Zeitschrift: Eclogae Geologicae Helvetiae
Herausgeber: Schweizerische Geologische Gesellschaft
Band: 87 (1994)
Heft: 1

Artikel: Depositional trends in the Valdorbia Section (central Italy) during the Early Jurassic, as revealed by micropaleontology, sedimentology and geochemistry
Autor: Monaco, P. / Nocchi, M. / Ortega-Huertas, M.
Kapitel: 3: Stratigraphy
DOI: https://doi.org/10.5169/seals-167447

2. Geological setting

The examined area belongs to the Umbria-Marche Apennine fold and thrust belt and, particularly, to its inner Ridge ("Ruga interna", Scarsella 1951). It consists of a right lateral "en echelon" set of three main anticlines designated, from west to east, as internal, intermediate and external (Fig. 1). The outer limb of each anticline is partially overturned and thrusted (Barchi et al. 1989). Mesozoic and Paleogene pelagic formations, consisting mainly of marls and limestones, are involved in this late Tertiary compressive phase which followed transtensive Jurassic activity responsible for the thinning of the Apulian continental margin.

The Valdorbia section (lat. N 43°25', long. E12°42') is located along the State Road N. 360 which runs between Scheggia and Sassoferrato (Fig. 2), on the left bank of the Sentino Creek, near the Molino delle Ogne (mineral water spring). The outcropping Jurassic stratigraphic units constitute the core of the internal asymmetrical anticline (M. Petria-M. Cucco), which is cut by the Sentino Creek and characterized by a well extended and slightly deformed axial zone. The western limb of the anticline dips westward while its eastern flank is vertical and partially overturned.

3. Stratigraphy

In the last 20 years many studies concerning the Umbria-Marche Basin (UMB) have revealed the existence of three main kinds of succession of Jurassic open marine or pelagic sediments deposited above the "Calcare Massiccio" carbonate platform: a) "condensed" successions, which are represented by thin, mainly calcareous, sedimentary sequences deposited on submarine elevated areas with slow or no subsidence (morphostructural highs), b) "extended" successions constituted of thick calcareous-clayey sediments, rich in detrital material, deposited in depressed and subsiding areas, c) "intermediate" successions that are very common in the UMB and are formed by sediments of medium thickness (compared to a – b above) without detrital material.

Recently Cresta et al. (1988) and Colacicchi et al. (1988) have distinguished five types and two subtypes of succession on the basis of the occurrence and the vertical extent of the Jurassic formations. These successions show heterogenous sedimentation in the Early and Middle Jurassic which reflects a diverse paleogeography, inherited from the Liassic break-up of the "Calcare Massiccio". The Valdorbia succession belongs to the "extended" successions (type 1, subtype b) and is characterized by abundant clay (Ortega-Huertas et al., 1993) and calcareous detrital sedimentation during the Toarcian.

The study of the section starts along the road at km 57 below an abandoned quarry, and only the stratigraphic interval from Carixian to the Lower Aalenian has been considered (Fig. 2). The lithostratigraphic units, well known from the literature (Cresta et al. 1988; Farinacci et al. 1978; Farinacci & Elmi (Eds.) 1981), are here briefly described.

a The "Corniola" unit (COR). The lower part of the section is represented by about 50 m of well-bedded hard limestones (Bathurst 1987), of white-grey colour and 10 – 30 cm thickness. The lower limit of the COR is not exposed. Abundant stylolites (Bathurst 1975) and small amounts of dark chert in lenses and nodules are present. In the middle part of the section fissile pink and nutty brown nodular marly limestones, of 20 – 50 cm in thickness, separated by thin reddish marly-shaley bands, occur. Undulose dissolution seams fit around grains or nodules instead of cutting through them (Bathurst 1987). In the upper part

