



# The Tree Ring Project 2011-2013

Technical School Daruvar  
Croatia





# GLOBE team

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# Daruvar





# Tehnička škola Daruvar - Základní škola Pomezí





Coordinates: [49°42′49″N 16°19′22″E](#)  
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Country	<a href="#">Czech Republic</a>
<a href="#">Region</a>	<a href="#">Pardubice</a>
<a href="#">District</a>	<a href="#">Svitavy</a>
<b>Area</b>	
• Total	25.28 km <sup>2</sup> (9.76 sq mi)
<b>Elevation</b>	575 m (1,886 ft)
<b>Population</b> (2006)	
• Total	1,118
• <b>Density</b>	44/km <sup>2</sup> (110/sq mi)
Postal code	569 71
Website	<a href="http://www.obecpomezi.cz/">http://www.obecpomezi.cz/</a>



Coordinates: [45.592895°N 17.223685°E](#)

<a href="#">Country</a>	<a href="#">Croatia</a>
<a href="#">County</a>	<a href="#">Bjelovar-Bilogora</a>
<b>Area</b>	
• Total	64 km <sup>2</sup> (25 sq mi)
<b>Population</b> (2001)	
• Total	13,243 (municipality)
<a href="#">Time zone</a>	<a href="#">CET (UTC+1)</a>
• Summer ( <a href="#">DST</a> )	<a href="#">CEST (UTC+2)</a>



# Four seasons in Daruvar





# Educational workshops for students





# Preparatory activities: locality and soil analysis





- Coring demonstration





# In search of *pinus nigra*





# In search of *pinus nigra*

- With the help of the local branch of Croatian Forestry Company we found two locations of *pinus nigra*.
- 1 Gornji Borki – Orašje
- 2 Gornji Borki - Dubrave





# Location 1: Gornji Borcki – Orašje





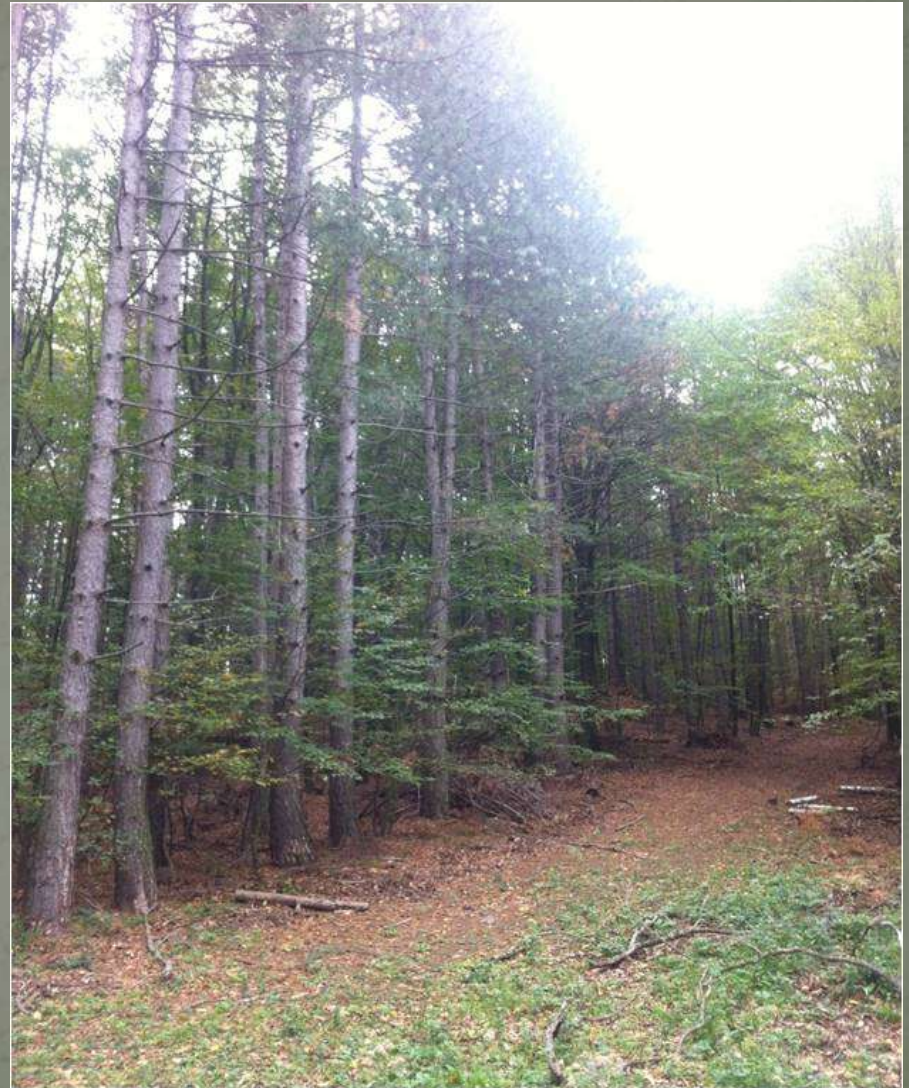
## Site description:

