Geophysical Research Abstracts
Vol. 16, EGU2014-258, 2014
EGU General Assembly 2014

North Patagonia climate over the last millennium inferred from variations in tree-ring width and isotopic composition

Aliénor Lavergne (1,2), Ricardo Villalba (2), and Valérie Daux (1)

(1) LSCE,Gif-sur-Yvette,France (alienor.lavergne@lsce.ipsl.fr; valerie.daux@lsce.ipsl.fr), (2) IANIGLA, Mendoza, Argentine (ricardo@mendoza-conicet.gob.ar)

To disentangle natural variability from man-induced climate changes, current climatic trends should be placed in a longer perspective. Tree-rings provide a wealth of information on past climates with high-resolution records covering up to thousands years. Recent tree-ring studies have highlighted the divergence phenomenon in Northern Hemisphere forests. At some temperature-limited northern sites, tree growth responses to climate during recent decades have changed, raising concerns about the quality of historical climate reconstructions based on tree-ring widths. This shift in the eco-physiological response of trees to climate has not yet been documented in the Southern Hemisphere. The aim of this study is to present the tree-ring evolution over the last centuries in northern Patagonia (southern South America; 41˚10'S-71˚50'W) in order to assess 1) divergence in tree-growth response to climate in recent decades, and 2) the potential of tree-ring parameters (width and δ^{18}O) to reconstruct temperature and atmospheric circulation patterns such as the Southern Annular Mode (SAM).

Based on quality and extent, instrumental temperature records across North Patagonia (39˚-41˚S) were selected for comparison with tree-ring records. Detection and correction of series inhomogeneities were conducted using HOMER software. A set of homogenized temperature data was developed for the period 1901-2013. Increment-borer samples from *Fitzroya cupressoides* and *Nothofagus pumilio* were collected along the regional precipitation gradient from the wet Valdivian rainforest to the mesic Patagonian forests during the austral summer of 2013. Six sampling sites (2 for *Fitzroya*, 4 for *Nothofagus*) along the gradient were established to maximize differences in tree-growth responses to climate and to assess the effect of precipitation on the responses. More than 500 cores were cross-dated, detrended and indexed. Composite tree-ring index (TRI) chronologies of *F. cupressoides* and *N. pumilio* extending from the late 9^{th}century to 2011 were developed. Variations in ring widths were compared between species and sites and correlated with climate parameters. The two *Fitzroya* chronologies show a long-term period of common variations in tree growth (r = 0.7-0.9, $p<0.005$) but diverge quite dramatically from 1975 onwards. The TRI from the wettest site is strongly related to previous summer (December-March) temperature (r =-0.5/-0.6). For the drier site, correlations are strong from 1901 to 1975, but decrease since then. For the *Nothofagus* chronologies, TRIs at the two intermediate sites along the precipitation gradient are well correlated to each other except for the interval 1945-1975. TRIs from the more distant *Nothofagus* sites are weakly associated. The strongest relationship between *Nothofagus* tree growth and temperature was recorded at the driest site during previous summer. δ^{18}O analyses for the last 60 years are currently being conducted. Correlation analyses and interpretation with δ^{18}O records are still in progress.