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Neural network applied on multi-proxies measured on coral skeleton

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Massive coral skeleton offers the best-suited material for reconstruction of tropical climate during the last century. Indeed, growth rate of some species is fast enough to provide high-resolution and chronology is easy. The formation of a big colony may cover continuously several decades, even, several centuries. Finally, aragonite skeleton, presents several possible proxies. However, the aragonite deposit is biologically controlled and all the proxies are influenced by both environmental and biologic factors. This implies strongly seasonal signals and the significance of a monthly proxy and an annual one are not exactly similar. It is the reason that annual and monthly reconstitutions will be conducted separately.

Since metabolic activity totally controls coral growth, we assume that during the time, chemical tracers measured on a single sample are all fractionated by external factors through the same biologic filter. However, each of them differently reacts because incorporated in the mineral by different ways. This is the reason that we used neural network (NN), which learns the behavior of several proxies submitted to one forcing during a well-documented period. Then, the complex relationship recognized by neurons between the different proxies is used to "predict" the forcing past in time. By this way, it is possible to calibrate temperature and salinity and thus to reconstruct separately, with two different networks, the two variables and thus reduce errors. A similar operation may be performed for seasonal variations.

Data obtained from a coral core harvested in Fiji from seven proxies for SST and four for SSS, indicated that SST and SSS are modified at each strong El Niño during the

last century. The optimization of the use of this statistical treatment will be discussed.