temperature in the forest, on the clear-cut (z1, z2, z3, z4) and at the gap (g1, g2, g3).

	t	SD	t <sub>min</sub>	t <sub>max</sub>	t	SD	t <sub>min</sub>	t <sub>max</sub>
	spring–summer				autumn			
<b>Forest</b>	16,0	5,17	2,9	31,5	6,4	4,63	-3,9	18,7
<b>z1</b>	15,6	6,36	-0,2	36,6	5,2	4,78	-5,8	17,9
<b>z2</b>	15,3	6,96	-1,1	37,4	4,9	4,89	-5,8	17,9
<b>z3</b>	16,1	7,96	-2,0	39,7	5,1	5,31	-6,8	19,4
<b>z4</b>	16,3	7,81	-1,5	38,8	5,7	5,46	-6,8	20,6
<b>g1</b>	15,0	5,34	2,1	32,8	5,7	4,54	-4,8	17,5
<b>g2</b>	15,6	6,34	2,0	37,9	5,5	4,57	-5,3	17,1
<b>g3</b>	17,2	7,12	3,3	41,5	6,3	4,90	-4,3	20,2

Characteristics of frost days at the clear-cut and at the gap as well as at the weather station of Warsaw University of Life Sciences in Rogów in May 2006

Date	Location where the frost occurs	$t_{\min}$	Time with $t < 0^{\circ}\text{C}$	Meteorological station				
				$t_{\min}$	$t_{\max}$	Relative humidity [%]	Wind direction	Wind speed [m/s]
11.05	z2, z3	-0,2	0,5h	0,2	24,5	76	WNW	1,3
15.05	z1, z2, z3, z4	-2,0	5,0h	-0,9	19,9	83	WSW	0,3
16.05	z3	-0,2	0,3h	0,5	24,3	72	ESE	1,6



Diurnal course of air temperature on research plots in spring- summer (A) and autumn (B)



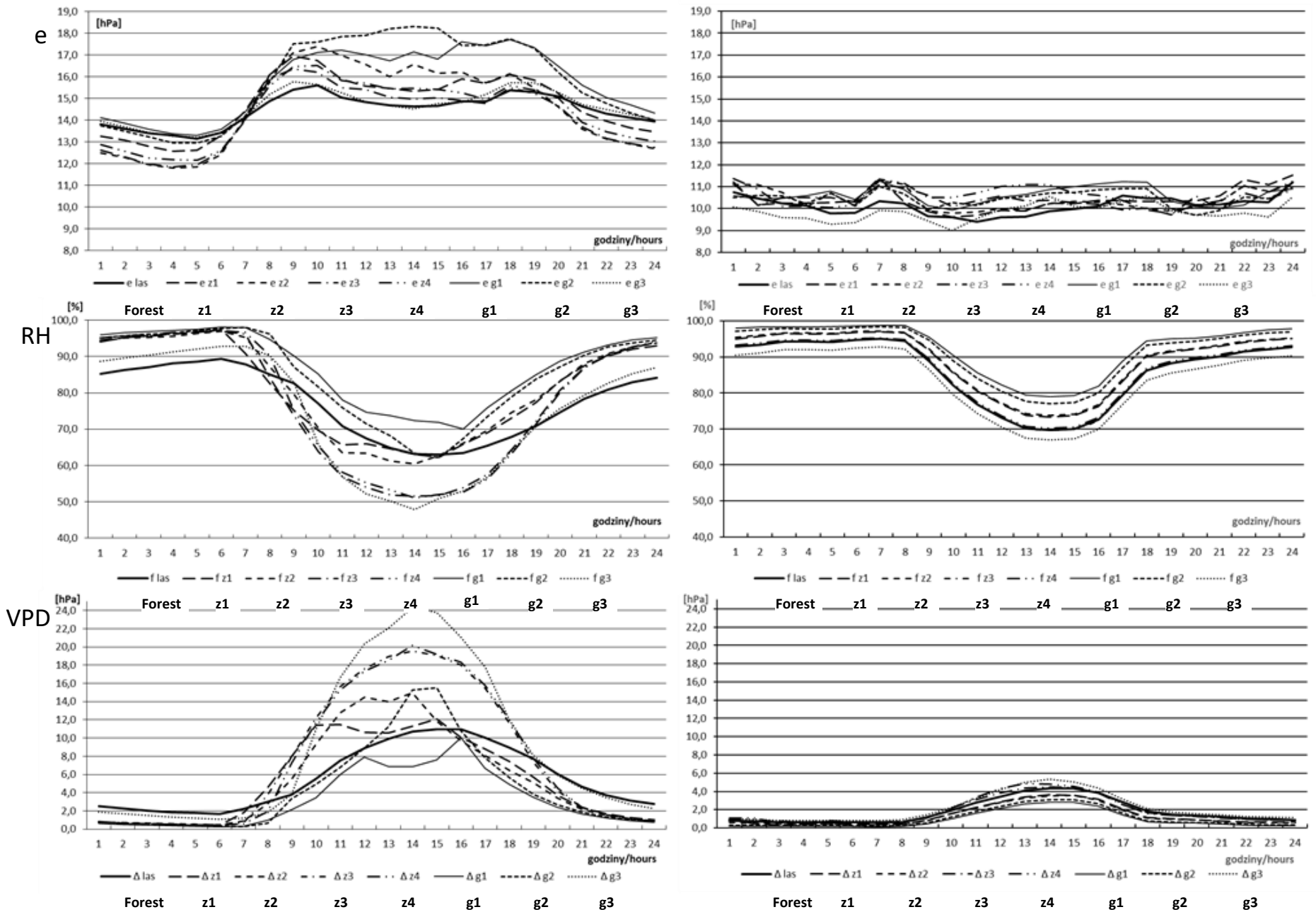
Average and extreme values, standard deviation (SD) of vapour pressure (e), relativity humidity (RH) and vapour pressure deficit (VPD) in the forest, on the clear-cut (z1, z2, z3, z4) and on the gap (g1, g2, g3) in the spring–summer period

