Dendrohydrology

Dendrohydrology is defined as the science that uses dendrochronology to investigate and reconstruct hydrologic processes, such as river flow and past lake levels. This process of dendrohydrology can give environmental engineers a form of tangible evidence towards predicting past and present variables in our environment. Here at PUCV we have studied these processes of dendrohydrology such as software programming as well as field work techniques.

To begin our understanding of dendrohydrology we first must dive into the field processes necessary to gather sample information. The first step of this it to bore a hole the trunk of the tree well past the center rings. If bored properly, using a steady hand and a perpendicular entry angle then these rings are an accurate representation of the tree’s history; as if we chopped the tree in half. Furthermore, the next step in this process is to take this sample to the laboratory to begin prepping it for analyzation.

To prepare our bored samples of the tree cores we must first glue them down on to a stable surface. In our case, this stable surface was a notched piece of wood rod. When gluing onto this wood rod it is particularly important to note that the grains of the sample must be perpendicular to how we place the sample. This perpendicular placement is necessary because the next step is to dry the sample and sand down the sample practically in half to have the most optimal view of the rings. In addition to our bored cores we also prepared cross sectional cuts of tree samples. The preparation process is done by sanding the samples starting with a very low grit and increasing to a higher grit level. Once these preparations are complete they are now ready to be microscopically analyzed.

Beginning with the bored tree core samples prepped and now ready for being analyzed, the next step of the process is to gather high resolution images for each of the samples so that we can count and measure the rings. We can utilize a software program called WinDENDRO to do the analyzation. The software program allows us to find linear paths following the grain directions of the samples. Measuring the distance between the rings with the program allows us to have a graph of the ring distances for the entirety of the trees lifespan. This graph can be uploaded into an excel software program to compare patterns among different bored samples within the same specified area. Following this we compare patterns to historical weather data such as air samples, pollution, and rainfall data. Regarding the cross-sectional tree samples the same process is applied however it is done by hand with a microscope rather than WinDENDRO. As one can imagine, if cross-dated properly this data that we have produced will give us a very close idea to variable patterns in a specific region which have happened up to the last 500 years.

Theoretically, if this process is done correctly and mapped out over a proper range of areas being studied; us engineers can map out variables we are studying over a graph of time we would not be able to reach without tree ring data. Some of these variables include weather patterns, pollutant potency, as well as river flow data. This data is very important because these maps over time give us scientists a tangible form of evidence to prove man made climate change. Therefore, our arguments with politicians regarding policy have a concrete backing to them. Additionally, we can conclude when environmental processes are working or not working.

A desktop computer sitting on a table

Description generated with very high confidenceA close up of a whiteboard

Description generated with high confidence