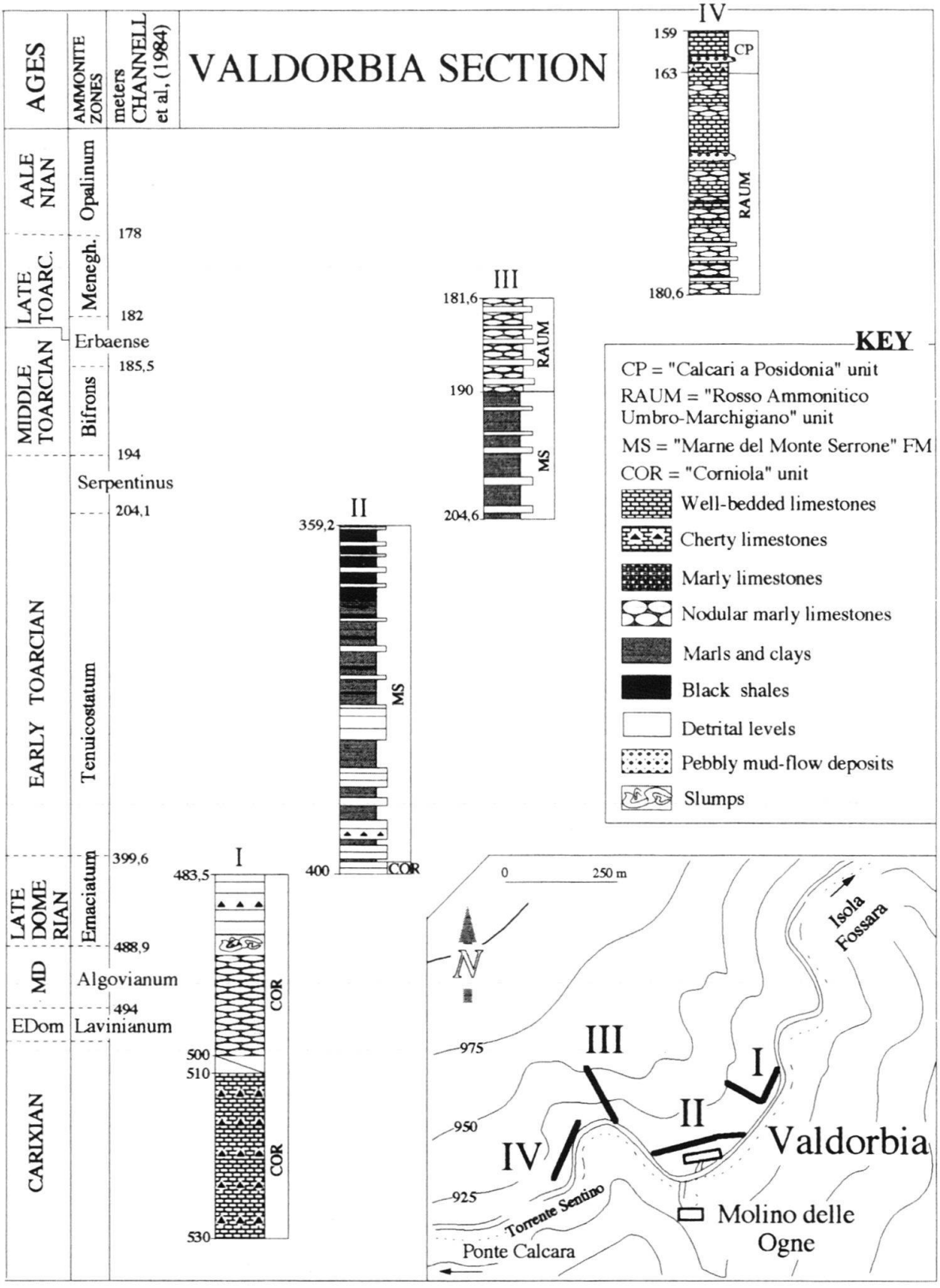

Fig. 2. Topographic location in the Sentino valley of four schematic partial sections (I, II, III and IV) that constitute the Valdorbia Section.

of the COR amalgamated calcisiltitic turbidites and associated gravity-flow deposits appear suddenly and the thickness of the beds almost doubles. There are two slumps, one at 495 m and the other at 489 m.

