Lower Cambrian carbon isotope evidence of photosynthesis from Krol-Tal carbonates of the Lesser Himalaya and global stratification in early Cambrian oceans

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Extensive development of cyanobacterial mats, digitate, crenulated and stratified microbialites, oncolites, conical-columnar stromatolitic build-ups, microbial balls and calcimicrobe (Eiphyton, Renalcis) in Upper Krol Carbonates of the Lesser Himalaya indicate presence of benthic microbial communities (BMNC) and photosynthesis in Precambrian-Cambrian boundary-Lower Cambrian sea. The carbonate-phosphate transitional facies of the Lower Cambrian Tal Formation reflects a major change in chemical sedimentation. The Tal Formation also indicates the evidence of bacterial activity, since small phosphatised stromatolites and oncolites are preserved in Chert-Phosphorite Member.

Carbon isotope (δ^{13} C carb., δ^{13}C org.) and rare earth element (*REE*) distribution in Krol-Tal carbonates as evidence of organic productivity and global stratification in early Cambrian oceans has been discuess across a well-studied profile in Mussoorie syncline.

Isotopically heavy carbonates (+6.6% PDB) were deposited in Upper Krol D stromatolitic facies representing enhanced organic burial. This strong positive isotopic shift is followed by a decrease in δ^{13}C from +2% to near zero in Krol E carbonates (topmost unit). There is a negative shift in δ^{13}C (−2.2‰) just below the Lower Cambrian or PC-C Boundary. These δ^{13}C records reflect global isotopic variations in Neoproterozoic-early Cambrian oceans of the world. Carbon isotopic shifts may indicate stratification of oceans due to photosynthesis in tidal flat areas (photic zone). Oxydising depositional environment is supported by the Ce anomaly of the Krol carbonates.