# 14. Invent Yourself: Dendrochronology

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Bulgaria

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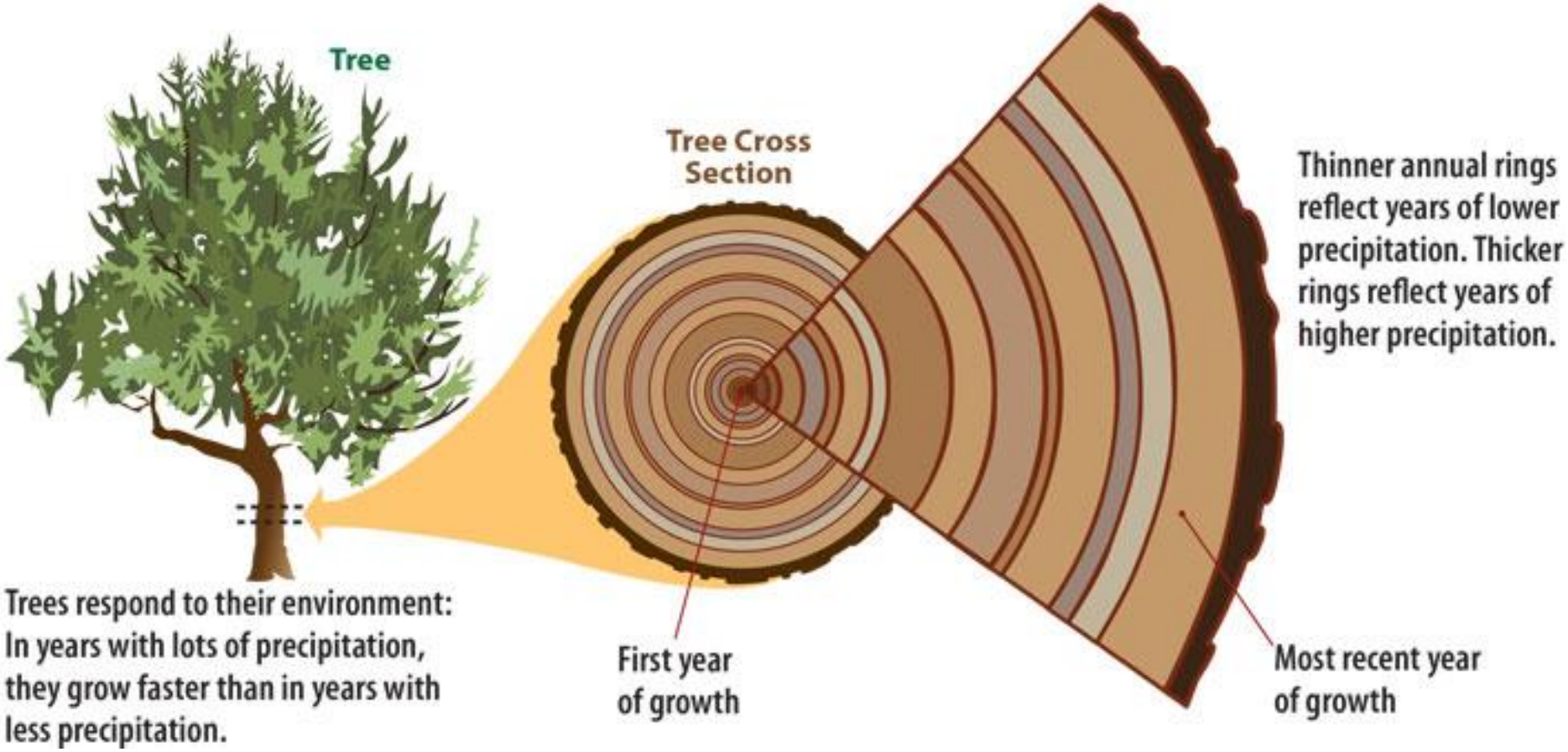
# Summary

# 1. Problem statement

**The process of tree sampling and sample analysis was studied and conclusions were drawn.**

# 2. Introduction

**Dendrochronology** – a scientific method of dating tree rings in order to establish the exact time in history when they were formed which helps understanding the atmospheric conditions and events in that time and place.