		Forest	z1	z2	z3	z4	g1	g2	g3
<b>e</b>	Average	14,4	14,5	14,5	14,1	14,3	14,6	14,7	14,5
	Min	4,7	4,6	5,6	4,9	6,0	5,4	6,8	5,7
	Max	24,9	30,6	29,2	26,7	27,3	26,7	28,5	25,9
	SD	3,53	4,04	4,20	3,84	3,78	4,01	4,22	3,45
<b>RH</b>	Average	77,2	81,1	81,5	77,4	77,8	87,2	85,1	74,5
	Min	20,3	21,3	24,4	17,0	17,4	25,7	23,0	17,0
	Max	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	SD	20,08	22,29	20,37	24,21	24,31	16,24	18,39	24,02
<b>VPD</b>	Average	5,5	5,3	5,2	7,5	7,4	3,2	4,4	8,6
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	31,1	37,1	44,6	55,9	55,6	26,4	50,6	67,9
	SD	6,5	7,9	7,9	11,4	11,3	5,0	7,5	12,8

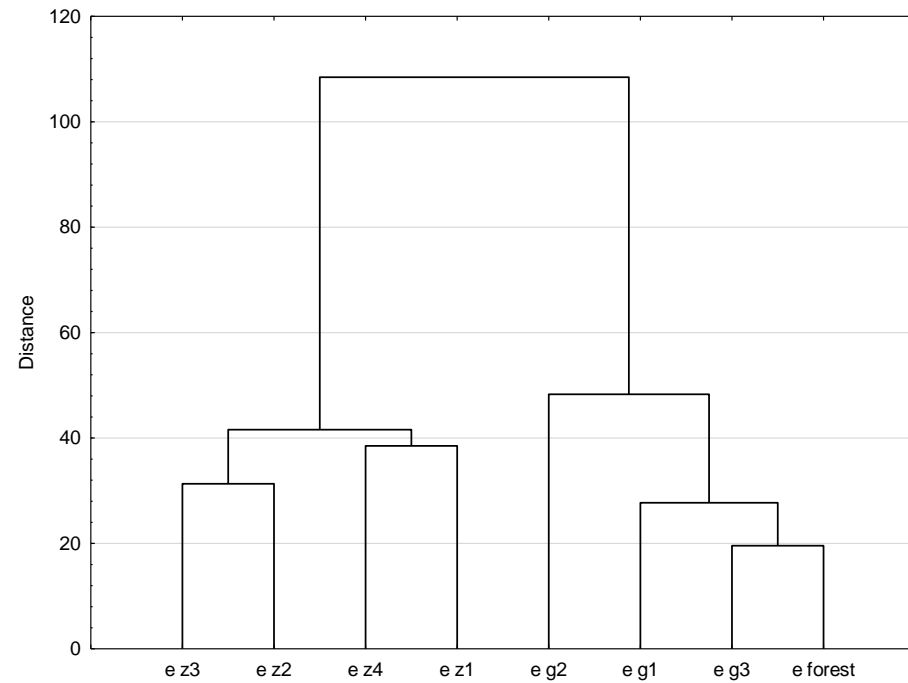
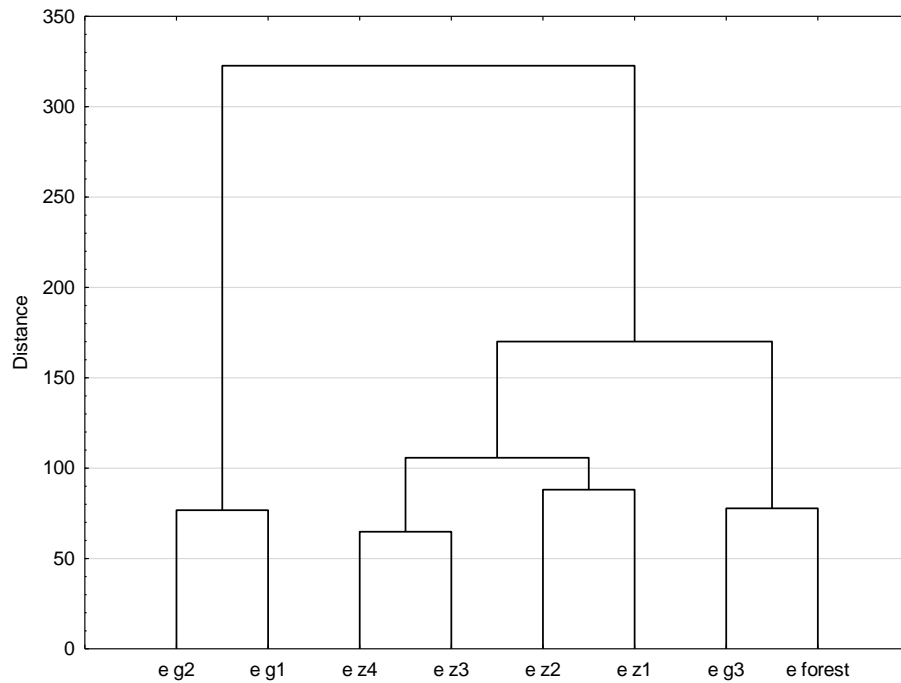


Average and extreme values, standard deviation (SD) of vapour pressure (e), relativity humidity (RH) and vapour pressure deficit (VPD) in the forest, on the clear-cut (z1, z2, z3, z4) and on the gap (g1, g2, g3) in the autumn period

