A NEW MULTIPROXIES APPROACH FOR MASSIVE CORALS

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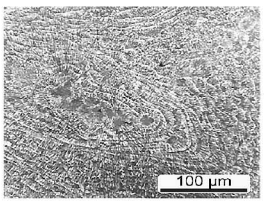
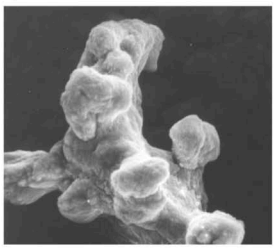
Tropical ocean-atmosphere interaction plays a key-role for worldwide climate variability. Instrumental observations are available only for the last decades and paleoclimatic reconstruction becomes necessary to recognize decadal and longer changes of the tropical system. Long-live massive corals, developed all around tropical belt, are unique archives offering both annual resolution and multicentury record lenght needed for reconstructing seasonal to centennial variations of tropical surface ocean variations. However the previous geochemical records did not provide the promised climatic indications. We propose a new approach.



fibers

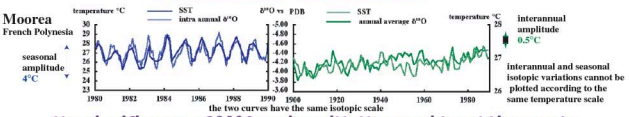
centres of calcification

J.P. Cuif



Cultured *Acropora*

Statistical treatment



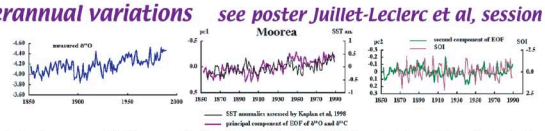
interannual and seasonal isotopic variations cannot be plotted according to the same temperature scale

the significance of $\delta^{18}O$ varies with the considered time scale

- *At each time scale*

dominant meteorological processes ⟷ **dominant deposition mechanisms**

- *Interannual variations* *see poster Juillet-Leclerc et al, session CL21*



- the principal component (PC) or empirical orthogonal function (EOF) analysis is used in order to find a time series that maximizes the covariance between the annual $\delta^{18}O$ and $\delta^{13}C$ covering at least 100 years
- more often, the principal component explains the majority of the variance of measured $\delta^{18}O$ and is temperature dependent
- the second component is the "isotopic thermometer". But the interannual variations are mainly due to seawater $\delta^{18}O$ fluctuations related to ENSO occurence. See below the example of the New Caledonia core

- *multiproxies calibrations to understand seasonal variations*

- Calibration will be based on instrumental data.
During 30 years daily SST and SSS have been measured near Amédée Lighthouse, New Caledonia
- From Fiji intra-annual data, preliminary investigations showed that:
$SST = A*\delta^{18}O + f(Sr/Ca) + noise$
$SSS = B*\delta^{13}C + g(Sr/Ca) + noise$
f and g being non linear functions

J. Oremppüller IRD

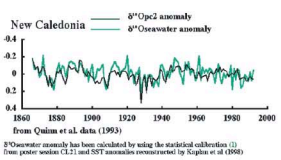
Proxies

$\delta^{18}O$, $\delta^{13}C$
^{14}C
trace elements
growth data

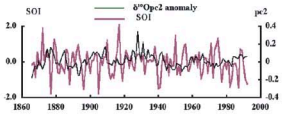
Potentiel tracers of

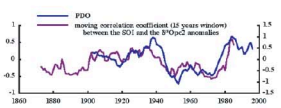
sea surface temperature
seawater $\delta^{18}O$
thermocline depth

- *The formation of the coral skeleton is much more complex that we supposed*
- *Quantitative SST or SSS reconstruction could only be provided by considering several proxies*
- *We need to develop a method of reconstruction well suited to each time scale*



these curves derived from the demonstration previously summarized and developed on the poster *Juillet-Leclerc et al, session CL21*





the SPCZ (South Pacific Convergence Zone) seems to move simultaneously with the PDO (Pacific decadal Oscillation) from Mantua, 1997