

AMERIDENDRO 2016

Third American Dendrochronology Conference

Monday March 28 - Friday April 1, 2016, Mendoza, Argentina



Organizing institutions

IANIGLA



CONICET

U.N. CUYO
GOBIERNO
DE MENDOZA



Tree-Ring Society

Sponsors



FUNDACIÓN
WILLIAMS



Ministerio de Agroindustria
Presidencia de la Nación



MENDOZA
ARGENTINA

mpgarcia@ujed.mx

Dendroecology: ECO-P-25 - Main Hall

Forest ecosystems have an important role in the global carbon cycle, so it is necessary to understand their dynamics of carbon uptake, which it depends on the temporal and spatial variation of tree growth and this linked with climatic variability. Sierra Madre Occidental is the lung of the north of Mexico with mixed conifers; however the studies of carbon accumulation over a lifetime appear incomplete for these forests. Here, we analyze the variations of trunk carbon in two populations of *Pinus cooperi* situated on different elevation gradients, using intra-annual wood density from X-ray densitometry, and their response to climatic factors. Wood cores were extracted by increment borer and processed using the classical methodology of dendrochronology. Carbon sequestration (50% biomass) was estimated from specific allometric equation for the species based: (i) wood density values each 0.04 mm and (ii) diameter reconstruction. Results showed that the population with more elevation had greater wood density, basal area, and hence, carbon accumulation. The influence of climatic variability on maximum density chronologies showed positive correlation with precipitation and Multivariate ENSO Index during winter season, and negative correlation with maximum temperature during spring season. We concluded that the carbon dynamics, based on the temporal variability of wood density, represents a significant improvement over previous studies on carbon sequestration, which can be used for environmental mitigation strategies, such *P. cooperi*, industrial species widely used in northern Mexico for its mechanical properties.

Conduit-size based comparison of present and past tree height growth rates at two treeline sites in the AlpsPRENDIN, A.L.¹; BUTTÒ, V.¹; CASTAGNERI, D.¹; CARRER, M.¹; FONTI, P.²; VON ARX, G.²; PETIT, G.¹

1 Department TeSAF, Università degli Studi di Padova, Italy; 2. Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

angelaluisa.prendin@studenti.unipd.it

Dendroecology: ECO-P-26 - Main Hall

The lumen diameter of newly produced xylem conduits is considered a good indicator of tree-height since it increases with distance from tree top according to a "universal" pattern driven by biophysical constraints. This pattern also shows in tree-rings, where conduit lumen diameter increases along with cambial age according to a power-like trajectory that levels off when maximum tree height is reached. We therefore believe that the comparison of time series of conduit lumen diameter in treeline trees of various age and epochs could offer new perspectives in studying treeline dynamics and tree height growth responses to climate change. In this poster we will present results from a conduit anatomical study investigating potential changes in present and past rates of tree height growth at Alpine treeline in the wake of global warming. More specifically, we analyzed trajectories of hydraulic conduit diameter (Dh) with cambial age in 52 young (<50 years) and old (>250 years) *Larix decidua* and

Picea abies individuals growing at two alpine treeline sites in Italy and in Switzerland in order to compare the height growth rate during their respective juvenile period. The Dh trajectories of young spruce trees with cambial age increased stronger than the one of old spruce trees at the Italian site. The same pattern was found in the larch trees at the Swiss site, while Dh trajectories did not differ between young and old trees in larch at the Italian, and spruce at the Swiss site. Our results suggest an increased height growth rate in recent time, which might be accompanied by an upwards shift of current tree-line. However, the species- and site-specific responses of height growth to climate change indicate that the benefit from warmer temperatures might be counterbalanced by other factors (such as soil properties, competition, etc.) under some conditions.

