The Piz da Peres section (Valdaora-Olang, Pusteria Valley, Italy) : a reappraisal of the Anisian stratigraphy in the Dolomites

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The Piz da Peres section (Valdaora–Olang, Pusteria Valley, Italy) A reappraisal of the Anisian stratigraphy in the Dolomites

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ABSTRACT

In the Piz da Peres area (Valdaora–Olang, Pusteria Valley, Italy) an Anisian succession is exposed.

A redefinition of the lithostratigraphy is made, and the presence of three terrigenous units of different ages (Piz da Peres Conglomerate, Voltago Conglomerate and Richthofen Conglomerate), as well as two carbonate platforms (Upper Serla Formation and Contrin Formation), is documented. This stratigraphic setting correlates well with other Anisian sections outcropping in the Dolomites and in the Recoaro area.

Using sequence stratigraphy as an integrated approach, four Anisian depositional sequences are identified. Preliminary results indicate that these sequences can be recognized throughout the Dolomites and the Recoaro area, and might even extend to the Southern Alps.

RIASSUNTO

Viene eseguita una revisione della successione stratigrafica anisica affiorante sul versante settentrionale del Piz da Peres (Valdaora–Olang, Val Pusteria–Pustertal). La presenza di tre unità terrigeno – conglomeratiche di diversa età (Conglomerato del Piz da Peres, Cgm. di Voltago e Cgm. di Richthofen) e di due distinte piattaforme carbonatiche (Formazione del Serla Superiore e Fm. di Contrin) consente una correlazione completa con le successioni coeve delle Dolomiti occidentali e dell'area di Recoaro.

L'analisi sequenziale ha permesso di individuare quattro sequenze deposizionali anisiche di 3° ordine. Dal momento che esse sono state riconosciute in molte altre sezioni delle Dolomiti occidentali e del Recoarese, è presumible che esse possano essere estese a tutto il Sudalpino.

Introduction

The aim of this paper is to present a revision of the Anisian in the Valdaora (Olang, Val Pusteria–Pustertal, NE Italy) area. The Anisian succession is well exposed (Fig. 1) on the northern slope of the Piz da Peres, South of Valdaora, between 2000 and 2200 m above sea level.

Correlation with coeval sections in the Dolomites and in the Recoaro area has been made by lithostratigraphic, biostratigraphic and sequence stratigraphic analyses.

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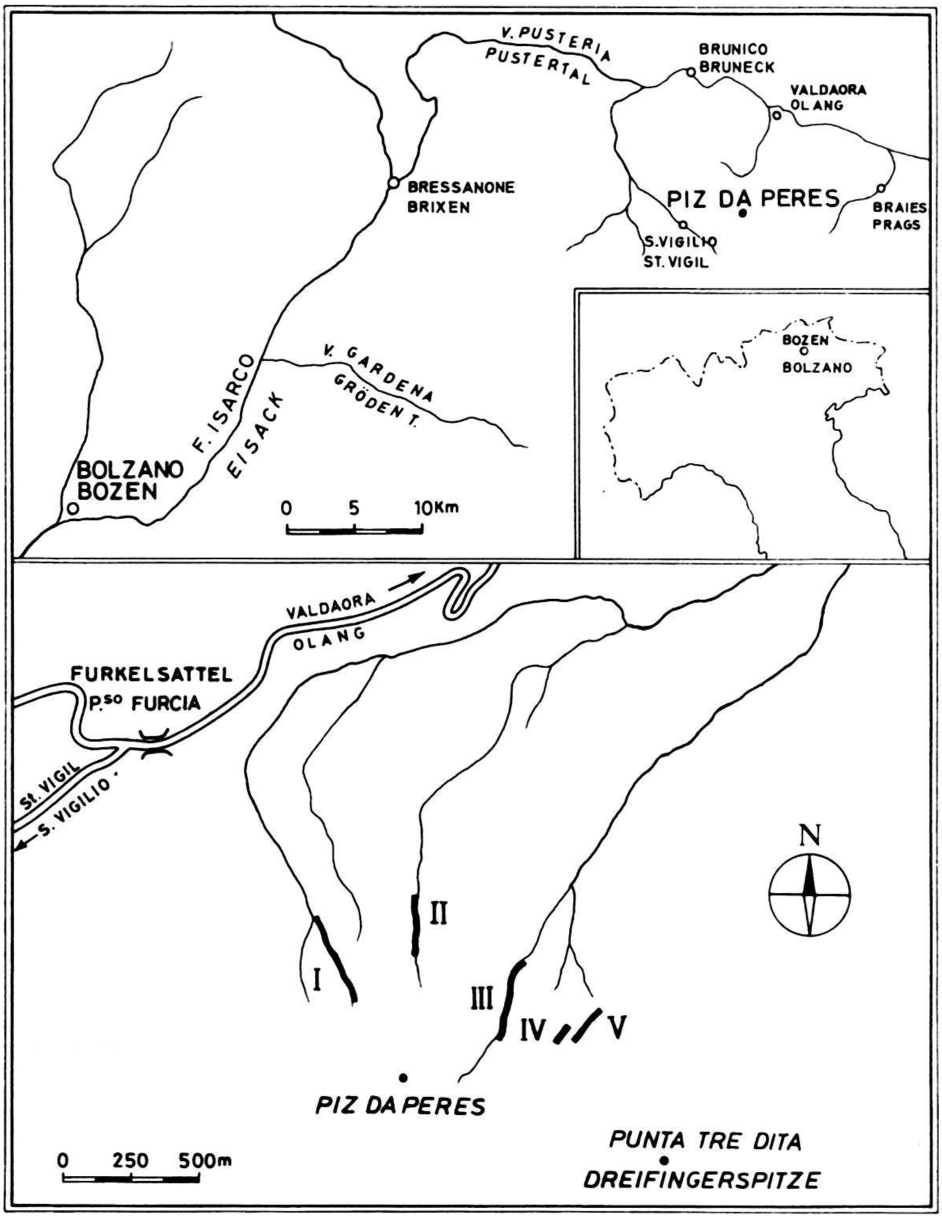


Fig. 1. Location map of the Anisian Piz da Peres section. I–V: measured columns.