b The "Marne del Monte Serrone" Formation (MS) (Pialli 1969a) (= "Unità Calcareo-Marnosa del Sentino" of Centamore et al. 1969, 1971). The thickness of the MS reaches 49 m and its contact with the underlying Corniola unit can be observed immediately before the mineral water factory. The MS consists of dark shales and grey marls with intercalated calcarenitic/calcisiltitic turbidites that reach thicknesses of up to 1.5 m, especially in the lower part of the unit. Towards the top of this part, behind the mineral water building, there are three horizons rich in organic carbon, related by several authors (Jenkyns & Clayton 1986; Jenkyns 1988; Baudin et al. 1990; Bartolini et al. 1992) to a widespread Early Toarcian anoxic event. These horizons contain fine-grained (calcisiltites) turbidites in the form of rounded nodules probably due to syn-sedimentary loading processes (Fig. 3b). The upper part of the "Marne del M. Serrone" Fm. was sampled beginning at the base of a cliff, corresponding to 205 m on the log of Channell et al. (1984). The contact between this Formation and the overlying "Rosso Ammonitico Umbro-Marchigiano" unit falls at 190 m (Channell et al. 1984) where there is the first nodular band on the cliff face and where the colour of the shales becomes reddish (Fig. 3a).

c The "Rosso Ammonitico Umbro-Marchigiano" unit (RAUM). The MS Formation is overlain by about 27 m of reddish nodular marly limestones, calcareous nodular marls and reddish shales of the RAUM Unit, with ammonite-rich horizons which are mainly Middle/Upper Toarcian in age (Cresta et al. 1988; Cecca et al. 1990). Sharp-base calcarenites of 25–40 cm in thickness, showing low-angle cross-stratification, are interbedded with nodular marls. At 185.7 m (Channell et al., 1984) a well-bedded calcilutite level, of 5 cm thickness, showing a characteristic yellow colour is present (Elmi 1981b). The contact between the RAUM and the overlying "Calcari a Posidonia" unit has been set where the predominantly calcareous sedimentation resumes and cherts occur again, while the nodular calcareous bands become less important.

d The "Calcari a Posidonia" (CP) unit. The CP unit was sampled along the road for a few metres. This unit is represented by white limestone beds, roughly 10 cm thick, with rare nodular cherty horizons in the lower part. In some beds the faunal content (mainly bivalves and/or radiolarians) is very high. In the topmost part of the section pebbly mud-flow deposits are present, interbedded with hard limestones containing nodular chert.

The four stratigraphic units described above are exposed along four partial sections (Fig. 2) which constitute the composite Valdorbia Section, already measured for paleomagnetic purposes by Channell et al. (1984). The paleomagnetic numbering used by these authors has been maintained here. Channell et al. (1984) began their numbering from 530 m for the oldest rocks and used descending numbers in stratigraphic sequence. They left intervals in the sampling between each of the partial sections to allow for discovery of sediments of intermediate age. Thus the numbering for the four partial sections is as follows: Section I – 530 m to 483.5 m, formed only by COR sediments (Fig. 4); Section II – 400 m to 359.2 m, covering the MS deposition from the COR/MS boundary and including the black shale lithofacies (Fig. 3b and 5); Section III – 204.6 m to 181.6 m, represented by both MS and RAUM strata which dip into the hillside on the left of the Valley (Fig. 3a and 6); Section IV – 180.6 m to 160, including RAUM and CP outcropping along the road (Fig. 6). Beside each lithologic column, information concerning sedimentology, mineralogy, geochemistry and paleontology are exposed.

Biostratigraphic studies (Reale, 1989) suggest that the gaps between the sections are non-existent or insignificant. Therefore, in figure 19 and 21 the sections have been combined in a schematic manner into one continuous section, using the conventional ascending numbering system beginning from one for the oldest rock. In this way the approximate thickness of the stratigraphic units, the sedimentological trends, the microfacies and the foraminiferal assemblage changes can be seen more easily all together with the mineralogical and geochemical data. Concerning the magnetostratigraphy the authors refer the reader back to the Valdorbia section published in Reale (1989).