ROXAS - Quantifying xylem anatomy in angiosperms and conifersPRENDIN A.L.¹; VON ARX, G.²

1. Department TeSAF, Università degli Studi di Padova, Italy; 2. Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

angelaluisa.prendin@studenti.unipd.it

Wood anatomy of tree rings: WOA-P-04 - Main Hall

Tree-ring anatomical features such as conduit size, density and cell wall thickness are nowadays recognized as valuable archives of past growth conditions. Compared to ring width that integrates conditions over an entire growing season, tree-ring anatomy, i.e. the analysis of anatomical features in time series of decades to centuries, can provide information about past growth conditions in an intra-annual resolution. Despite these promising perspectives, the wide use of tree-ring anatomy has been mostly limited by technical constraints, because measuring anatomical features is often very cumbersome and time consuming. This is why time series of wood anatomical features have been either short or based on a small subset of the sample such as a few radial files. In this poster we present ROXAS: a specialized image-analysis tool that has been developed to overcome many of the previous constraints. ROXAS can be used for angiosperms and conifers, for (circular) branch and root samples as well as (linear) tree cores. It is designed to process large images of large samples and produce output for all conduits, even in conifers (up to 1,000,000 tracheids per sample). After automatic recognition of conduits and (with some limitations) ring borders, the user can efficiently improve the automatic output directly in the image. Besides the ring width and lumen area and position of conduits, data output includes, many additional parameters such as size distribution of conduits, mean hydraulic diameter (Dh), position within the ring, theoretical hydraulic conductivity, conduit grouping (angiosperms), cell wall thickness for all conduits (conifers) and Mork's index. ROXAS can be obtained at www.wsl.ch/roxas for free within the scope of the user policy, but depends on the commercial software Image-Pro Plus.

Dendroecology of *Gymnanthes klotzschiana* Müll. Arg. trees, naturally growing in Northern Uruguay.PROFUMO, L.¹; GALVÃO, F.²; BOTOSSO, P.³

1. Associate Professor, Complex Territorial Systems Department, Centro Universitario de Rivera, Universidad de la República 1; 2. Senior Professor, Forestry Science Department, Universidade Federal do Paraná; 3. Researcher, Empresa Brasileira de Pesquisa Agropecuária - EMBRAPA - Florestas.

ludendrofila@gmail.com; lprofumo@cur.edu.uy

Dendroecology: ECO-P-27 - Main Hall

Forests in Uruguay have marginal distribution, covering just 3% of the country land surface. Nevertheless, they are extremely important in the conservation of the quality of water as a *primus inter pare*, in an extended list of environmental services. The pampas or grasslands are the prevalent biome, extending from south Brazil, the hole of Uruguay's territory, to northeast of Argentina. In an intent to contribute with knowledge of ecological behavior of some forest species, this research's objective was to identify the bioindicator's potential of *Gymnanthes klotzschiana* to express the environment dynamics, from the analysis of their annual tree ring growths, in two sub-basins: Paso Vargas (30°58'58.3"S - 55°37'56.10"W; 185 ma.s.l.) and Platón (31°01'17.2"S - 55°42'26.60"W; 190 ma.s.l.). The lowland forest was stratified into geomorphologic surfaces, where they were established physical and chemical soil characteristics. For the diagnosis of the growth rings were collected sample discs, at breast height, of 43 adult trees of *G. klotzschiana*. The samples were prepared and analyzed using dendrochronological procedures, generating four series of radii by each disc. The radii that showed correlation values with the master series higher than the average were selected for a second synchronization. Thus, 97 have been used for constructing final master series. There was positive correlation between the annual cumulative rainfall of the precedent year, for one of the sub-basins, ranged from 0.34 to 0.71 (P 0.13 to 0.0005). There was no correlation between tree rings series with the average minimum annual and monthly temperature, nonetheless negative correlation occurs with the average maximum temperature of November and December, ranging between -0,15 to -0,26 for Paso Vargas and -0.12 to -0.61 for Platón. The quality of the chronologies of *G. klotzschiana* show potential for being explored from the climatic stand point in Uruguay.

The potential use of *Pilgerodendron uviferum* tree-ring dating in the historical interpretation of the churches of Chiloé, World Heritage.