Geologic setting

The Valdaora Dolomites are part of the so called Braies (Prags) area in the northern Dolomites. They form the northernmost Triassic succession cropping out in the eastern Southern Alps, directly South of the Periadriatic Line (cfr. Schmid et al. 1989).

During Anisian time, the rock units of this area, as well as those outcropping in the central and western Dolomites and in the Recoaro area, were deposited on a shelf which probably coincided with the "Piattaforma Atesina" in Bosellini (1965).

According to Winterer & Bosellini (1981), Trümpy (1982), Brandner (1984), Picotti & Prosser (1987) the Middle Triassic regional tectonic setting can be referred to an extensional regime. Local Anisian compressional structures (Bosellini 1968) can be explained as a result of movements along transcurrent faults.

Historical and lithostratigraphic review

Up to now Pia's (1937) monograph on the stratigraphy and tectonics in the Braies Dolomites has served as a reference point for researchers in the Triassic of the Dolomites. In fact Pia distinguished the "Unterer Sarldolomit" and the "Oberer Sarldolomit" and named a complex of Anisian terrigenous and terrigenous – carbonate units "Pragserschichten".

Moreover, Pia (1937, p. 40), and Mojsisovics (1879, p. 272) before him, realized that the Anisian succession in the Braies area could be compared to the coeval succession in the Recoaro area (Vicenza). Pia (1937) pointed out that the "Unterer Sarldolomit" in the Valdaora area might correspond to the "Gracilis beds" in the Vicentinian Alps.

In 1970 Bechstädt & Brandner reexamined the Middle Triassic succession in the Braies and Valdaora area. Their work comprised a study of many stratigraphic sections and very detailed petrographic facies analyses. They included in the "Pragserschichten" (Fig. 2) a dasycladacean-rich calcareous unit ("Algenwellenkalk").

Pia's term "Pragserschichten" was emended by Pisa et al. (1979). In the Dolomites their Braies Group refers to the Anisian terrigenous and terrigenous – carbonate units lying between the Lower Serla Dolomite and the Buchenstein Group (*sensu* Viel 1979). Most recently De Zanche & Farabegoli (1982, 1988) recognized the Braies Group throughout the Southern Alps.

In the Valdaora area within the Anisian succession three main terrigenous lithozones can be identified. From bottom to top they are:

a) Piz da Peres Conglomerate (= Untere Peresschichten *sensu* Bechstädt & Brandner 1970)

b) Voltago Conglomerate (= Mittlere Peresschichten *sensu* Bechstädt & Brandner 1970)

c) Richthofen Conglomerate (= Obere Peresschichten *sensu* Bechstädt & Brandner 1970).

The Voltago Cgm. (b) and the Richthofen Cgm. (c) correspond to their namesakes redefined by Pisa et al. (1979), who also pointed out the correlation between the Anisian conglomerates in the Agordo and Zoldo area and those in the Valdaora area.

The Piz da Peres Cgm. (a) is proposed as a new name for the "Untere Peresschichten". Pia (1937) proposed the subdivision in "Untere" and "Obere Peresschichten", whereas Bechstädt & Brandner (1970) also distinguished a stratigraphically lowermost conglomerate as the "Untere Peresschichten" intercalated in the "Unterer Sarldolomit". Pia (1937), before them, recognized this lowermost conglomerate but did not define it separately. Therefore, as emphasized by Pisa et al. (1979), the "Untere Peresschichten" in Pia correspond to the "Mittlere Peresschichten" in Bechstädt & Brandner (Fig. 2). The potential confusion created by the name "Peresschichten" induced us to abandon it.

These three terrigenous units in the Valdaora Dolomites can be respectively compared with: a) Val Leogra Breccia, b) "Voltzia beds" and c) Tretto Conglomerate in the Recoaro area (cfr. Barbieri et al. 1980; De Zanche et al. 1981; De Zanche & Mietto 1981).

In the Piz da Peres area the stratigraphic intervals between these terrigenous deposits are recorded by other terrigenous – carbonate and carbonate units. The lithologic and sedimentologic characters of the lower interval, between the Piz da Peres Cgm. and the