# 2. Introduction

**Dendrochronologists** establish a tree ring library from many samples of living trees from specific geographic areas. Based on this library they can then date wood originating from paintings, ships, houses and others and help in understanding in which period of time and in which geographic area they were made.

# 2. Introduction

**Obtaining a sample from a living tree:**

- cut the tree across the stem and obtain a cross-section (destructive method)

- using a hand borer to obtain a core from the tree (non-destructive method)

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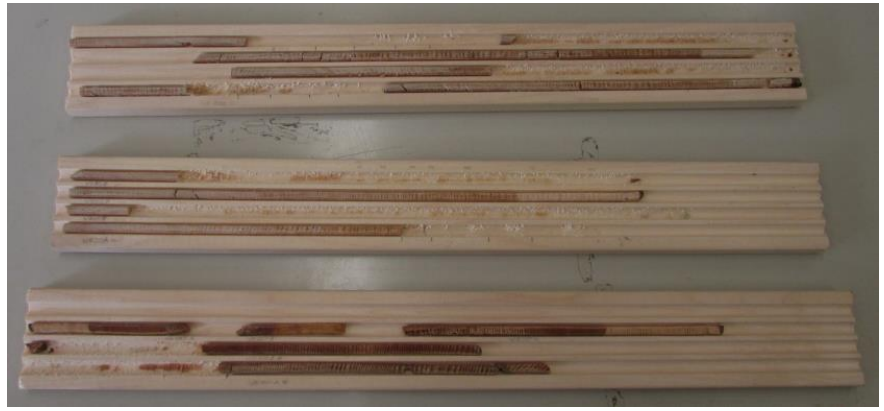
**Preparing the core sample**

- embedding the sample in a core mount
- sanding of the cores until a flat and smooth surface is obtained



# 3. Materials and methods

Samples from ***Pinus nigra*** trees **(black pine)** found in south-west Bulgaria.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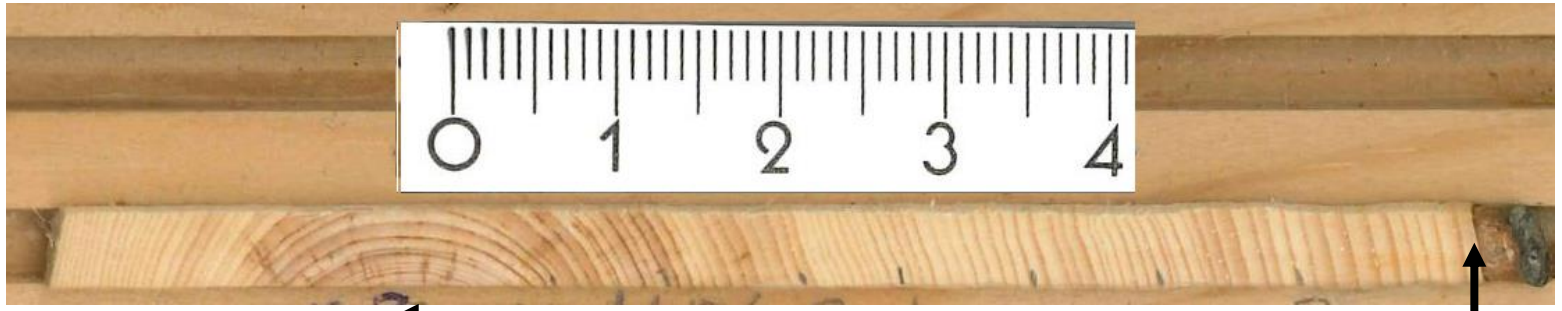
**Scanned samples from *pinus nigra* trees:**


Counting and measuring of the width of tree rings was performed on 4 samples.