- 400m above sea level, trees planted
- mixed stands of European beech with some oak, elm, cherry and conifers (pine, spruce) of good quality.
- Along the road to the northern part of the department there are groups of black pine in the form of lines, there are also solitary trees inside the section.
- The central part of the department also contains rare beech and pine trees, and the ground is covered with bushes and thin beech trees.



# Location 01

- Section: 16b
- Phytocoenoses: beech and woodruff (asperulo-Fagetum prov. Pelcer)
- Soil type: brown soil on limestone and dolomite
- Exposure: south- southeast (microlocation was east- notheast)
- Area: 20.76ha
- Slope: 3-17%
- Set: thick
- Age: 50 years
- Elevation: 390-500m (microlocation 480-500m)
- Growing stock: 2987 m<sup>3</sup> (black pine 298m<sup>3</sup>)





# Coring and taking samples







T 04  
small crest  
many damaged branches  
DBH 85,5cm  
height 25cm



T 05  
On the slope 15°  
Damaged stem, broken branches  
Small crest (1,5-2m)  
DBH 107cm, height 25m







T 08  
Forks at 2,5 m height  
Broken branches  
Shorter tree 17-18 m  
rare crest  
DBH 106.5 cm



T 06 - Location 1  
Shorter tree 17,5 m  
Slope 20%  
DBH 84cm





# Field results analysis

Tree no.	DBH	H	crown	Comment	No of rings
01 loc 1	122	24	rare	bent, damaged and missing bark	34
02 loc 1	111	25	asymmetrical	30% dry and damaged branches	39
03 loc 1	98	24,5	rare crest	stump forks into two branches	41
04 loc 1	85,5	25,5	small crest	40% damaged branches	41
05 loc 1	107	25	asymmetrical	15% slope, damaged stem, some broken and dead branches	40
06 loc 1	84	17,5	small	20% slope	41
07 loc 2	108	15	asymmetrical	thicker on the southern side	34
08 loc 2	106,5	17,5	rare crest	forks at 2,5m height	35
09 loc 2	80	20	rare	thick stand	33
10 loc 2	78	13	small, dry	forks at 2,28 m	31
11 loc 2	83	17,5	asymmetrical	Bent	37



## Location 2: Gornji Borki –Dubrave



- Pure stands of black pine of uniform shape.
- Along the road there are trees of somewhat reduced growth due to shallow soil.
- Along the northern edge there are other species of beech, hornbeam, cherry and white pine which grow individually or in groups.