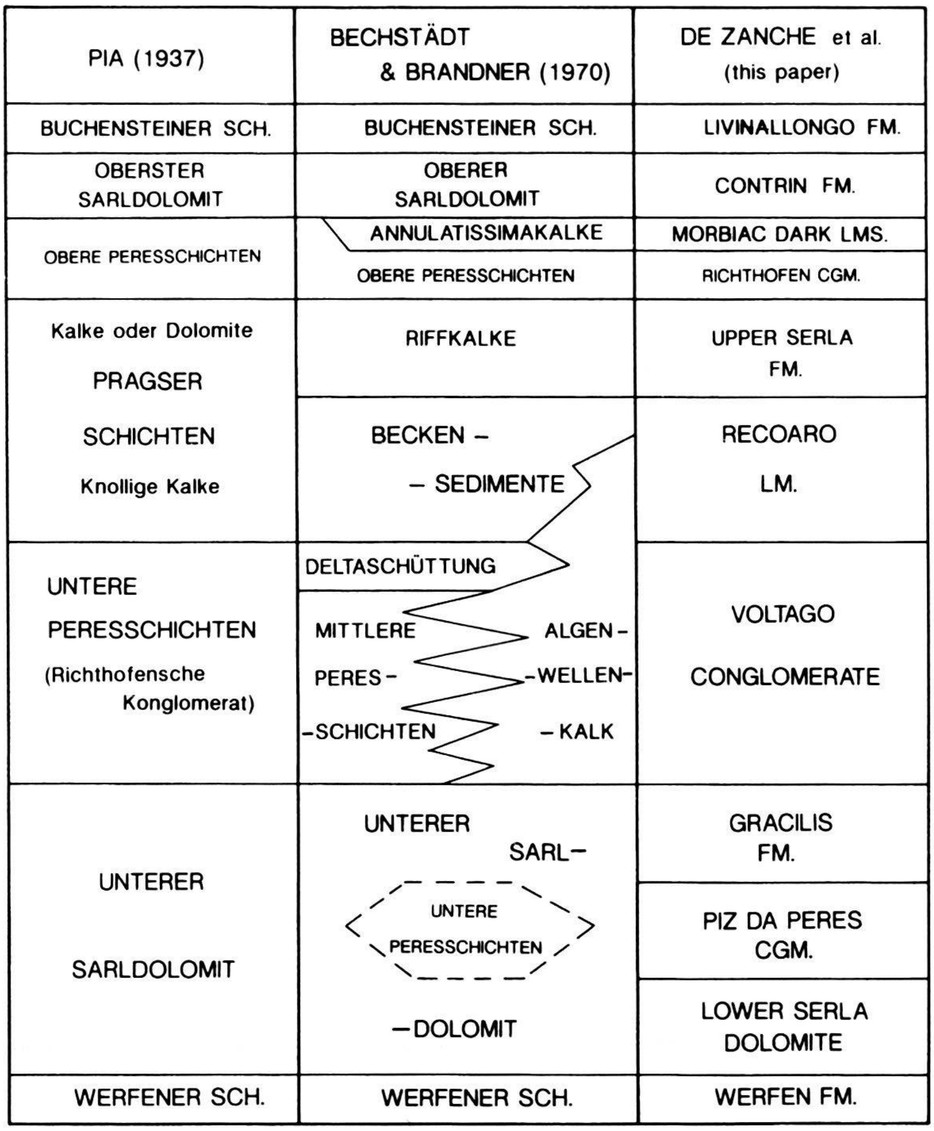


Fig. 2. A schematic comparison between Pia's (1937), Bechstädt & Brandner's (1970) and this work's Anisian stratigraphy in the Piz da Peres area.

Voltago Cgm., are similar to those of the Gracilis Formation (cfr. Tornquist 1901; Barbieri et al. 1980; Cucato et al. 1988; De Zanche & Mietto 1989).

Overlying the Voltago Cgm. a second carbonate – terrigenous unit, the Recoaro Limestone, is documented. This name is used in the Valdaora area because it is the oldest one given to this interval in the eastern Southern Alps. The unit also shows lithologic, paleontologic and chronologic similarities with the Recoaro Limestone in the Recoaro area. In the Dolomites the Framont dark Limestones and the Coll' Alto dark Limestones (Pisa et al. 1979) correspond to the same interval.

Up to date, Anisian carbonate platforms are a matter of discussion. Pia (1937) defined the "Oberer Sarldolomit" at Mt. Serla (Sarlkofel), near Braies, in order to indicate a carbonate body lying between the "Unterer Sarldolomit" and the "Buchensteiner Schichten". Within this carbonate body Bechstädt & Brandner (1970) distinguished a lower part termed "Hauptdiploporenkalk" and an upper part termed "Oberer

Sarldolomit". Therefore the "Oberer Sarldolomit" in Pia and in Bechstädt & Brandner have different meanings.

The name "Contrinkalk" is used by Ogilvie Gordon & Pia (1940) to indicate the undolomitized "Oberer Sarldolomit", which is widespread in the Western Dolomites. For a long time the names "Serla Dolomite" and "Contrin Limestone" have represented different lithological terms for the same Anisian platform (cfr. e.g. Rossi 1968). Later stratigraphic reviews (Assereto et al. 1977; Farabegoli et al. 1977; Assereto & Pisa 1978; Pisa et al. 1979; Casati et al. 1981; Gaetani et al. 1981; Farabegoli & Levanti 1982; Farabegoli et al. 1985; De Zanche & Farabegoli 1988; De Zanche 1990) show, without doubt, that two Upper Anisian carbonate platforms exist: the Upper Serla Formation, which is Pelsonian in age and the Contrin Formation which is Illyrian in age. As described below, these platforms can be calcareous or dolomitized and each one is characterized by well-defined stratigraphic relationships with the adjacent units. The top of these two different carbonate platforms is coincident with two different sequence boundaries. Therefore the Upper Serla Fm. and the Contrin Fm. are within two unmistakable depositional sequences, even where the latter directly overlies the former, e.g. at Mt. Serla.

In the Piz da Peres section, about 16 km West of Mt. Serla, the stratigraphic setting (Fig. 3) is different. The two carbonate platforms are separated by terrigenous and terrigenous-carbonate units. In our scheme the Upper Serla Fm. corresponds to the "Riffkalk" in Bechstädt & Brandner (1970) and to the massive limestone or dolomite of the uppermost "Pragserschichten" in Pia (1937, p. 40). The Contrin Fm. relates to the "Oberer Sarldolomit" in Bechstädt & Brandner (1970) and to the "Oberster Sarldolomit" (= the upper part of the "Oberer Sarldolomit") in Pia (1937), p. 40), who considered this carbonate body in the Piz da Peres section to be only the upper part of his "Oberer Sarldolomit".

Lithostratigraphy

Werfen Formation (Scythian)

In the Piz da Peres section a stratigraphic contact between the Werfen Fm. and the overlying Anisian units is not exposed. For a general description of the unit and an exhaustive reference see Broglio Loriga et al. (1990).

Lower Serla Dolomite (? Latest Scythian – ? Aegean)

This corresponds to the "Unterer Sarldolomit" p.p. both in Pia and in Bechstädt & Brandner (1970). Our work demonstrates that the Lower Serla Dolomite should be restricted to the white, well-bedded dolomites underlying the Piz da Peres Cgm. (Figs. 2 and 3).

The unit crops out very discontinuously on the northern slope of the Piz da Peres. It consists of centimetre-thick, even to slightly undulated white dolomitic mudstones and wackestones. The upper part of the unit includes common thin rudstone intercalations mostly consisting of well rounded carbonate clasts with a micritized rim.

The lower boundary with the Werfen Fm. is not exposed. The upper boundary with the Piz da Peres Conglomerate has been placed at the erosional base of the first thick conglomerate bed.