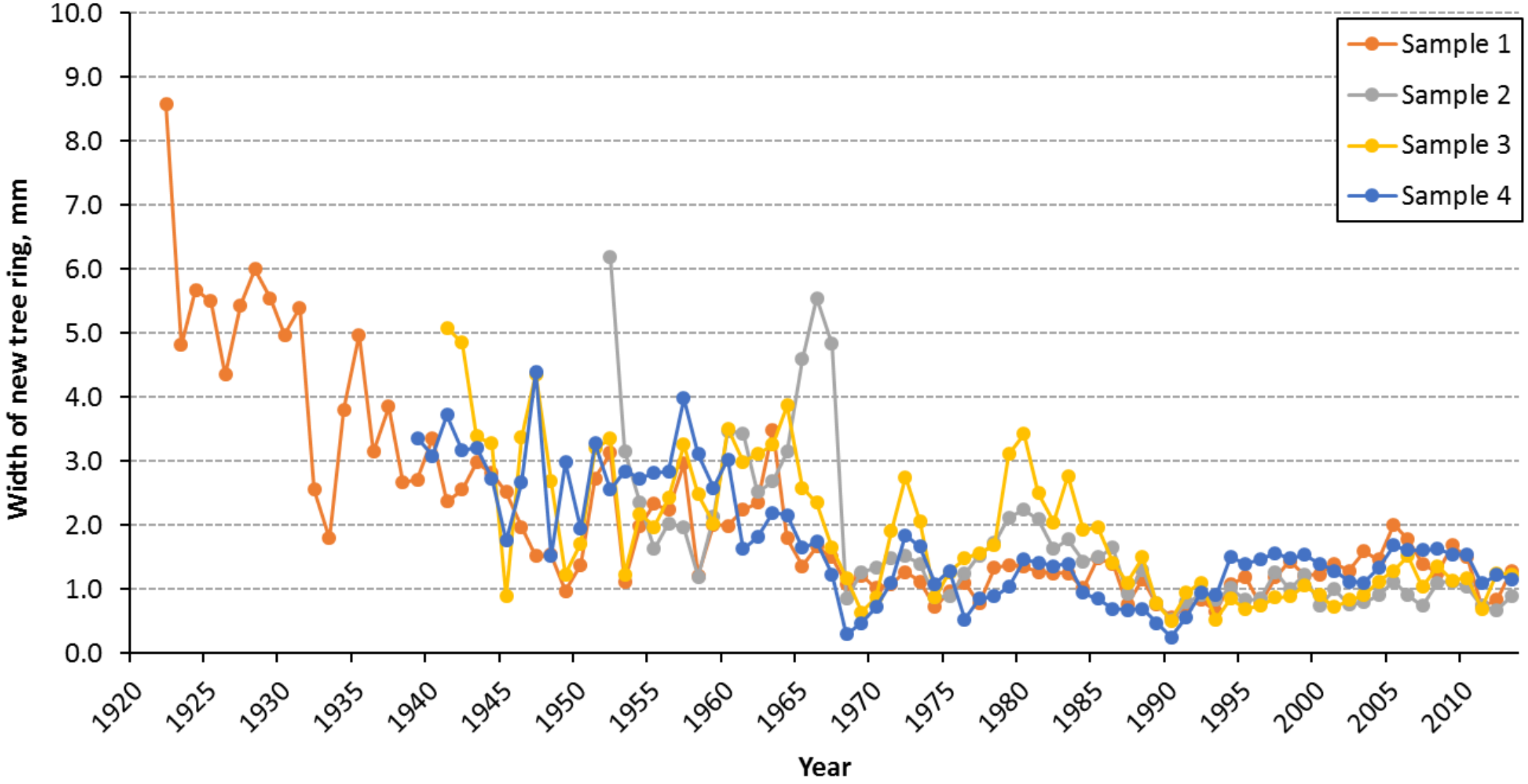
counting the rings back – tree was born in 1939

sample was taken in 2013

# 4. Experiment

Sample 1 – 91 years old
Sample 2 – 61 years old
Sample 3 – 72 years old
Sample 4 – 74 years old

