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International Summer School “Plant Ecology and Digital Wood Anatomy” in Siberia, Russia



The Siberian Federal University (SibFU), together with the Swiss Federal Institute of Forest, Snow and Landscape Research (WSL) and the Khakass Technical Institute, organized the International Summer School “Plant Ecology and Digital Wood Anatomy” for the first time in Russia. The School was held at Shushensky Bor National Park, Siberia, from the 1st to 8th of August 2016, and was attended by almost fifty participants, including early stage researchers from Azerbaijan, Kyrgyzstan, Italy, Poland, Spain, Switzerland and Russia, employees from protected natural territories in Siberia, and a group of high school students from Abakan (Fig. 1).

Because of the importance of the event for the region, the Minister of Education and Science of the Republic of Khakassia, the heads of Universities and of the National Park, as well as the Chief Engineer of the Sayano-Shushenskaya hydroelectric power plant were present to warmly welcome the participants. During the School, leading scientists in the field (Prof. F.H. Schweingruber and Dr. P. Fonti WSL, Switzerland; Prof. E.A. Vaganov, Prof. N.V. Stepanov and Prof. V.V. Shishov, SibFU, Russia, and Dr. A. Crivellaro, University of Padua, Italy) presented the state of the art in dendroecology and wood anatomy.

The work program was very full and included daily trips to the wild nature for sampling wood and observing ecological features of the region. There were also theoretical and practical classes introducing the methods of dendroecology, digital xylem anatomy and their applications in ecological research. Participants had the option to participate in one of two focus groups, “Plant Ecology” or “Digital Wood Anatomy”.

The goal of the Plant Ecology group was to demonstrate the ecological and anatomical diversity of wood. During excursions to pine forest steppes, steppes on limestone and granite, and mountain forests, participants learned to describe ecological conditions and to take cores from stems, shoots and roots of different dicotyledonous plants. In the laboratory, the material was sectioned and prepared for microscopic examination. Macroscopic and microscopic analyses and their combination with environmental data clearly showed the importance of dendrochronological dating and the staining of slides. Intensive discussions within small groups were concluded by the presentation of preliminary results to the whole audience.

The second group was introduced to the methods and applications of quantitative (digital) wood anatomy. A dataset of anatomical features of tracheids of *Larix sibirica* Ledeb. growing close to the School was provided to the participants to develop their



Fig. 1. Participants of the International Summer School “Plant Ecology and Digital Wood Anatomy”. Photograph by O. Semenova.

own research projects. The dataset included Roxas measurements (<http://www.wsl.ch/dienstleistungen/produkte/software/roxas/index.EN>) of images from core micro-sections of 30 annual rings from 8 trees, and the site description and daily weather records from the nearest weather stations. Additionally, the participants had the opportunity to practice preparing micro-sections and acquiring images using several types of microtomes, microscopes with digital cameras and an image analysis system. The research topics included i) the applications of intra-annual climate-growth relationships, ii) the analysis of tracheid structure-function relationships and their dependence on climate conditions with a focus on intra-annual density fluctuation, iii) the parametrization of the Vaganov-Shashkin model via VS-oscilloscope to simulate tree-ring growth and identify the factors limiting growth, iv) and the application of a novel tracheid-based model to assess the hydraulic versus mechanic trade-off and its climatic variability. The participants demonstrated great interest, as well as initiative and creativity in their data analyses.

Many excellent poster and oral presentations were given in the last half day. Evening talks by established scientists enriched the class. For many participants, it was a challenge to communicate in English; however, it was just great to see how easy it was to bridge cultural and language barriers. Thus, the school served as a platform for professional communication, informal exchange of experiences and the development of new partnerships. Joint excursions to the Sayano-Shushenskaya hydroelectric power plant, Shushensky Bor National Park, Arboretum "Berendey" and the outdoor museum promoted a friendly, collegial atmosphere. Thus, the school was a significant event in the lives of its participants, who took home many beautiful pictures, positive, lasting emotions and kind memories.

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