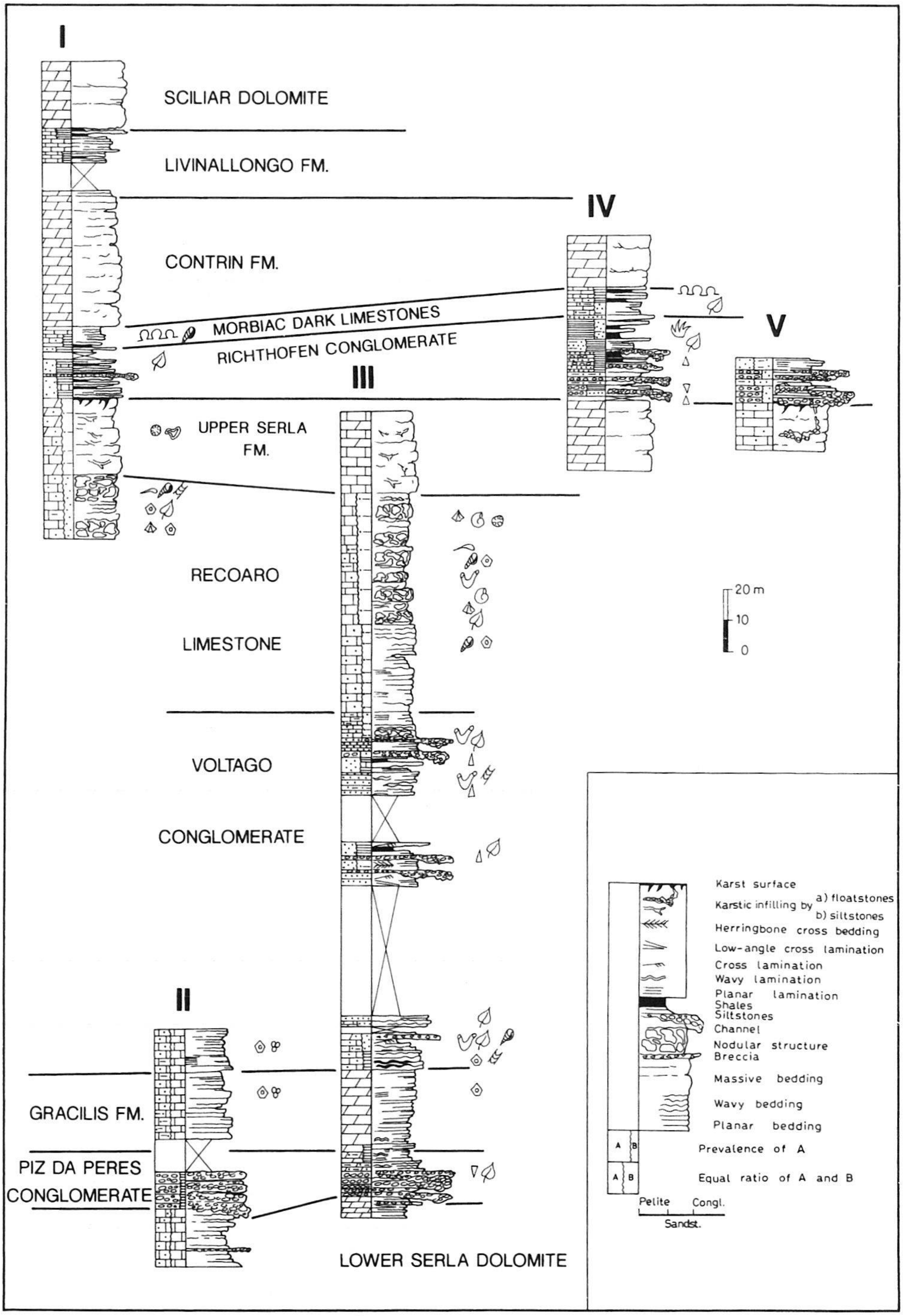


Fig. 3. Lithostratigraphy of the Anisian Piz da Peres section. (see location in Fig. 1).

Fossils are very rare: foraminifers (*Meandrospira dinarica* Kochanski-Devidé & Pantić, *Glomospira* sp.), ostracods and crinoid fragments. The Lower Serla Dolomite was a broad shallow carbonate platform; in its upper part, inter- and supratidal episodes, indicated by tepees and caliches, have been recognized. The Lower Serla Dolomite is about 50 m thick.

The uncertainty of the age is due to lack of marker fossils. Recently (Broglio Loriga et al. 1990) the unit has been referred to the Scythian-Anisian transition.

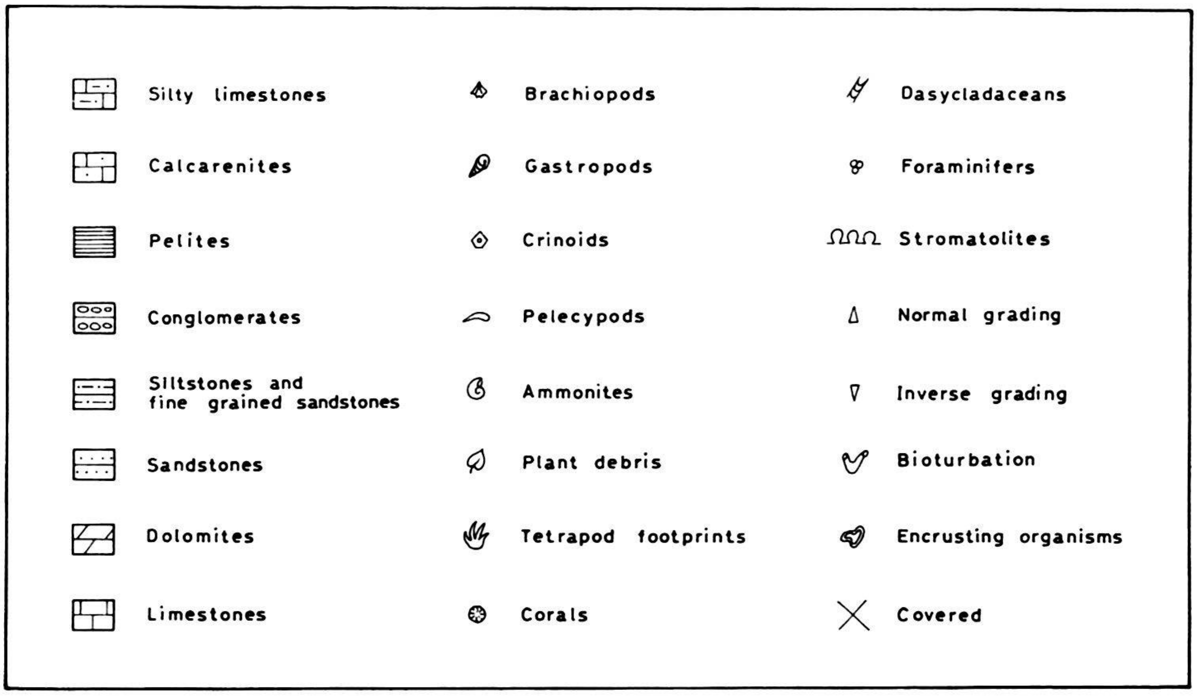
Piz da Peres Conglomerate (Aegean – ? Bithynian)

A new name given to this unit replaces the term "Untere Peresschichten" in Bechstädt & Brandner (1970) in order to avoid confusion. It corresponds to the Val Leogra Breccia in the Recoaro area (cfr. De Zanche et al. 1981; De Zanche & Mietto 1981).