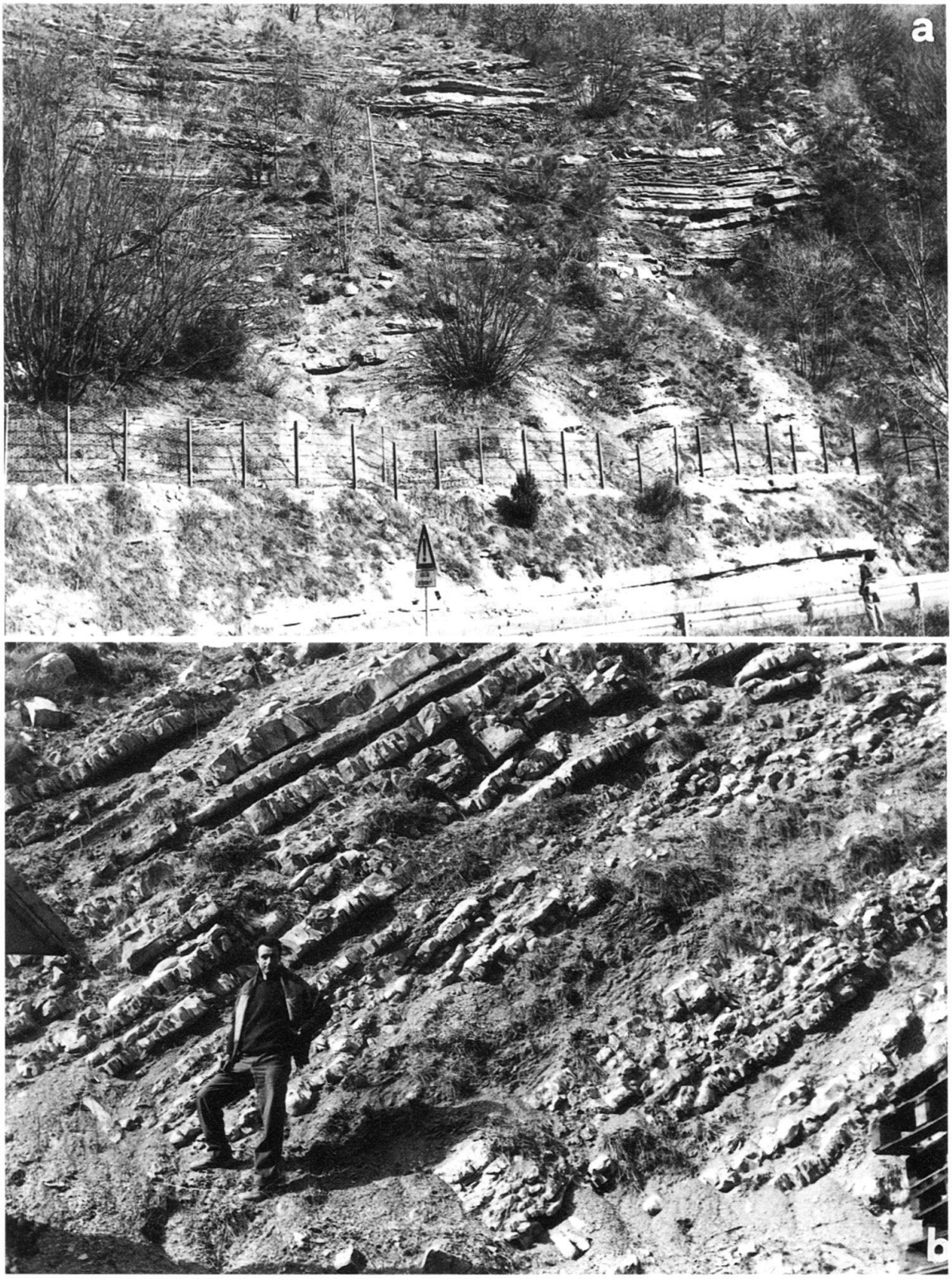

Fig. 3. **a** The MS-RAUM transition (Middle-Upper Toarcian). The MS Formation consists of soft grey marls intercalated with calcarenitic-calcisiltitic turbidites. The RAUM Unit is represented by reddish nodular marly limestones and reddish nodular marls. Sharp-based hummocky cross-stratified calcarenites (HCS) occur in this part of the VD Section. **b** Black shale deposits with low-density calcisiltitic turbidites containing radiolarians (Lower Toarcian, middle-upper part of Tenuicostatum Zone).

