



THE UNIVERSITY OF ARIZONA
COLLEGE OF SCIENCE

Laboratory of
Tree-Ring Research

TREE-RING TALK

Wednesday, Sept 16th
12:00



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Dr. Weerabaddana doing fieldwork
in the Marshall Islands

***Corals: the trees of the ocean
inform past hydroclimate
changes in the tropical
Western-Central Pacific***

The climate state of the tropical Pacific strongly influences regional rainfall through changes in the Intertropical Convergence Zone (ITCZ), essentially a band of heavy rainfall just north of the equator. While we understand seasonal and year-to-year rainfall changes well, longer patterns of wet and dry periods (spanning decades) remain mysterious, mainly because reliable instrumental measurements only go back a few decades. To address this information gap, I use natural marine archives such as corals that lived for centuries. Corals grow in layers, much like tree rings. As they grow, they record chemical clues about the surrounding seawater. Specifically, the oxygen isotope chemistry ($\delta^{18}\text{O}$) in coral skeletons tells us about seawater salinity, which is directly linked to ITCZ rainfall in the tropical Pacific. By studying seven overlapping coral records from the Marshall Islands, we pieced together nearly 260 years of rainfall history (1765–2024). About two-thirds of the oxygen isotopic signal in Marshall Islands corals reflects changes in seawater salinity driven by rainfall shifts connected to the ITCZ. The record reveals distinct dry and wet periods on timescales from seasonal to multi-decade. Interestingly, until the mid-1900s, decadal-to-multidecadal cycles dominated, after which year-to-year climate variability from the El Niño Southern Oscillation (ENSO) increasingly controlled rainfall variability. During an El Niño, the warm phase of ENSO, the ITCZ shifts southward, leaving the Marshall Islands in severe drought. If El Niño intensifies or becomes more frequent as climate change continues, the tropical Pacific rain belt may shift southward, potentially leaving islands north of the equator uninhabitable in the future.



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