Reconstruction of Mid-Holocene Paleoceanographic Conditions In Northern And Southern Sri Lanka Using Modern Analogues

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ABSTRACT

Sri Lanka is an island located in the mid-way of the Indian Ocean (IO) and its Northern and Southern seas are mainly influenced by changes in the Bay of Bengal and Arabic sea respectively. Long lived corals are ideal climate reorders in which their response to environmental changes can be measured. This study has been carried out to reconstruct the paleoceanographic conditions during the mid-Holocene in Northern and Southern Sri Lanka. Coral growth rate, Sr/Ca, Mg/Ca ratios and $\delta^{13}C$ were used as proxies in this study. A core sample was collected from Point Pedro (PPD) by drilling a large *Porites lobata* to reveal modern changes of the Northern sea. Another two cores from Iranathivu island (IR), North of Sri Lanka and Akurala (AK), South of Sri Lanka were collected to reveal the past oceanographic conditions. These two cores were dated as 5191±28 and 5050±30 years BP during mid-Holocene. All cores were X-radiographed and analyzed for Sr/Ca and Mg/Ca ratios. PPD core had a record of 36 years from 1981 to 2016. Sea Surface Temperature (SST) derived from Sr/Ca ratio showed more or less similar values to satellite based SST values. But Mg/Ca SST were unusually high probably due to Manganese enrichment in Bay of Bengal. However, same trend in the variation was observed. Average growth rate of modern *Porites lobata* was 13.3 mm/yr. It is a drop of 2.33 mm/yr when compared with 1980's. Present Average annual SST in Northern region has increased up to 27.97°C from 25.3°C during 1980's and $\delta^{13}C$ has reduced up to -2.39 from -1.02. Rise in SST and drop of available nutrients may have been affected on reduced growth rate over the time. These modern analogues were used to reconstruct mid-Holocene paleoceanographic conditions. Sr/Ca derived SST in Northern region during mid-Holocene was 17.4°C and in Southern region was 26.6°C. A difference of 9.2°C cannot practically occur but this temperature gradient is remarkable. Warm Arabic sea has brought warm currents to make SST in Southern sea higher than the Northern sea fed by cold water of the Bay of Bengal. Coral growth rates during the mid-Holocene has a significant drop. Cold SST in Northern region must be a possible reason and increased evaporation during the Holocene may have result heavy precipitation which enhance nutrient enrichment (N and P) in Southern sea and indirectly reduce calcification and growth rate. Thus, dilution of sea water in Southern region has reduced $\delta^{13}C$ (-1.62) whereas lack of fresh water input to Northern region has increased $\delta^{13}C$ (0.13). Presence of shallow sea and nutrient input from Bay of Bengal (Bengal fan) to Northern sea must have increased Carbon productivity as well.