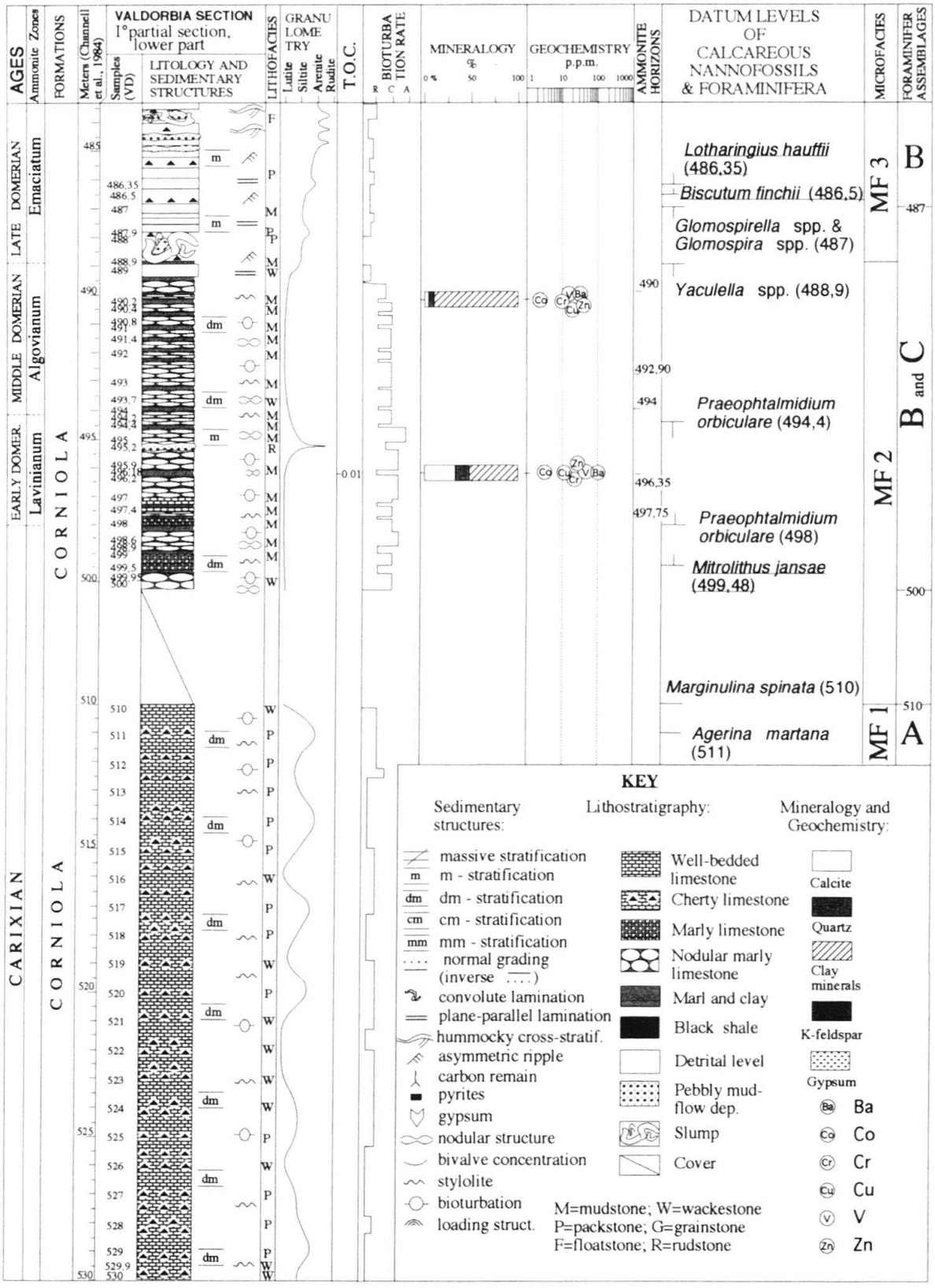

Fig. 4. Partial Section I, lower part of the Valdorbia Section.