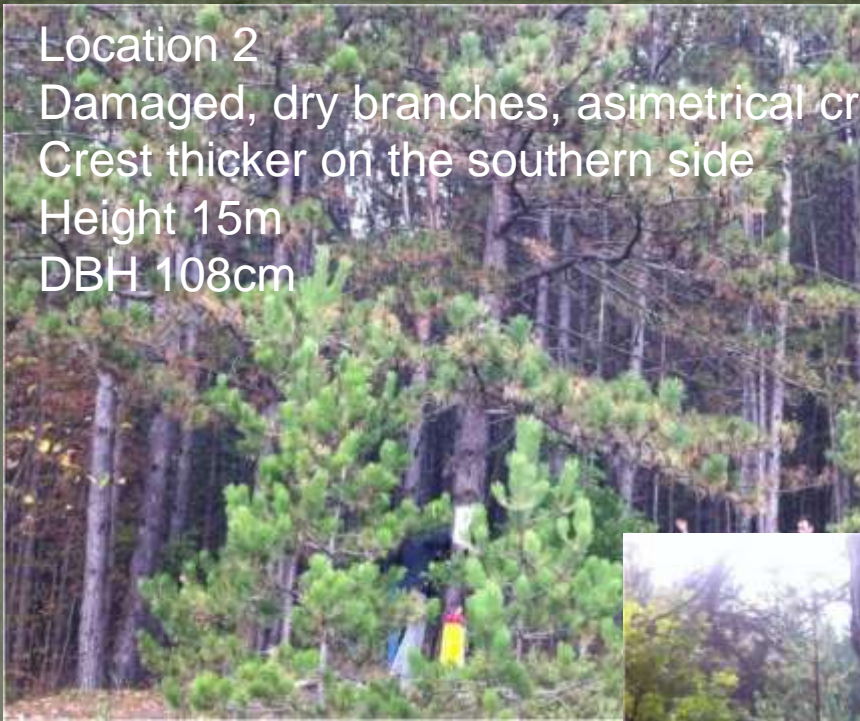
# Location 02

- Section: 14e
- Phytocoenoses: allochthonous conifer (*Pinus nigra*)
- Soil type: brown soil on dolomite
- Exposure: southwest- west
- Area: 1.85ha
- Slope: 1-3%
- Set: thick
- Age: 45 years
- Elevation: 430-450m
- Growing stock: 378 m<sup>3</sup> (black pine 345m<sup>3</sup>)





Location 2  
Damaged, dry branches, asymmetrical crest  
Crest thicker on the southern side  
Height 15m  
DBH 108cm



T 10  
Forks at 2,28m  
Some broken and dry branches  
Small and rare crest  
Shorter  
DBH 78cm



T 09  
bent tree  
Dry branches, some broken  
Rare crest  
DBH 80cm  
Height 20m  
Thick surroundings



# Sanding cores and discs





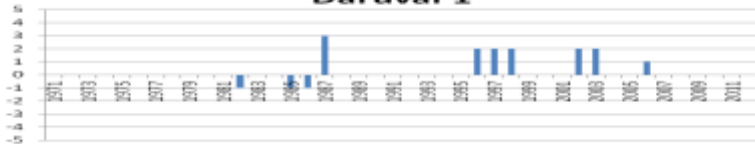
# Samples prepared for skeleton plotting





