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Tree-ring dating of Alerce timbers commercially imported into Japan

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Alerce (*Fitzroya cupressoides*) is rare and long-lived cypress growing in southern Chile and adjacent Argentina. Considerable effort has been devoted to developing millennium-long tree-ring chronologies of Alerce, and this has led to a 5682-year-long tree-ring width chronology, which is the longest for the Southern Hemisphere. In this study, tree-ring dating was conducted using Alerce timbers, which were commercially imported into Japan before forbidding its international commerce under Convention on International Trade of Endangered Species. We measured annual growth rings to an accuracy of 0.001 mm. Standardized ring-width series was then cross-dated against several tree-ring chronologies so far developed using Alerce from the region. It turned out that many samples were shown to have groups of micro-rings that could not be cross-dated. We therefore selected samples with relatively wide rings. A total of five samples were successfully cross-dated, covering the period 693–1058 CE. The sharp radiocarbon spike observed globally at 774–775 CE was well reproduced using one of our dated samples, which provides independent support for the dating of tree rings. Specifically, our spike appears in 774 CE, which is one year earlier than those observed in the Northern Hemisphere. The event is considered to have occurred within the boreal growing season (June to August) of 774 CE. Tree-ring chronologies from temperate regions of the Southern Hemisphere lag those from the Northern Hemisphere by approximately six months, owing to the phase difference of the extratropical growing seasons between hemispheres. Our spike found in 774CE is therefore consistent with the previous findings. In fact, radiocarbon data previously reported using another Alerce tree also starts the spike in 774 CE. While the sample size is limited in this study, tree-ring dating based on ring widths works for the Alerce timbers commercially imported into Japan.

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Student Submission

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