Paper Number: 143

Significance of Speleothems in Paleoclimate change , Intensity of Tropical Monsoon , Inter Tropical Convergence Zone and Geomicrobiological process : Evidences from the Himalayan and Asian caves

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Cave deposits (Speleothems) are best developed in the NW and NE Himalaya and Meghalaya in India and the neighbouring regions in East and South Asia (China and Nepal). Speleothems (Stalagmite, Stalactite and Flowstons) are archives of past climate change ,interpret the precipitation of the Monsoon based on oxygen isotopes and their geomicrobiological origin. Carbonate speleothems are indicative of seasonal growth rates and variation in paleoclimate and temperature. The carbon and oxygen isotope profiles in stalagmite suggest the paleovegetation (C3 / C4 plants) and the intensity of rainfall. Carbon isotope ratio in speleothem reflects the degree of biogenic activity above the cave and related to local vegetation. The oxygen isotope ratio in the speleothems is a powerful tool to deflect the influence of rainfall and intense precipitation. It has been established in tropical monsoon regions in the Himalaya , India and west, East and South Asian regions. Speleothem oxygen isotope data from the Himalayan and other tropical caves in the Northern Hemisphere and subtropical Southern Hemisphere (Brazil) is very crucial in establishing the intensity and location of Intertropical Convergence Zone (ITCZ). Molecular biological (DNA sequencing) , Atomic Force Microscopy (AFM) and Laser Raman Spectroscopy (LRS) of the speleothems from the Sahastradhara caves in Himalaya and Shillong Plateau (Meghalaya) has been carried out recently to know the geomicrobiological process involved in the speleogenesis.

Stalagmites are being used for reconstructing climate and monsoon precipitation for the Indian Summer Monsoon and East Asian Monsoon. The high resolution oxygen isotope data available from the Sahastradhara cave situated in the Garhwal Lesser Himalaya, India has suggested that the increase in rainfall is indicated by much lighter oxygen isotope ratios and decrease in the carbon isotope ratios.This also substantiates the earlier record of oxygen isotope ratios recorded from other similar caves in the Kumaon- Garhwal Himalaya and the Meghalaya, Shillong Plateau [Tewari, 1,2,3].The carbon isotope ratio of the stalagmite from the Sahastradhara cave show much negative values which indicates wetter and cooler climate. The biodiversity above the Sahastradhara cave is represented by the tropical mixed deciduous scrubby vegetation and also suggest wet and cool climate.It is concluded that stalagmites are providing significant past climate records form the Himalayan caves from NW to NE Himalaya and will improve our current understanding by further high resolution oxygen and carbon isotope ratios, trace element data and thorium dating of these stalagmites.

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[2] Tewari V.C.(2011) Jour. Indian Geol. Cong.,3 (1), 87- 104.

[3] Tewari V.C.(2013) In : *Proceedings of Selected Topics in Earth System Sciences,* 31-39