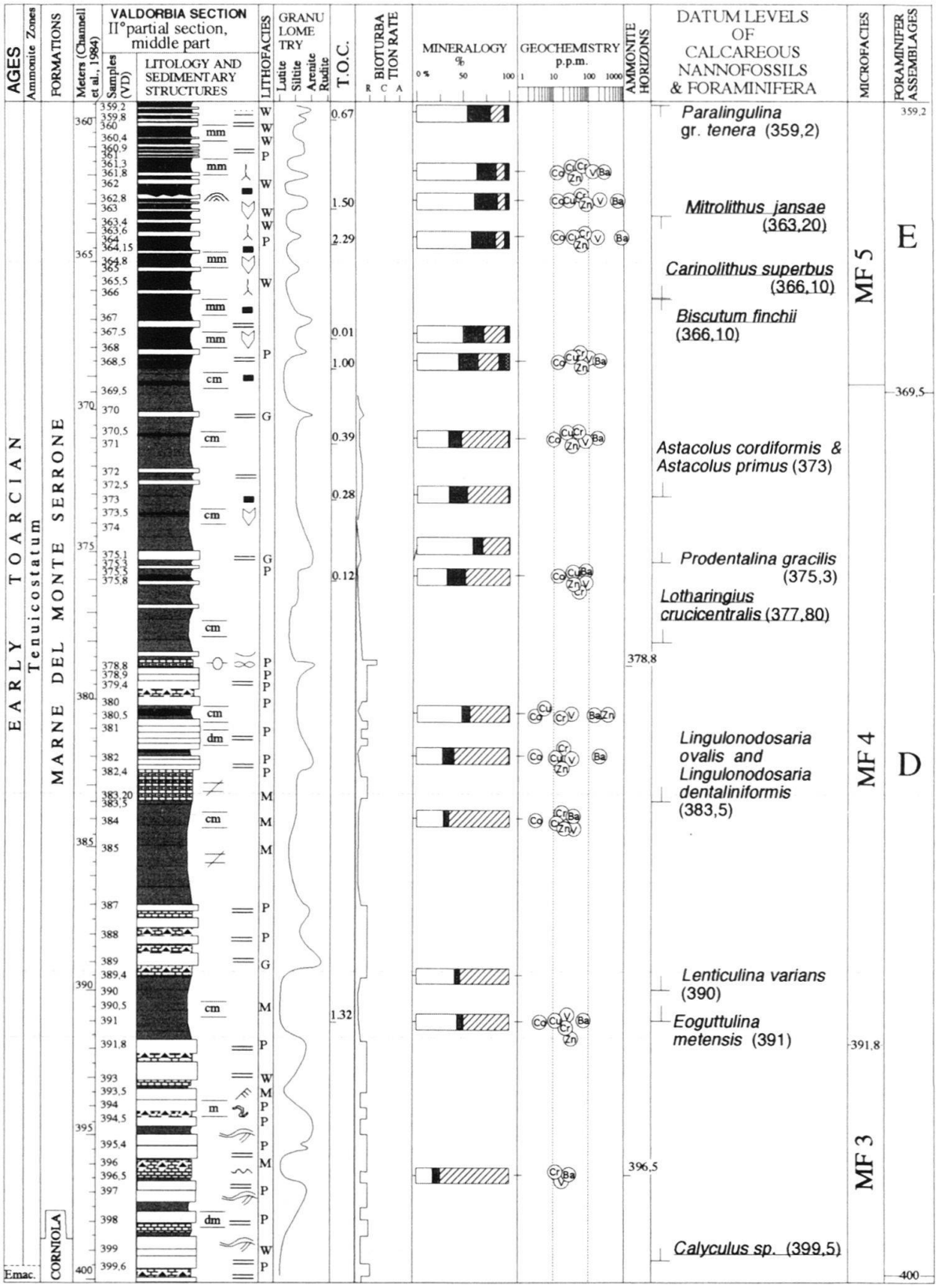

Fig. 5. Partial Section II, middle part of the Valdorbia Section.