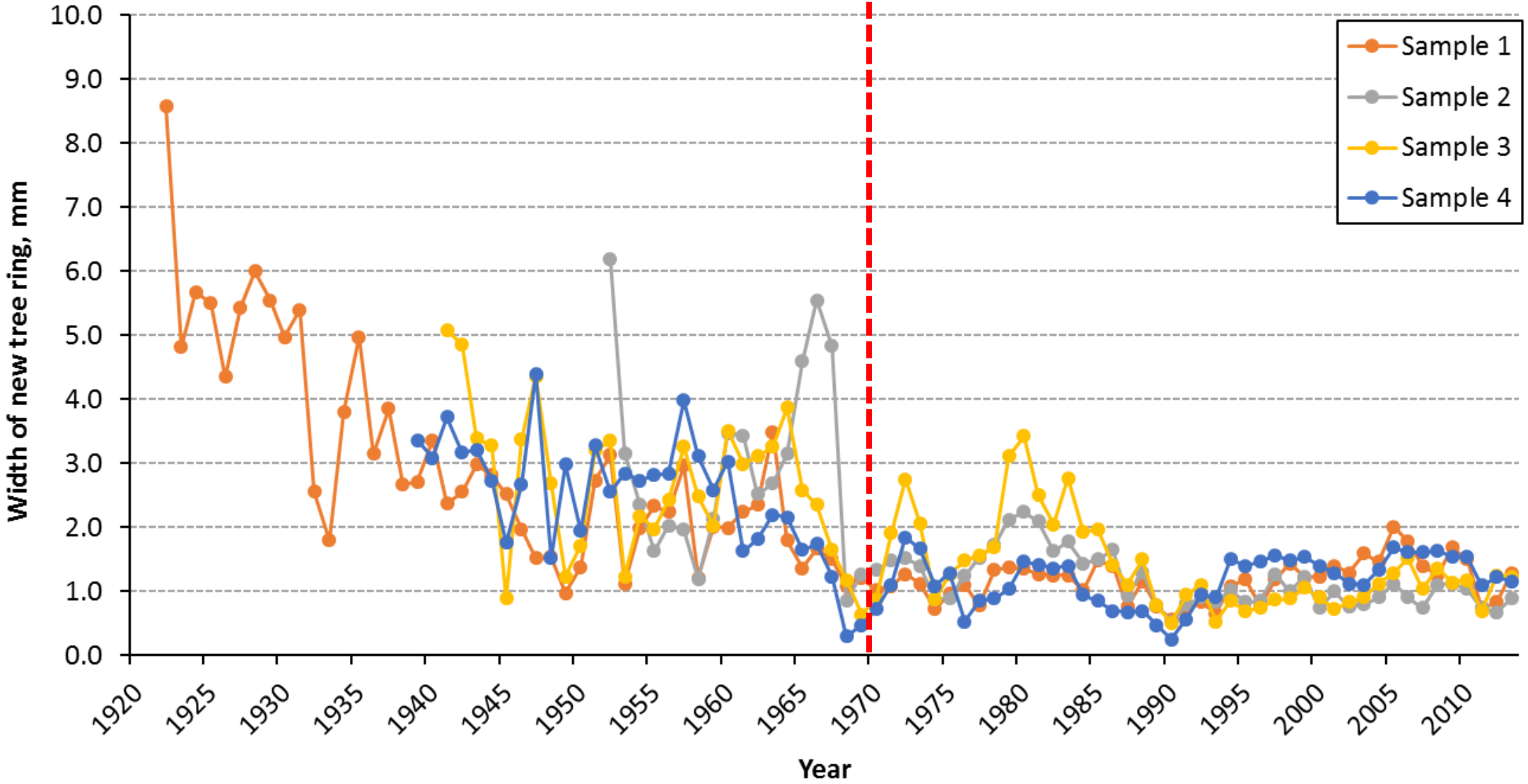
## We obtained this graph of growth of tree rings over time:



