microfabrics are micritic, clotted-peloidal and agglutinated, with some filament relicts. (6) *Agglutinated oolitic stromatolites* are found in tidally-influenced eastern outcrops with ostracodes and miliolids. They show domical morphologies and microfabrics dominated by trapped ooids and bioclasts and clotted-peloidal micrite. Calcified filaments are rare.

A clear link between particular facies and microbialite types is observed. For example, filamentous microfabrics (oncoids, skeletal stromatolites, dendrolite fragments) occur in freshwater-dominated facies, whereas non-filamentous microfabrics (thrombolites, fenestral laminites, agglutinated stromatolites) are found in facies with stronger marine influence. Thus, microbialite variability in the Leza Fm reflects the diversity of sedimentary environments. We conclude that at this time, coastal-wetlands at the crossroads of marine and freshwater realms provided a broad variety of hydrochemical and hydrodynamic settings that could promote the development of differing microbial communities and products.

Furthermore, the early Aptian was a period of microbialite abundance in many carbonate platforms located as far afield as Arabia, Western Europe, and the Pacific Ocean. Global oceanographic and climatic changes have been suggested as possible causal factors. Comparison of the Leza Fm transitional-coastal setting with coeval carbonate platforms could help to further understand these early Aptian microbialite paradises.

Microbial carbonate reef components in the mid-Triassic Italian Dolomites: A biogeochemical approach

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Triassic carbonate buildups of the Dolomites have for decades been regarded as classic examples of ancient coral reefs and have been the subject of extensive research. During the mid-Triassic reefs underwent important changes, evolving from reefs mainly composed by sponges, seafloor crusts, and calcimicrobes such as *Shamovella*, to more modern-looking coral-algal associations with clotted-peloidal crusts. We examined good examples of both types at Punta Grohmann and Alpe di Specie. The Punta Grohmann samples of high-rise platform margin reef rock are from erratic 'Cipit Boulders' in Late Ladinian-Middle Carnian basinal sediments (Wengen and San Cassiano formations). These blocks escaped the extensive dolomitization that affected the buildups, and preserved their original mineralogy and organic content. The Alpe di Specie samples are from small Late Carnian patch reefs in the Heiligkreutz Formation, and are widely regarded as in situ or nearly in situ. Their coral-sponge-algal framework cavities contain distinctive clotted-peloidal micrite microfabric. Despite their small size, these bioherms are among the earliest examples of skeletal framework reefs whose major components are broadly comparable with those of present-day tropical coralgal reefs. We carried out biogeochemical analyses on selected samples from both localities to characterize the organic matter and bacterial metabolic signatures. These included UV epifluorescence observations, Total Organic Carbon (TOC) content, FT-IR spectroscopy and biomarkers analyses. Rare Earth Elements (REE) distributions were also investigated to determine the oxidation state in which these deposits precipitated.

The Punta Grohmann and Alpe di Specie reefs are not very different in age but show significant differences in components, structure and fabrics, reflecting contrasting depositional environments. Punta Grohmann sponge-microbial reefs contain biomarkers for various bacteria including cyanobacteria but lack specific molecules typical of sulfate-reducing bacteria. This suggests that aerobic bacteria were able to directly degrade the organic matter from primary producers, and is consistent with well-oxygenated depositional conditions indicated by REE values, and with the high-energy platform margin setting in which they formed. Alpe di Specie scleractinian patch reefs contain sulfate reducing bacteria

biomarkers and REE values indicative of sub-oxic conditions. These are consistent with their autochthonous clotted-peloidal crusts and the more muddy low energy conditions under which they formed. Their small growth cavities that apparently favored formation of clotted-peloidal sediments resemble those of present-day autochthonous reef crusts induced by sulfate reducing bacteria.

The division of the morphological groups of the Li Mei calcareous algal bioherms, Western Hunan, China

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In the late Early Cambrian, during deposition of the Qingxudong Formation, a homoclinal carbonate ramp was developed over what is now Li Mei village, Western Hunan Province. The ramp comprised three different sedimentary facies associations, which are referred to as the inner, mid- and outer ramp zones. A series of calcareous algal bioherms were developed in the mid-ramp zone.

The bioherm contains nineteen species of calcareous algae. The major constituent algae in the bioherm facies are *Epiphyton*, *Renalcis*, *Botomaella*, *Razumoviskia*, *Proaulopora*, *Batinevia*, *Chabakovia*, *Bija*, *Nicholsonia*, and *Girvanalla*.

The bioherm algae can be divided into four groups and seven sub-groups based on comparative morphology: (1)botryoide group; (2) dendritic group(sub-groups: i. short and small dendritic, ii. Cluster and ball-shaped dendritic, iii. Dendritic); (3) tubiform group(sub-groups: i. fan-like tubiform, ii. Isolated and loosely associated tubes, iii. Cluster tubiform, iv. Tangled, coiled and mass-like tubiform); (4) blanket hair-like group.

Since morphological groups can be environmental indicators, one or several algal morphological groups and/or sub-groups can be assigned to either of four algal environment zones in the bioherm: (1) low-energy zone-developed at the bottom and periphery of the bioherm; (2) & (3) relatively high-energy zone-located in the middle part of the bioherm; (4) very high-energy zone-developed on the top of the bioherm.

The division of the morphological groups of the Li Mei calcareous algal Bioherms are of great importance in determining sedimentary microfacies, and analyzing the correlations between algae morphology and sedimentary environment.