# Skeleton plots

Daruvar 1



Daruvar 2



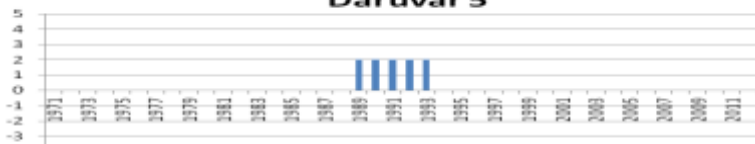
Daruvar 3



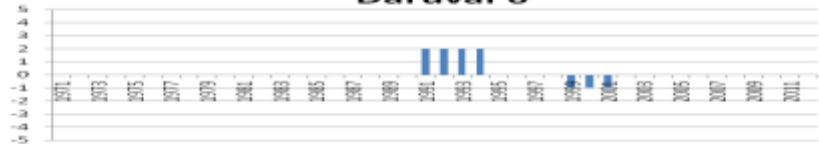
Daruvar 4



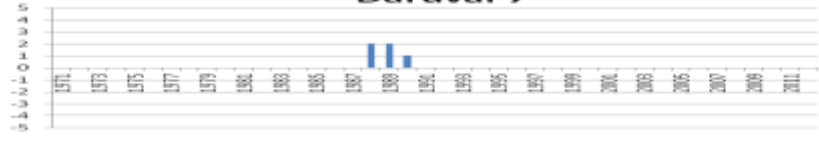
Daruvar 5



Daruvar 6



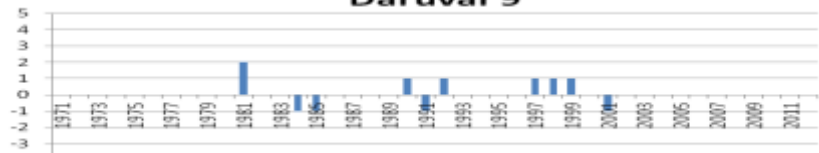
Daruvar 7



Daruvar 8



Daruvar 9

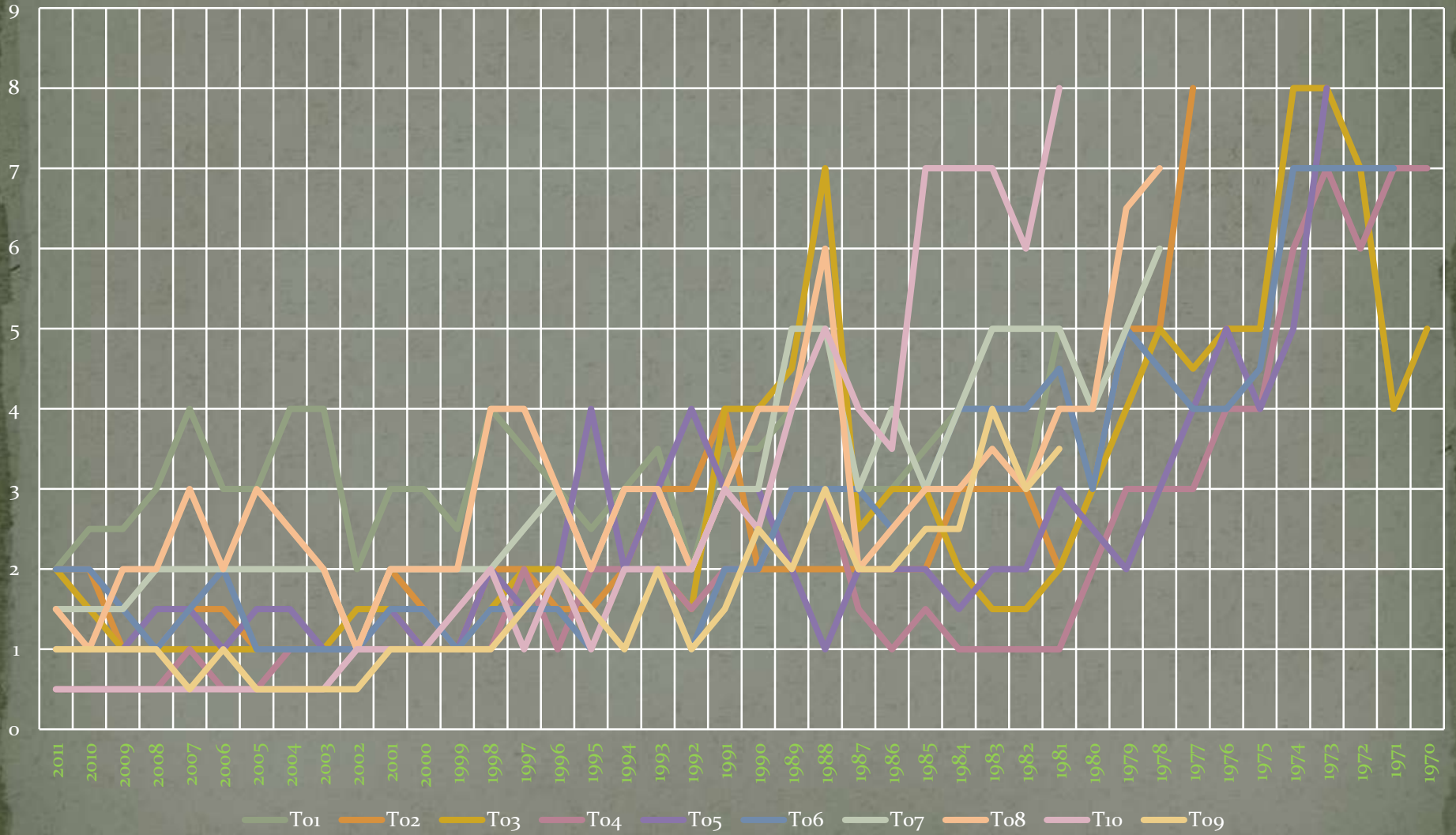


Daruvar 10





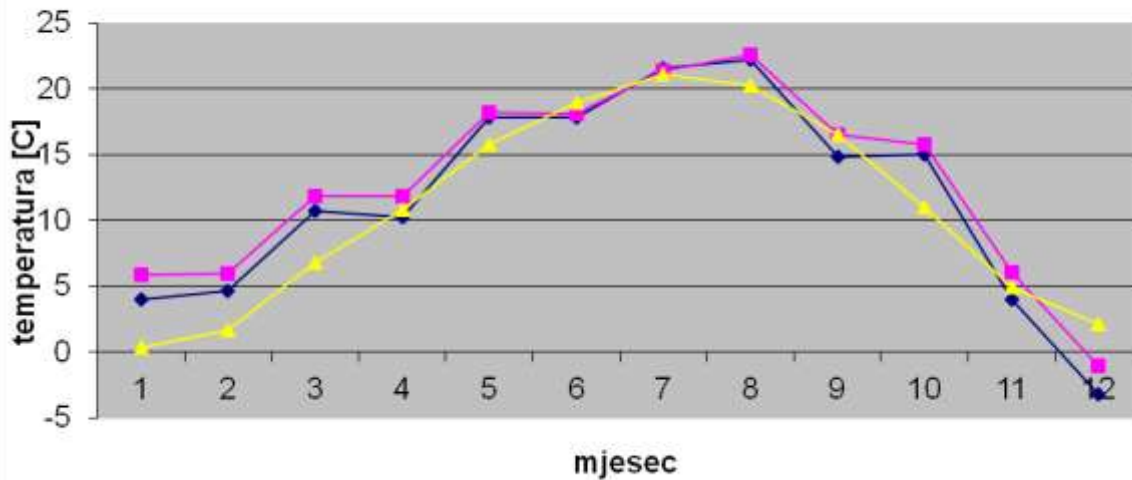
# Tree ring width/mm





DATE	LAT	LON	ELEV	SCHOOL	SITE	TCUR	TMAX	TMIN	
20010801	455.975	172.214	170	3c1RvNI	ATM-01	28	33	16	24,5
20010802	455.975	172.214	170	3c1RvNI	ATM-01	27	32	16	24
20010803	455.975	172.214	170	3c1RvNI	ATM-01	29	34	18	26
20010804	455.975	172.214	170	3c1RvNI	ATM-01	32	37	19	28
20010805	455.975	172.214	170	3c1RvNI	ATM-01	25	29	20	24,5
20010806	455.975	172.214	170	3c1RvNI	ATM-01	22	26	18	22
20010807	455.975	172.214	170	3c1RvNI	ATM-01	26	30	15	22,5
20010808	455.975	172.214	170	3c1RvNI	ATM-01	27	32	15	23,5
20010809	455.975	172.214	170	3c1RvNI	ATM-01	26	34	16	25
20010810	455.975	172.214	170	3c1RvNI	ATM-01	32	37	18	27,5
20010811	455.975	172.214	170	3c1RvNI	ATM-01	15	18	14	16
20010812	455.975	172.214	170	3c1RvNI	ATM-01	19	23	9	16
20010813	455.975	172.214	170	3c1RvNI	ATM-01	21	26	8	17
20010814	455.975	172.214	170	3c1RvNI	ATM-01	23	29	11	20
20010815	455.975	172.214	170	3c1RvNI	ATM-01	26	31	14	22,5

