Hydrogeochemical studies in Nagavali microwatershed-Vizianagaram District Andhra Pradesh, India

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The study area underlain by Achaean group of rocks is mostly irrigated land depend upon rainfall; bore well and through canal water system. Apart from agricultural needs water is also used for drinking purpose. Thus quality becomes an important aspect for the irrigation and domestic requirements.

Nitrate range between 6 and 100mg/l with an average of 35.52mg/l, nearly 26% exceed the permissible limit. Mg concentration range between 18.6 to 214 mg/l with an average of 63 mg/l around 80% of samples exceed the permissible limit. Fluoride concentration range between 0.1 to 1.0mg/l which is with the permissible limits. Zn range between 0.031 to 16157 μg/l around 7.14% samples exceed the permissible limits. Pb range between 0.02 to 16.78 μg/l, most of the samples are within permissible limits. Co range between 0.003μg/l to 4.077μg/l around 23% samples exceed the permissible limit. Ni range between 0.045 to 248.25 μg/l around 45% of the samples exceed the permissible limit. Cd range between 1.23 μg/l to 3.36 μg/l around 14% samples exceed the permissible limit. As range between 0.047 to 13.73 μg/l around 4% of the samples exceed the permissible limits.

In the study area regular application of nitrogenous fertilizers, phosphates, other agrochemicals such as fumigates, rodenticides, insecticides and herbicides create blanket or plume of non-point source of contamination. The present study has helped to identify the problems related to the contamination of the groundwater with major and trace elements. This is important because water in the study area apart from agriculture is also being used for drinking.

Effects of diagenesis on paleoclimate reconstructions from modern and young fossil corals

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The geochemical composition of skeletal aragonite in massive reef-building corals provides high-resolution records of past climate and environmental variability. A serious limitation of coral paleo-reconstruction, however, is the high potential for diagenesis of the coral skeleton. As such, the integrity of coral-based reconstructions requires detailed knowledge of the effects of diagenesis on coral skeleton and geochemistry. We use scanning electron microscopy (SEM) and secondary ion mass spectrometry (SIMS) to investigate the effects of diagenesis on oxygen isotope- and Sr/Ca-based paleo-reconstructions in modern and fossil corals from Fanning Island (4°N, 160°W) and Palmyra Island (6°N, 162°W) in the central tropical Pacific.

In a 30 yr-old modern coral from Fanning island, SEM reveals extensive secondary aragonite (SA) cements that cause offsets in bulk coral $\delta^{18}O$ and Sr/Ca equivalent to coolings of up to ~ -3°C and -4°C, respectively. SA cements in a 17th century Palmyra fossil coral contribute high $\delta^{18}O$ and Sr/Ca, yielding SST artifacts of up to -2°C and -4°C, respectively. SIMS Sr/Ca measurements of SA cements in this fossil coral are ~3.5mmol/mol higher than Sr/Ca values of primary coral aragonite, equivalent to a paleo-SST of ~ -11°C alone. Secondary calcite (SC) cements in a 13th century Palmyra fossil coral cause Sr/Ca-based SST anomalies of up to +11°C, consistent with extensive subaerial diagenesis. SIMS analyses of the SC and adjacent dissolved primary aragonite in this coral yield similar, highly variable Sr/Ca values, indicating that both have been altered by diagenesis. However, SIMS Sr/Ca measurements of relatively pristine coral aragonite from altered region of both fossil corals are consistent with bulk measurements from pristine portions of each coral, implying the interior of the coral skeleton remains geochemically intact. Overall, our results indicate diagenesis has a larger impact on Sr/Ca than on $\delta^{18}O$ at our research site. Our study highlights the potential of using micro-scale Sr/Ca analysis to extract paleo-reconstructions from fossil corals that have experienced moderate to severe diagenesis.