Staying at the forefront: building state of the art image analysis and density capacity for climatic and ecological research for the Lamont Tree-Ring Lab

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Tree-Ring Laboratory

Abstract: To address the debate on the use of tree rings for terrestrial climate reconstructions, the LDEO TRL seeks to improve the way we produce primary dendrochronological data for climatic and forest ecology research, including climatic reconstructions, whole-forest response to environmental change, and biodiversity studies. Tree-ring reconstructions that are based entirely or in part on the Maximum Density (MXD) parameter provide an inter-annual signal that often results in stronger climate reconstructions (**Figure 1**) with a stronger volcanic signature than tree ring widths alone (Davi et. al 2002, Andreu-Hayles et al 2011, Anchukaitis et al. 2012). MXD records were time consuming to build, but new technology has made the process efficient. The TRL MXD facility is rather obsolete. Worse, the manufacturer has no capacity or interest in upgrading the operating system of our facility. We therefore request $10,000 to partially offset the cost of a complete image analysis platform WinDendro Density LA2400 (the total cost is $16,640. The remaining funds will be supplied by TRL PIs through various incentive funds). The new WinDendro system is crucial for conducting detailed studies of wood properties from a variety of previously sampled, but unused temperate and tropical tree species currently archived at TRL. Together with state of the art blue light intensity methodology (Campbell et al. 2007), the TRL will have the capability to speed up and simplify the process for acquiring accurate measurements of sub-annual wood density – *an essential parameter for paleoclimate studies* – as well as rapidly measuring total ring width, and earlywood and latewood as separate values. This system also allows for cell wall thickness and springwood vessel density measurements, both of which have been linked temperature at sub-annual timescales. This upgrade represents the first major capacity overhaul for the TRL in more than a decade.