The Piz da Peres Conglomerate consists of whitish decimetre thick pebble conglomerate lense-shaped beds alternating with subordinated centimetre-thick red, rarely green, clayey siltstones. Pebbles, a few centimetres in size (rarely over 10 cm), well-rounded to subrounded and normally pitted, mostly consist of dolomitic mudstones and wackestones from the Lower Serla Dolomite. Rare clasts are referable to the Werfen Fm; some of them include *Meandrospira pusilla* (HO) and other foraminifers. The matrix is very scarce and consists of carbonate silt, containing scattered fine grained quartz and mica, and red clayey siltstone.

The lower boundary is strongly erosional and the conglomerates infill channels a few metres deep which cut the supratidal deposits of the Lower Serla Dolomite.

Upwards conglomerates disappear and are replaced by silty to sandy red or light green dolomites alternating with decimetre-thick red and greenish siltstones.



Legend to Fig. 3

The Piz da Peres Conglomerate, which is between 15 and 20 metres thick, is interpreted to have been deposited in a fluvial or fluvial-deltaic environment. The age is uncertain. However, it is to be assigned to the Early Anisian as it underlies the Gracilis Fm., essentially Bithynian in age.

Gracilis Formation (Bithynian – ? Earliest Pelsonian)

This name refers to the carbonate-terrigenous interval lying between the Piz da Peres Conglomerate and the Voltago Conglomerate. It corresponds to the upper part of the "Unterer Sarldolomit" both in Pia (1937) and in Bechstädt & Brandner (1970).

The unit mostly consists (Fig. 3) of more or less dolomitized, decimetre-thick, even to slightly undulated, locally nodular, wackestone and calcsiltite beds. They contain foraminifers (*Agathammina judicariensis* Premoli Silva), pelecypods, gastropods, oncoides, dasycladaceans, crinoids, fine grained angular quartz ($< 5\%$), rare mica flakes and sparse carbonate clasts. Typically, the rock bears light pink and green spots. Thin red and green siltstone layers are interbedded.

The Gracilis Fm. is about 40 m thick. Its lower and upper boundaries are sharply defined respectively to the Piz da Peres Conglomerate and the Voltago Conglomerate. The former is characterized by a strong decrease in siliciclastics and the latter is marked by the increase in clastic sediments.

As the substantial constancy of the facies throughout the Braies area suggests that no striking break in slope exists. Therefore the depositional environment could be referred to a carbonate ramp, with low terrigenous input.

The age could be Bithynian as, elsewhere in the Southern Alps (unpublished data), the Gracilis Fm. seems to be older than the Cuccense Subzone (base of the Pelsonian, pers. comm. Mietto & Manfrin).

Voltago Conglomerate (? Bithynian – Earliest Pelsonian)

Pia (1937) considered this unit to be the Richthofen Conglomerate (Fig. 2), although he recognized its correspondence with the "Voltzia beds" in the Recoaro area. Owing to the presence of Binodosus Subzone ammonites in the overlying Recoaro Limestone this unit corresponds to the second Anisian conglomerate unit and not to the Richthofen Conglomerate.

The lower part of the Voltago Conglomerate consists of the following lithologies: 1) silty-micaceous, locally nodular, bioturbated wackestones, 2) bright pink, violet, green and grey quartzy-micaceous siltstones and fine grained sandstones with plant debris, 3) well cemented dasycladacean rudstones, 4) foraminifer-dasycladacean-crinoid packstones/grainstones, 5) subordinate reddish floatstones. Sandstones contain fine angular quartz grains (up to 30%), scattered and occasionally broken oolites and little rounded carbonate lithoclasts, sometimes bearing *Meandrospira pusilla* (HO), from the Werfen Formation. Sandstones and siltstones are commonly cross-laminated.

In the upper part of the unit, grey centimetre/decimetre-thick strongly wavy to nodular silty lime grainstone beds bearing dasycladaceans, crinoids, gastropods and carbonate intraclasts, are interbedded with predominant grey siltstones, fine grained sandstones and conglomerates. Nodules are bound by yellowish dolomitized siltstones.

Plant debris is abundant throughout the unit. Conglomerate beds, consisting of rounded centimetre-sized pebbles in a red sandy matrix, are subordinate. Normally they are a few decimetres, rarely more than 1 m, thick and are erosional.

In the northern slope of the Piz da Peres the lower boundary with the Gracilis Fm. corresponds to an increase in siliciclastics. At its top the unit, about 70 m thick, is rapidly replaced by Recoaro Limestone in connection with a strong decrease in the influx of siliciclastic and a contemporary increase in carbonates.

In the Piz da Peres section the Voltago Conglomerate does not show evidence of a fluvial depositional environment, contrary to the current situation in the Dolomites. It is organized in a prograding wedge which pinches out landwards and it was probably deposited under coastal conditions. The dasycladacean and crinoid packstones and grainstones in the lowermost and uppermost Voltago Conglomerate of the Piz da Peres section correspond to part of the "Algenwellenkalk" in Bechstädt & Brandner (1970).

A preliminary comparison with sections elsewhere in the Dolomites and in Carnia suggests a Earliest Pelsonian age (Cuccense Subzone) for the Voltago Conglomerate.

Recoaro Limestone (Pelsonian)

The unit overlying the Voltago Cgm. may be ascribed to the Recoaro Limestone owing to the lithologic, paleontologic and chronologic similarity with the same unit in the Recoaro area. Pia (1937) included it in the "Pragserschichten".

