Project acronym: EnResClim

Project title: Environmental Response to Climate change – from cell to landscape level

Project leader: Jiří Lehejček, Jan Evangelista Purkyně University, Czech Republic

Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Uapishka research Station (Canada)

Our project aims to provide better understanding of complex environmental responses of vegetation to climate change. This is to be done from cell, over stand, to landscape level. Specific research objectives therefore are:

1. Intra-annual growth responses and adaptation of J. communis to climate change
2. Understand how interspecific factors and trade-offs modulate climate-growth interaction at transition between forest and tundra
3. Identify how climate change and large-scale circulations influence frequency and intensity of forest disturbances

We will establish two inventory plots per research aim around Uapishka research station. Ring width series of each sampled tree/shrub will be modeled using relevant process-based models – namely Vaganov-Shashkin and/or VS-Lite – to answer the first aim of the project. The models statistically decompose tree-ring width into daily/monthly growth segments and calculate growth intensity for each of those segments. Key environmental thresholds can be extracted for each tree/shrub from the outputs of the model. We have successfully applied this model on juniper shrub sites spanning over a large area but the sites representing western Atlantic are still missing.

To address the second aim (processes modulating climate-growth interaction at treeline) we will build site chronologies from trees and shrubs sampled on each inventory plot using standard dendrochronological procedures. The effect of climate on variability in tree-ring widths will be assessed by means of correlation analysis between chronologies and climatic data (monthly resolved temperature, precipitation and drought index). Differences between climate-growth responses of site chronology and individual chronologies based on specific

subsamples of trees will be interpreted according to ecological requirements of trees in different developmental stages.

To address the third aim of the project, we will utilize multiple tree-ring parameters for disturbance reconstruction, such as growth patterns, abrupt growth changes, resin ducts, reaction wood or death and establishment dates. The proper combination of these parameters provides a robust benchmark for detection of past disturbance frequency and intensity.