Srednje mjesečne temperature za 2001. godinu



26	31	15	23
26	31	15	23
26	32	16	24
27	33	15	24
27	33	17	25
23	29	19	24
21	27	17	22
23	28	17	22,5
23	25	16	20,5
24	30	15	22,5
27	31	16	23,5
26	31	16	23,5
19	22	17	19,5
21	27	14	20,5
21	25	8	16,5
16	19	12	15,5



# Climatic influence on growth

- Generally, *pinus nigra* can grow on extreme sites and has good response to climate. It tolerates summer droughts and high temperatures but doesn't tolerate drought during early spring well. Summer sunshine is tightly connected with moisture stress in trees, so the width of annual tree rings is under the influence of the direct and interactive effects of sunshine duration.
- It generally reacts positively to January –April temperatures. There is significant negative correlation with mean June-August sunshine hours. The June-July period is the most important part of the growing season for the tree ring formation because of the moisture stress.
- To conclude, black pine experiences good growth after a warm but also moist spring, especially when followed by a cool and moist summer. If the summer is hot and dry, pine trees react negatively because of drought conditions and stops growing.



- Generally, most samples taken from two representative locations of Orašje and Dubrava are relatively complacent and show low degree of annual variation.
- The rings are roughly the same for many years consecutively and limiting growth factor is not variable from year to year.









# Other factors influencing growth

- fires, pollution, erosion, landslides
- very local in effect





# Other factors

- Other negative events are mostly sporadic and probably related to individual tree stress such as heavy snow causing damage to branches and crown or certain disease or blight.
- During our field visits to both locations we spotted many forked and damaged trees which are direct results of mechanical damage caused by severe winter weather conditions.





# Project presentation in the school

## Projektni dan

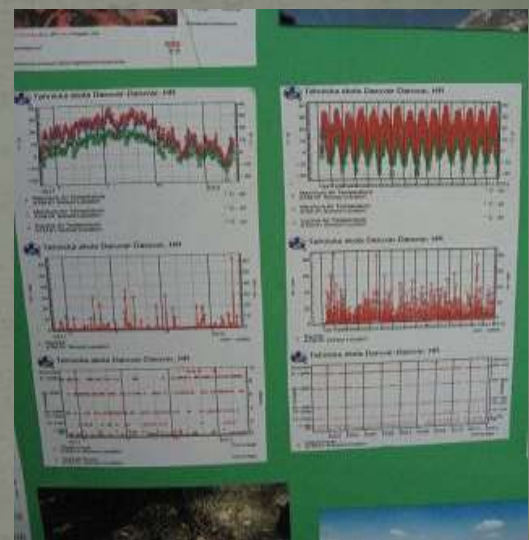
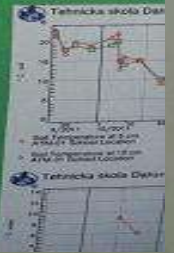
U školi provodimo projektni dan kojim pokušavamo zainteresirati učenike da se priključe GLOBE programu.

Nastojali smo provesti što više mjerenja: određivanje GPS koordinata, određivanje piksela, procjena visina drveća, određivanje pokrivenosti tla i krošnje te ostala hidrološka i geološka mjerenja prema GLOBE programu.



## THE TREE RING PROJECT (PROJEKT GODOVI)

- škola se uključila u međunarodni Projekt Godovi, kojem je cilj suradnja učenika, učitelja i znanstvenika na temu dendroklimatologije i dendrokronologije
- u projektu sudjeluju 24 osnovne škole iz 3 države: Norveške, Češke i Hrvatske
- Tehnička škola Daruvar je partner Osnovnoj školi u gradiću Pomezi u Češkoj
- učenici 2.pt i 1.pt su uspostavili komunikaciju e-mailom, te razmjenjuju znanja i iskustva
- uzorkovani su primjerci crnog bora, te analiza godova





# Thank you for your attention!



Technical school Daruvar team

[www.tsd.hr](http://www.tsd.hr)