# 5. Results

tree ring width typically **above 2 mm** per year

tree ring width typically **less than 2 mm** per year



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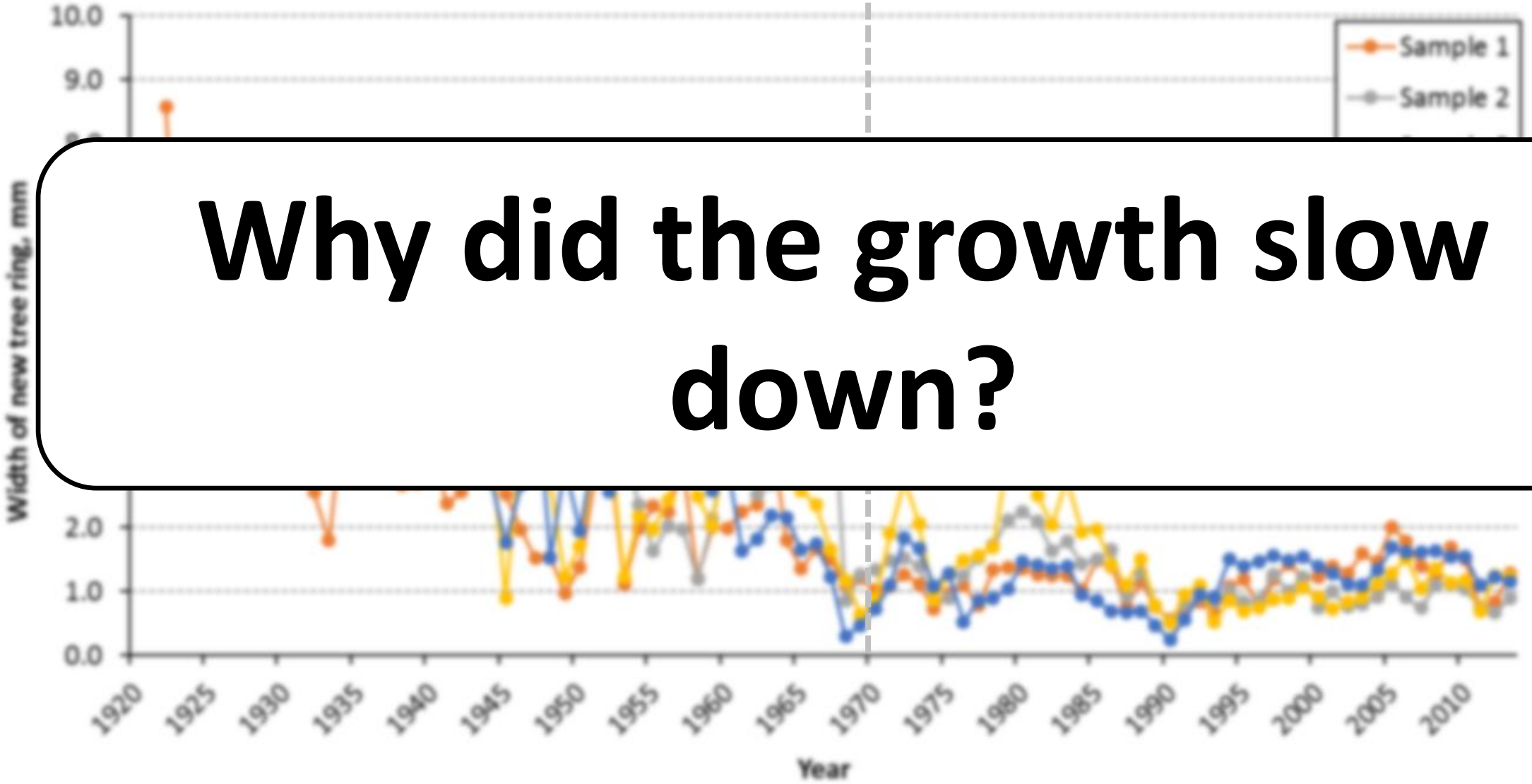
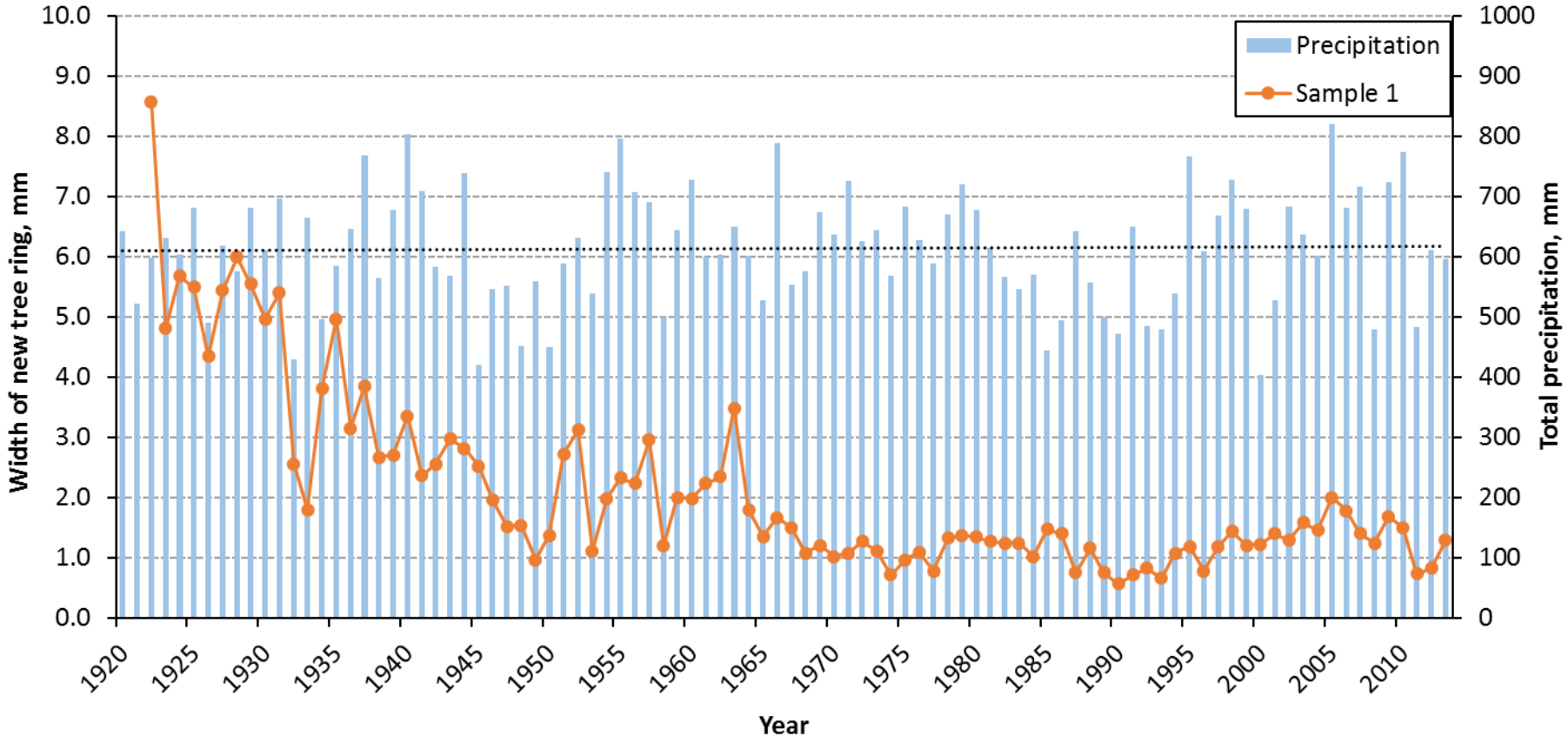