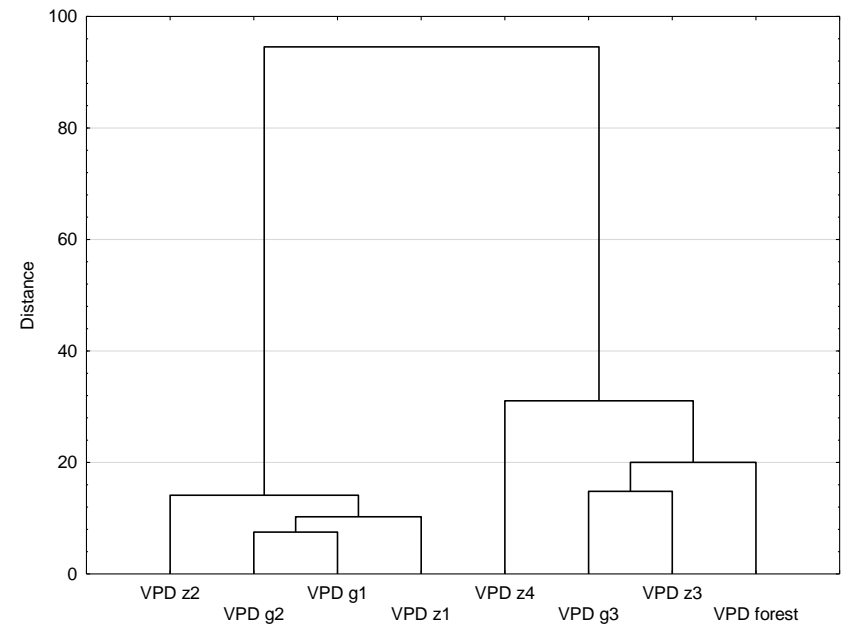
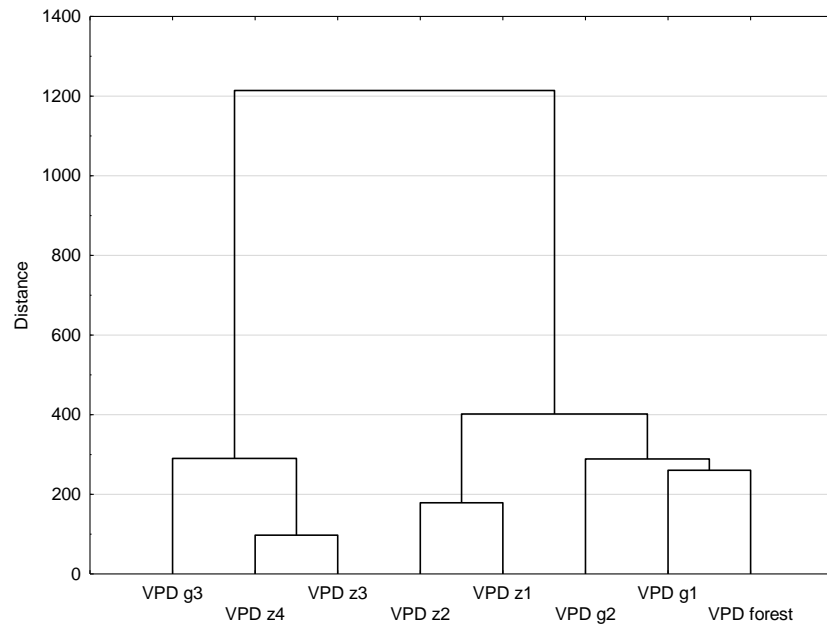
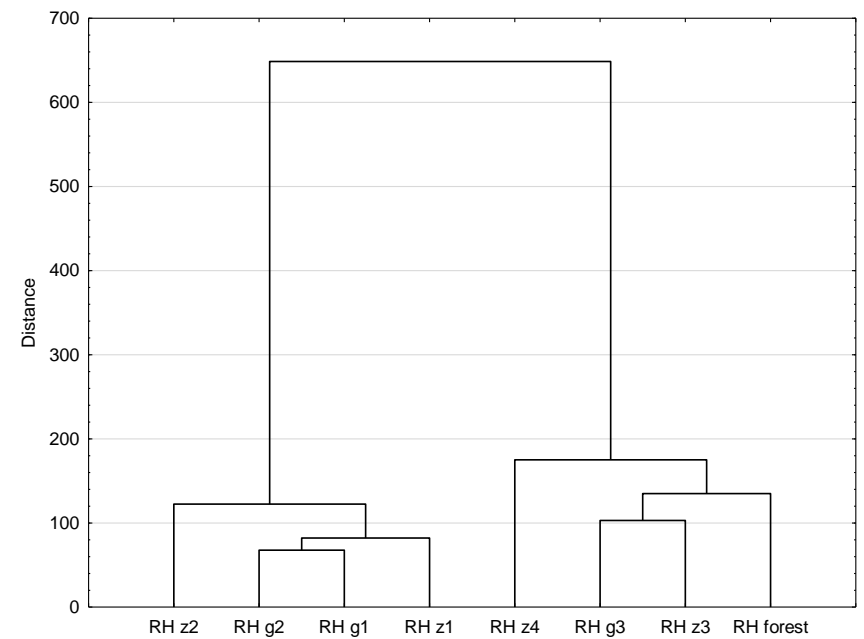
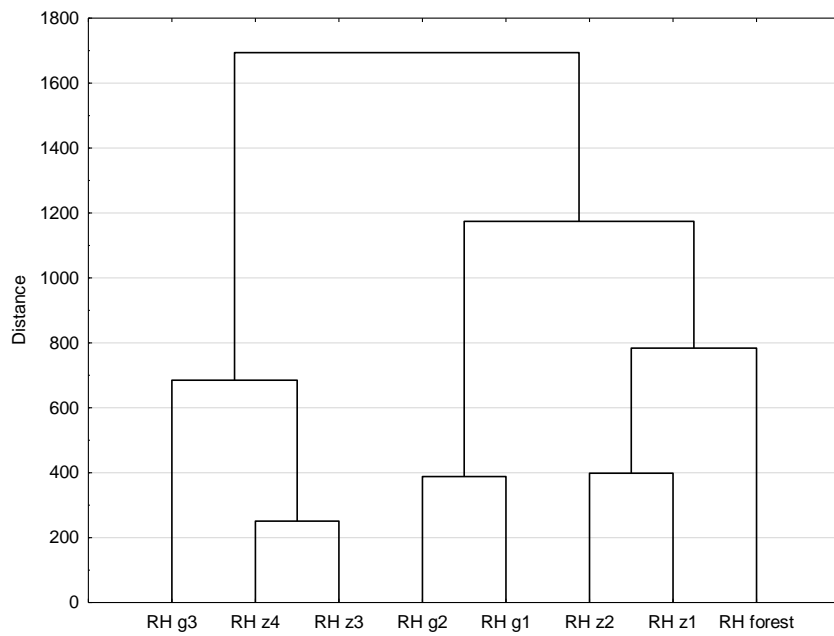
		Forest	z1	z2	z3	z4	g1	g2	g3
<b>e</b>	Average	10,2	10,4	10,4	10,3	10,6	10,6	10,5	9,9
	Min	4,3	0,7	3,9	3,7	3,9	4,5	4,3	4,1
	Max	26,2	34,0	34,1	32,6	32,8	36,2	35,5	25,5
	SD	2,80	3,82	3,99	3,90	3,79	3,33	3,47	2,78
<b>RH</b>	Average	85,9	88,7	89,1	86,0	86,4	92,5	91,4	83,4
	Min	43,8	50,0	48,1	43,9	44,4	53,8	51,7	41,1
	Max	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	SD	13,60	13,18	12,59	13,58	13,49	10,78	11,50	13,86
<b>VPD</b>	Average	1,6	1,4	1,4	1,9	2,0	0,9	1,1	2,2
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	7,6	6,7	6,8	8,4	9,6	5,9	6,3	9,4
	SD	1,94	1,69	1,65	2,03	2,26	1,38	1,48	2,20



Diurnal course of vapour pressure (e), relative humidity (RH) and vapour pressure deficit (VPD) on research plots in spring-summer (at left) and autumn (right) period



Similarity of the study plots in terms of vapour pressure (e) in the spring-summer (left) and autumn (right) period



Similarity of the study plots in terms of relative humidity (RH) and vapour pressure deficit (VPD) in the spring-summer (left) and autumn (right) period

The thermal and humidity conditions on the clear-cuts and gaps depend particularly on the elements of the radiation balance, which are shaped differently in their individual parts. In late spring and summer, the insolation on the clear-cut was more diversified, which resulted in a greater diversity of thermal and humidity conditions. A greater risk of extreme thermal conditions (frosts, heat waves) occurred in the clear-cut than in the gap. In the sunny parts of the clear-cut and the gap, extremely low values of relative humidity were found (17% on the clear-cut and the gap) and very high values of humidity deficiency (55.9 hPa on the clear-cut and 67.9 hPa on the gap). Taking into account the high temperature in these places and the importance of moisture deficit for the functioning of plant organisms, special attention should be paid to weather conditions during conducting renovation studies in these parts of the clear-cuts and gaps.

Thank you very much for you attention

