



## **Annual record of environmental history in corals and tree-rings – a land-sea correlation at Ogasawara Islands, Japan**

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Massive annually-banded scleractinian corals provide high-resolution archives of local environmental change as well as large-scale variations in ocean-atmosphere dynamics. Reconstructions of temperature, hydrologic balance/salinity, circulation, upwelling, terrestrial runoff and pH of the surface ocean are possible at subdecadal to subseasonal resolution. Tree rings provide annual to subseasonal resolution archives of local to regional environmental change, as well as large-scale variations in atmospheric dynamics. Geometrical study of ring width, early and latewood width, X-ray analysis of density, and measurement of isotopic composition allow high-resolution climate reconstructions. Drawing a history of temperature, precipitation, aridity, etc. are possible from monthly to annual resolution at centennial to millennial time scales. However, a joint study of both records is hindered by the rarity of locations, where both suitable (tropical) coral colonies grow and trees produce annual rings (mostly under temperate climate).

Coral and tree-ring record of environmental change is being jointly studied at the

same location at Chichijima, Ogasawara (Bonin) Islands, Japan. Located at 27° latitude within the western Pacific, Ogasawara lies at the northern limit of coral reef distribution, and hosts tree species producing clear annual rings. Annual precipitation is 1235 mm, there is 24° summer and 18° winter average temperature, and distinct seasonality with marked aridity in summer. Meteorological and sea surface temperature data are available for 1907 to 1943 and since 1970. A *Porites lutea* colony cored at 3 m depth in October 1998 (27° 06' 15" N, 142° 11' 40" E) yielded a 92-year record, being analysed for growth band width, X-ray density and  $\delta^{18}\text{O}$  composition. Living *Juniperus taxifolia* trees located 1 to 6 km away from the coral site at 100 to 310 m elevation above sea level were cored, while disks were cut from dead wood in the course of a field campaign in May 2006. Five sites yielded 34 cores from 28 living trees and stumps, and 30 disks from logs. An endemic species, *J. taxifolia* is flat-lying, strongly curved when exposed to wind, but erect to 3 m height at protected sites. Growing on lithic soil with poor moisture retention, it is sensitive to changes in precipitation. A more than two-hundred-year long tree-ring chronology is being developed and compared with the coral archive. Existence of both interannual and intraannual variability in both records make Chichijima a promising site for joint coral/tree-ring studies (climate history, ocean circulation changes, solar-cycle-related phenomena in multiple archives).

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