The Recoaro Limestone predominantly consists of packstones and packstones/grainstones arranged in decimetre-thick layers alternating with thin calcsiltite beds containing angular fine grained quartz grains (2–3%). They include oncoids, crinoids ("*Encrinus*" *liliiformis* Lam.), foraminifers, brachiopods (*Coenothyris vulgaris* [Schloth.], *Tetractinella trigonella* [Schloth.], *Decurtella decurtata* [Girard]), pelecypods, gastropods (*Undularia scalata* [Schloth.]), corals, codiaceans and dasycladaceans. Plant debris is common. In the lower part of the unit, beds are slightly undulated, whereas in the upper part a nodular, strongly bioturbated facies is typical and dominant.

The depositional environment is referable to a carbonate ramp, rich in life, slightly contaminated by terrigenous input.

The boundary with the Voltago Conglomerate is marked by a strong decrease in siliciclastics and grey limestones becoming predominant. The upper boundary is transitional: within a few metres layered grey limestones grade into white and massive limestones of the Upper Serla Formation. In the Piz da Peres section the unit is more than 70 m thick.

The age is Pelsonian. In the upper part of the unit ammonites of the Binodosus Subzone, e.g. *Bulogites zoldianus* (Mojs.), have been collected.

Upper Serla Formation (Late Pelsonian)

In the Piz da Peres section (Fig. 2) this formation corresponds to the topmost "Pragser Schichten" in Pia (1937, p. 40) and to the "Riffkalke" in Bechstädt & Brandner (1970). At Mt. Serla, East of Lake Braies, Pia (1937) included it in the "Oberer Sarldolomit", whereas Bechstädt & Brandner (1970) distinguished it as "Hauptdiploporenkalk".

It consists of packstones, grainstones and rudstones containing crinoids, gastropods, pelecypods, foraminifers, porostromata, dasycladaceans and *Tubiphytes*. Wackestones with fenestral fabric are abundant in the upper part. On the whole the unit is whitish and massive. A decimetre-sized layering is only visible locally.

Numerous irregular centimetre-sized (maximum 10–15 cm) cavities are scattered throughout the carbonate body, but mainly at its top. These cavities are filled with yellowish dolomitized siltstone bearing angular fine grained quartz (1–2%). A paleo-karstic cavity, some metres long (a few decimetres wide), filled with a floatstone with rounded clasts from the overlying Richthofen Conglomerate, has been recognized. These structures are interpreted as dissolution features generated during the emersion of the platform at about the end of the Pelsonian.

The Upper Serla Fm. transitionally overlies the Recoaro Limestone. At its top it is unconformably overlain by the Richthofen Conglomerate. Thickness ranges from 15 to about 20 m.

The age is referable to the Latest Pelsonian on the basis of unpublished ammonite data from elsewhere in the Dolomites.

Richthofen Conglomerate (Early Illyrian)

It constitutes the third Anisian conglomerate unit and corresponds to the "Obere Peresschichten" both in Pia (1937) and in Bechstädt & Brandner (1970).

The unit is dominated by sandstones and siltstones which alternate with subordinate conglomerate beds, a few decimetres thick, erosionally based. In some sections (IV and V in Fig. 3) conglomerates fill up the valleys incised at the top of the Upper Serla Formation. On the average, clasts, which are always well rounded, are 1–3 cm large (maximum 20 cm). Most of them belong to the Werfen Fm., the Lower Serla Dolomite and the Upper Serla Formation. The matrix, as well as the sandstones and siltstones, is yellowish or grey, rarely red; it bears about 30% angular quartz grains and mica flakes.

Within silty beds in the upper part of the unit tetrapod footprints have been found. In the Braies area Brandner (1973) first reported tetrapod footprints at this stratigraphic level.

The Richthofen Conglomerate, which is less than 30 m thick, unconformably overlies the Upper Serla Formation. The upper boundary is transitional to the Morbiac dark Limestones.

The Richthofen Conglomerate is interpreted to have been deposited in a fluvial environment (Dal Cin 1967). Its age could be referred to the Early Illyrian.

Morbiac dark Limestones (Illyrian)

At the Piz da Peres this unit, which is well developed in the Dolomites, is only 4 m thick. It prevalently consists of more or less silty, centimetre-thick grey or light brown lime wackestones and packstones bearing ostracods, foraminifers and porostromata. Stromatolite bindstones and thin grey or green siltstone layers are interbedded. The lower and upper boundaries are transitional.

Contrin Formation (Late Illyrian)

In the Piz da Peres section (Fig. 2) it corresponds to the "Oberster Sarldolomit" (= upper part of the "Oberer Sarldolomit") in Pia (1937) and to the "Oberer Sarldolomit" in Bechstädt & Brandner (1970). The Contrin Fm. consists of layered whitish dolomites one decimetre thick. Dolomitization obliterated all primary structures.

The unit overlies the Morbiac dark Limestones and is sharply bounded at its top by the Plattenkalke of the Livinallongo Formation (Buchenstein Group). Thickness is about 45 m.

The unit is to be assigned to the Late Illyrian as it underlies the Livinallongo Fm. whose base is referred to the Latest Anisian.

Sequence stratigraphy

Within the Piz da Peres section, stratal discontinuities, bounding packages of genetically related units (Van Wagoner et al. 1988), can be recognized.

From bottom to top four Anisian depositional sequences, including the following lithostratigraphic units, are suggested (Fig. 4):

A 1- 1) uppermost Werfen Fm.; 2) Lower Serla Dolomite.

A 2- 1) Piz da Peres Conglomerate; 2) Gracilis Fm.

A 3- 1) Voltago Conglomerate; 2) Recoaro Limestone; 3) Upper Serla Fm.

A 4- 1) Richthofen Conglomerate; 2) Morbiac dark Limestones; 3) Contrin Fm.

The Contrin Fm./Livinallongo Fm. transition is coincident with the lower sequence boundary of the first Ladinian 3rd order cycle (L1).

Sequence A 1 (? Latest Scythian – Aegean)

The lower sequence boundary lies within the upper part of the Werfen Fm., but in the Piz da Peres section this interval is not exposed.