**Why did the growth slow down?**

# 5. Results

**Comparison of growth of trees with <u>rainfall</u> over time in Bulgaria** (example on sample 1)**:**

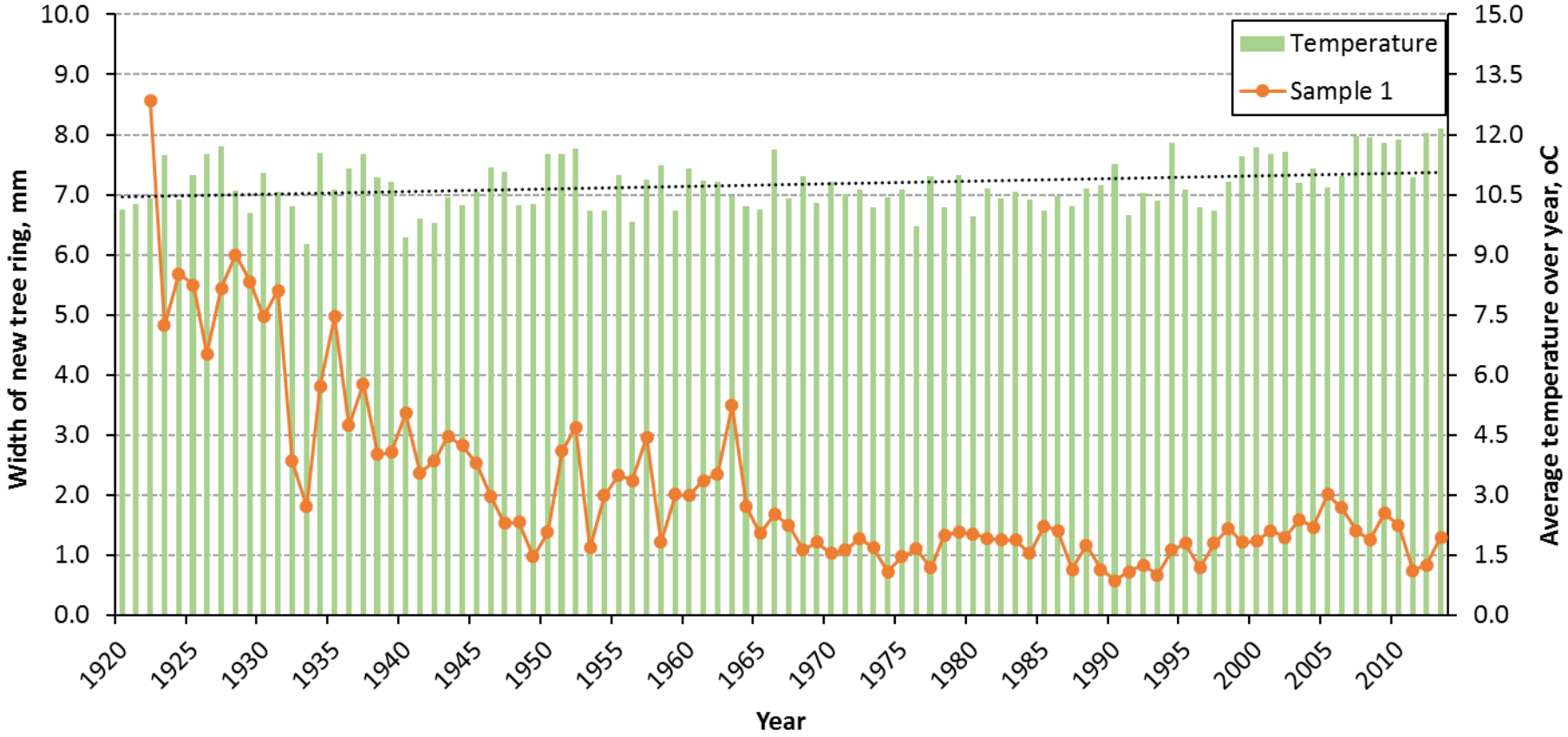



The rainfall over time has not changed drastically over the years, but:

- 1931 – total precipitation of 700 mm and ring growth of 5.5 mm
- 2002 – total precipitation of 680 mm and ring growth of 1.3 mm

# 5. Results

**Comparison of growth of trees with average <u>temperature</u> over time in Bulgaria** (example on sample 1)**:**




The average temperature in the country is showing an increasing behavior. Trees grow actually faster when the temperature is higher. But extreme heat will slow down the growth and increase moisture loss.

# 6. Conclusions

It is known that the Earth’s temperature is rising and that the climate changes globally due to human activity. We could observe some of these changes on the growth of tree samples collected in Bulgaria.

In Bulgaria the industrialization started around the 1950’s and we can assume that the effect of climate change shows later (after 1970).

We could conclude, that one of the reasons for slower tree growth in recent years is the climate change and the extreme hot and cold temperatures.

# THANK YOU FOR YOUR ATTENTION!

## Used literature

[1] http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisCCode=BGR
[2] http://www.conifers.org/pi/Pinus_nigra.php
[3] https://www.bg-istoria.com/2012/12/18-40-50.html
[4] K. D. Naydenov, F. M. Tremblay, N. J. Fenton, A. Alexandrov, Structure of Pinus nigra Arn. populations in Bulgaria, Biochemical Systematics and Ecology 34 (2006) 562

Special thanks to the University of Forestry, Bulgaria for providing the samples and teaching us about dendrochronology!

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