PUCHI, P.¹; MUÑOZ, A.A.¹; GONZÁLEZ, M.E.²; ABARZÚA, A.³; ARAYA, K.⁴; TOWNER, R.⁵; FITZEK, R.⁶; HOLZ, A.⁷; STAHL, D.⁸

1. Laboratorio de Dendrocronología y Estudios Ambientales, Instituto de Geografía, Pontificia Universidad Católica De Valparaíso; 2. Universidad Austral de Chile, Instituto de Conservación, Biodiversidad y Territorio, Valdivia, Chile; 3. Universidad Austral de Chile, Instituto de Ciencias Ambientales y Evolutivas, Valdivia, Chile; 4. Fundación Amigos de las Iglesias de Chiloé, Ancud Chile; 5. University of Arizona, Laboratory of Tree-Ring Research, Arizona, USA; 6. Fundación San Ignacio de Huinay, Chile; 7. Portland State University, Department of Geography, Portland, USA; 8. University of Arkansas, USA

paulinapuchi@gmail.com

Dendroarchaeology: ARC-P-03 - Main Hall

Chiloé Churches are the oldest and most unique wood structures in Chile. Chiloé islanders adapted European colonial techniques and developed unique regional construction styles when building these UNESCO recognized community and religious centers. Although these historical treasures are preserved, much of the construction history of these churches remains unknown. Tree-ring dating is a proven archeological dating method used to identify the construction dates of historical buildings. The majority of Chiloé churches were constructed using *Pilgerodendron uviferum* wood, therefore, the objective of this study was evaluate the potential use of this species to date timber found at Vilupulli and Ichuac Churches. Timber from both structures was successfully cross-dated using three regional multi-century long *P. uviferum* tree-ring site chronologies located in the Chiloé region. Two samples from pillars located in the tower of Vilupulli contained 311 and 181 tree-rings, while four samples with 79, 89, 97 and 135 annual growth rings were obtained from floor beams in the Ichuac. Timbers used to build the Vilupulli tower cross-date to 1918 and corroborate colloquial knowledge that the structure was built in the early 20th century. Dates obtained from floor beams in Ichuac range from 1920-1929, and contradict the colloquial thinking that the structure was built at the end of the 19th century, yet could constitute material used in a later restoration not previously recorded in Ichuac's history. These findings conclude that *P. uviferum* presents strong potential for further use in tree-ring dating of important historical structures located in the temperate region of Southern Chile.

A dendrochronological assessment of snow avalanche events in Río de Las Vueltas, Santa Cruz, Argentina

RADINS, M.; AMOROSO, M.; BIANCHI, L.; BONADA, A.; MARCOTTI, E.; RODRIGUEZ PALMIERI, M. P.; VILLALBA, R.

IANIGLA-CONICET, Mendoza, Argentina.

mradins@mendoza-conicet.gob.ar

Dendroecology: ECO-P-28 - Main Hall

Snow avalanches are a common disturbance that affects large portions of the *Nothofagus pumilio* subalpine forest in the southern Patagonia Andes. However, detailed studies of avalanches are hampered by the lack of historical records in the region. In this context, tree-ring derived reconstructions of avalanche events are a valuable alternative to analyze the influence of this disturbance on the structure and composition of the *N. pumilio* forests. In this contribution, we present recent advances in avalanche reconstructions in the Río Toro and Río Milodón valleys, in the Las Vueltas basin, Santa Cruz, Argentina. Our reconstruction is based on 312 cross-sections and increment borer samples. The year of each event was determined by dating scars and abrupt growth releases and suppressions related to avalanches. Avalanches were found to be frequent over the past 100 years, when 10 major events were identified. The most intensive avalanches were observed during the years: 1966, 1971, 1985, 1998, 2002 and 2012. The occurrence of avalanches since 1965 coincided with years of abundant winter precipitations. Avalanches took place in both valleys during the