The upper part of the Lower Serla Dolomite was deposited during highstand time. In fact it shows a regressive trend, testified by upwards increasing supratidal structures (tepees, calcrete, etc.).

Sequence A 2 (? Latest Aegean – Bithynian)

The A 2 sequence boundary is represented by an erosional surface cutting the uppermost part of the Lower Serla Dolomite. According to Vail et al. (1990), it corresponds to type 1 sequence boundary in a ramp setting. During late lowstand time, incised valleys were filled by conglomerates (lower part of the Piz da Peres Conglomerate). Fining upward sediments such as sandstones, marine shales and marly limestones overlie the conglomerates and represent backstepping facies deposited during transgressive time. The maximum flooding event is reached at the base of the terrigenous dolomites which are related to the highstand systems tract (Gracilis Fm.).

Sequence A 3 (? Latest Bithynian – Pelsonian)

The A 3 sequence begins with alternating sandstones, shales and fossil-rich wavy-bedded limestones (wackestones, skeletal packstones) that show progradational features and

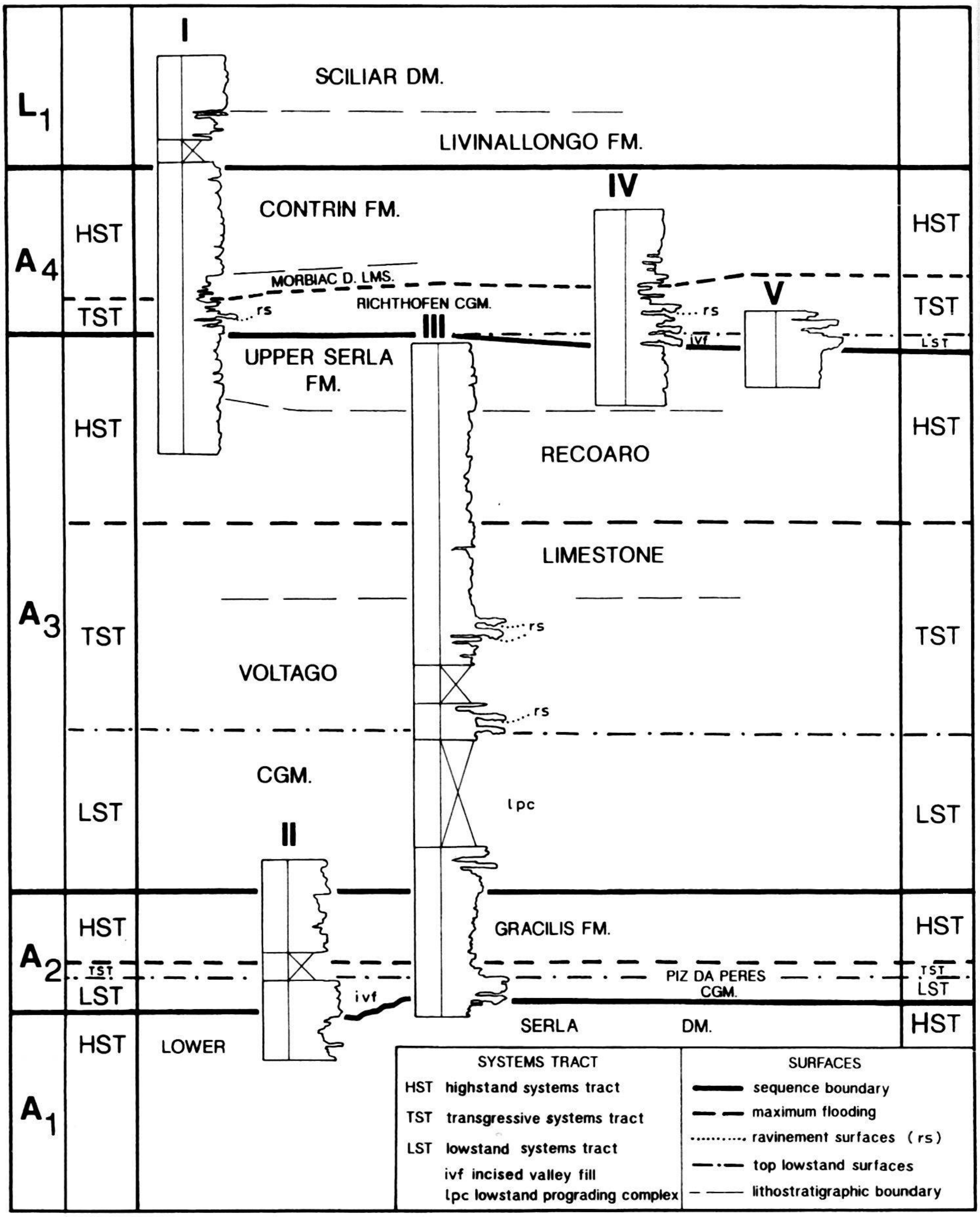


Fig. 4. Sequence stratigraphy of the Anisian Piz da Peres section.

form the lowstand prograding complex (lpc) during late lowstand time. In the northwestern slope of the Piz da Peres (Bechstädt & Brandner 1970, tab. III, 5, A) the Voltago Cgm. deeply cuts into the "Unterer Sarldolomit" showing stratal patterns related to type 1 sequence boundary. The lower part of the transgressive systems tract, deposited on top of the prograding complex, consists of a set of backstepping clastic parasequences bounded at the base by ravinement surfaces. The overlying marly-silty limestones and marls, forming the lower part of the Recoaro Lm., were also deposited during transgressive time. The maximum flooding surface could correspond to the stratal surface represented by the lithologic change between the marls and marly-limestones and the nodular, bioturbated, fossil-rich wackestones-packstones of the upper part of the Recoaro Limestone. These sediments show an aggradational pattern typical of the early highstand systems tract. The late highstand sediments consist of dolomitized carbonates from a platform environment (Upper Serla Fm.).

Sequence A 4 (Illyrian)

The A 4 sequence boundary is coincident with the karst and erosional surface at the top of the Upper Serla platform. During the late lowstand the incised valleys were filled with conglomerates (Richthofen Cgm. p.p.). Thin conglomerates, sandstones and shales (Richthofen Cgm. p.p.), showing a fining upward trend, make up a set of backstepping parasequences which were sedimented during the transgressive time. In the upper part of the unit, marine marls and shales are related to the maximum flooding event. The highstand systems tract consists of dark bioclastic limestones (Morbiac dark Lms.) and the overlying carbonate platform (Contrin Fm.).

