

1. PHD PROJECT DESCRIPTION (4000 characters max., including the aims and work plan, all in English)

Project title: Intra annual density fluctuations in wood- what we know about atypical radial growth

- 1.1. Project goals:** Intra-Annual Density Fluctuations (IADFs) can be considered as tree-ring anomalies that can be used to better understand tree growth. We want the answer the question whether IADFs, in temperate climate, resulting from a prompt adjustment to fluctuations in environmental conditions to avoid stressful conditions and/or to take advantage from favorable conditions?

- 1.2. Outline:** In the current research project we will use a collection of the 1500 samples taken in years 1999-2018 and deposited at the Department of Ecology and Biogeography, Faculty of Biological and Veterinary Sciences. Using this samples 4 papers were published in years 2006-2013. However in the previous studies only the tree-ring widths were considered. Atypical growth called Intra-Annual Density Fluctuation is currently under the interest because of the climate change and its impact on forest, especially drought effect. PhD student will analyse this growth using the classification proposed by Campelo et al. (2012). On the selected samples the micro-anatomical wood analysis were prepared in order to identify climate or site parameters affected wood growth.

- 1.3. Work plan:** Student will visually identify atypical growth on the collected samples and next will prepare statistical analysis according the methodology proposed by Klisz et al. (2016). Next on the selected samples PhD student will prepare micro-sections in order to study effect of temperature and precipitation on atypical growth.

- 1.4. Literature**

Battipaglia, G., Campelo, F., Vieira, J., Grabner, M., De Micco, V., Nabais, C., Cherubini, P., Carrer, M., Bräuning, A., Čufar, K., Di Filippo, A., García-González, I., Koprowski, M., Klisz, M., Kirdeyanov, A. V., Zafirov, N., de Luis, M., 2016. Structure and Function of Intra–Annual Density Fluctuations: Mind the Gaps. *Front. Plant Sci.* 7.

Campelo, F., Nabais, C., Carvalho, A., Vieira, J., 2016. tracheideR—An R package to standardize tracheidograms. *Dendrochronologia* 37, 64–68.

Klisz, M., Koprowski, M., Ukalska, J., Nabais, C., 2016. Does the Genotype Have a Significant Effect on the Formation of Intra-Annual Density Fluctuations? A Case Study Using *Larix decidua* from Northern Poland. *Front. Plant Sci.* 7.

Vieira, J., Campelo, F., Nabais, C., 2009. Age-dependent responses of tree-ring growth and intra-annual density fluctuations of *Pinus pinaster* to Mediterranean climate. *Trees-Struct. Funct.*, 23, 257–265.

- 1.5. Required initial knowledge and skills of the PhD candidate: Master in Biological Sciences, Earth Sciences or Forestry. Exceptionally, finished last year of abovementioned master studies.

- 1.6. Expected development of the PhD candidate's knowledge and skills: PhD candidate will be working in the international team of the Department of Ecology and Biogeography. I expect her/his strong development in communication with other scientists, presentation, interpretation and critical analysis of the results. This international atmosphere will let her/him with strong self-confidence apply in the future for position in the research projects or for grants.