Tundra shrub willow ring-width chronologies along a latitudinal gradient in northeastern Alaska.

Laia Andreu Hayles, Postdoctoral Research Fellow, TRL-LDEO; **Kevin Anchukaitis**, Doherty Associate Research Scientist, TRL-LDEO; **Rosanne D'Arrigo**, Doherty Senior Scientist, TRL-LDEO.

Abstract

Satellite-derived indices of photosynthetic activity such as the Normalized-Difference Vegetation Index (NDVI) have already documented changes in northern forest growth patterns over recent decades. A shift in the sign of photosynthetic activity at the interface between boreal forest (negative slope) and tundra (positive slope) for sites in Alaska has been detected using this satellite vegetation data. Tree-ring data can be very useful for validating the large-scale vegetation dynamics obtained with satellite data. However, to date, the majority of studies based on tree-ring data in the Arctic have used coniferous and deciduous trees, whereas very few studies have exploited tundra shrub species for dendrochronology. The objectives of this project are: (1) to sample preferentially *Salix alaxensis* and *S. lanata* L., and secondly *S. arctic,* along a latitudinal transect in northeastern Alaska with the aim of developing one or several ring-width chronologies of tundra shrub willows; (2) to cross-date the samples at the laboratory using standard dendrochronological techniques and to build reliable statistical tree-ring width chronologies; (3) to establish size/age relationships for different species and/or sites and to assess tundra shrub willow growth rates and trends along the latitudinal gradient; (4) to compare the obtained tree-ring data with satellite observations for forest growth in the study region; (5) to investigate the growth-climate relationship of the tundra shrub willows in order to assess their potential for past climate reconstruction at the Arctic region. We will sample the largest willows at each site; we will seek out willows that are erect when possible, and that show the widest diameter. The location of every single willow (latitude and longitude) will be recorded with GPS, and size parameters such as height and diameter will be measured. For each individual a minimum of four slices between root collar and the upper canopy will be taken. Although the longevity of the willow is usually no more than 100 years, well-preserved dead wood material in the Arctic can eventually be cross-dated to extend the living chronologies back in time. These arctic shrubs could provide very valuable ecological data for a better understanding of arctic tree-line dynamics and growth rates in the tundra. Even more relevant, they can become sources of material for dendoclimatological analyses in the treeless tundra, greatly increasing the geographic distribution of areas where paleoclimatic reconstructions are possible to remote areas across the Arctic.