



Gamma-ray logging on peritidal carbonates: a case history from the Dolomia Principale/Hauptdolomit (Sella Group, Dolomites, Northern Italy)

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Despite the Dolomia Principale/Hauptdolomit (DPR) is one of the most known lithostratigraphic units covering large parts of the Alpine chain, difficulties remain in correlating the inner platform succession from different sectors. This is due both to the absence of significant biomarkers and to the apparent uniformity of cyclic arrangement, making the stacking-pattern analysis hard, but also to the sin-sedimentary differential subsidence, resulting in quite lateral thickness changes (250 to over-1000 m). Integrating field observations with gamma-ray logging could help to interpret the sequence- and event-stratigraphic architecture of these successions, improving middle-to-large scale correlations. A case history is reported from the Sella Group (Dolomites, Northern Italy), where the DPR is entirely well-preserved and exceptionally exposed: it consists of dolostones arranged in m-scale, peritidal asymmetric cycles, for a total thickness of 285 m. The sedimentological patterns described by previous authors were furtherly integrated by new field observations, and a detailed stratigraphic column was prepared. On this section, an outcrop spectral gamma-ray survey was performed using a portable GR spectrometer. By means of a large NaI crystal detector, the total bulk-GR, and the K, U, Th components were detected. A 120 second count time was used with 1 m sampling step. Raw data were processed in order to obtain GR, SGR and SGR2 indexes. Results were plotted on the stratigraphic column, showing interesting features: at least 4 major shifts of the GR signal occur, each one characterized by high values of Th and U.

The basal part of DPR is characterized by a constant decrease of K, likely related to the retreat of the terrigenous coastline to which the platform was attached. A first GR-shift is recorded in the lower portion of DPR, where inter-supratidal facies prevail and high-energy facies are not rare in subtidal part of cycles, matching a peculiar pelitic horizon: relative low values of K and the residual character of Th support a diagenetic origin of pelites, in an organic-matter-rich environment (high values of U), like ponds in an emerged tidal flat. The second GR-shift roughly corresponds to a change in the cyclic arrangement of DPR, with prevailing subtidal facies characterized by intra-bioclastic or crystalline dolostones. A third GR-shift slightly precedes the transition to the upper part of DPR, dominated by inter-supratidal dolostones where stromatolites and pisoidal layers are common and paleokarsts are very frequent. The fourth GR-shift falls within the transition-interval to the overlying Rhaetian Dachstein Limestone, where reddish and well-developed paleokarsts are common: similarly, to the first one, the younger shifts are characterized by low values of K, contrasting relative high concentrations of Th and U, and the same sedimentological causes can be hypothesized. Considering the minimum time-span covered here by the DPR (15 Ma ca.) and assuming steady sedimentary control-factors, the Th-U shifts recur every 3,5/4 Ma and could be related to 3rd-order depositional sequences. Notably, the U trend shows minor shifts at high frequency, but cyclostratigraphic analysis are still underway to establish whether if they could be related to orbitally-driven cyclicity or not.