Sequence L 1 (Latest Illyrian – Early Ladinian)

The study of this depositional sequence is not the topic of this paper. Moreover, this sequence is difficult to examine in the study area because sections are not well exposed and often tectonically cut by faults.

The sharp boundary between the Contrin Fm. and the overlying dark bituminous pelagic laminites of the Plattenkalke (Livinallongo Fm.) relates to a type 1 sequence boundary. The Plattenkalke correspond to part of the transgressive systems tract of the first Ladinian depositional sequence.

A comparison with Anisian sections in the Valdaora, Dolomites and Recoaro areas

During Anisian time, four third order depositional sequences were deposited, more than the ones in the chart of Haq et al. (1987).

The stratal discontinuities and the ammonite biochronostratigraphic data allow correlations to be made between the depositional sequences defined in the Valdaora area and those in the western and central Dolomites and in the Recoaro area.

No basinal evolving sections have been presented, but only sections located on the paleoshelf and characterized by similar sedimentary evolution. In fact in this paleogeographic context, the successions might show a similar response to the eustatic signal.

Figures 5 and 6 show significant examples. An Anisian succession only including the A 4 sequence is the typical situation in the western Dolomites (cfr. Dal Cin 1967; Bosellini 1968; Rossi 1973). In the central-western Dolomites (cfr. Pisa et al. 1979) A 3 and A 4 sequences unconformably overlie the A 1 sequence. Finally A 1 – A 4 sequences make up the classic succession in the Recoaro area (cfr. Barbieri et al. 1980; De Zanche & Mietto 1981), in the neighbourhood of Trento (cfr. Cucato et al. 1988; De Zanche & Mietto

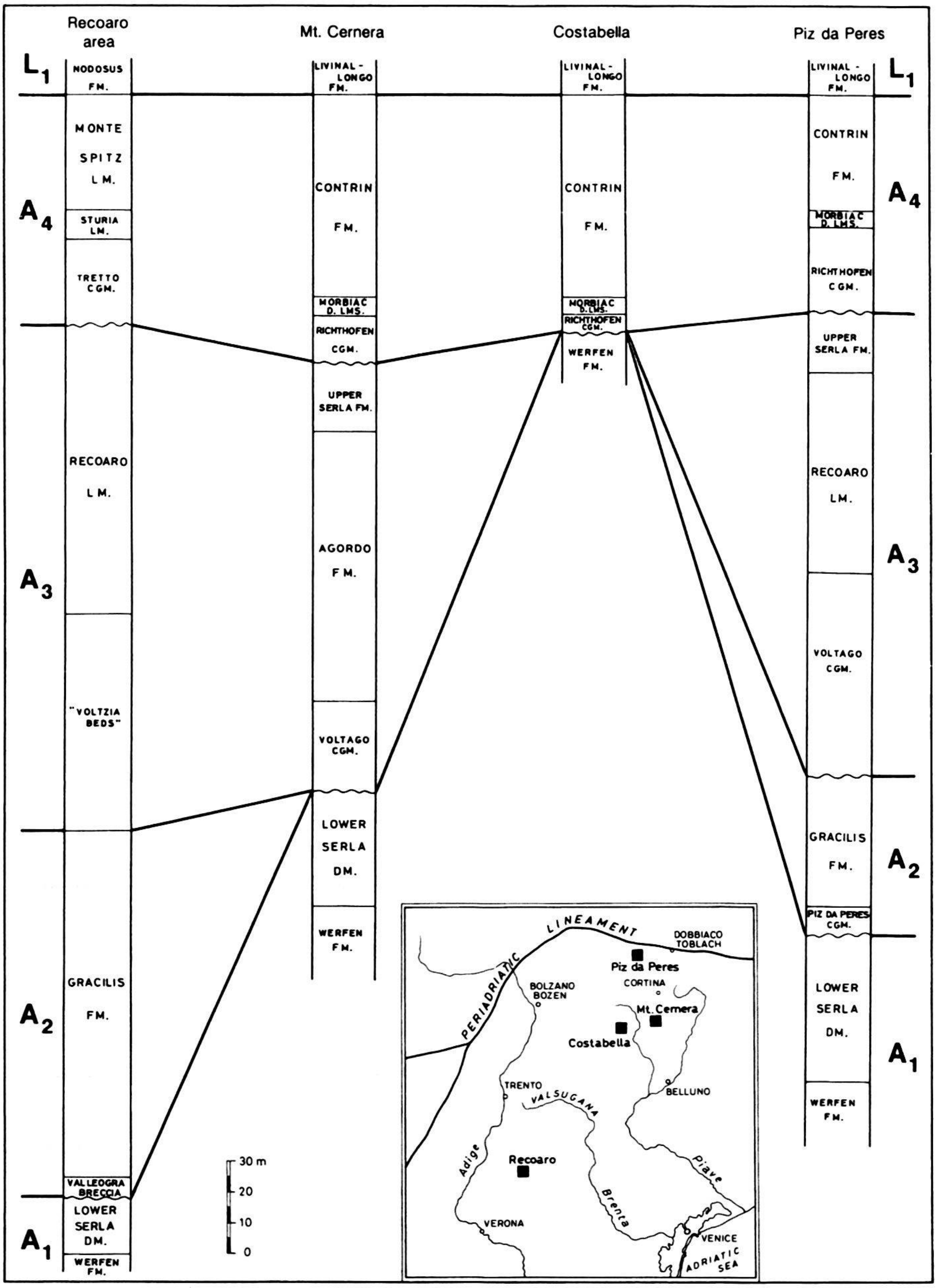


Fig. 5. Lithostratigraphic correlation between some Anisian sections in the western Dolomites and in the Recoaro area.

1989) and in the Valdaora Dolomites. Anisian tectonics is responsible for the more or less complete record of the sequences. Even if the regional tectonic setting can be related to extensional tectonics, the situations in Fig. 5 confirm the existence of local transpressive

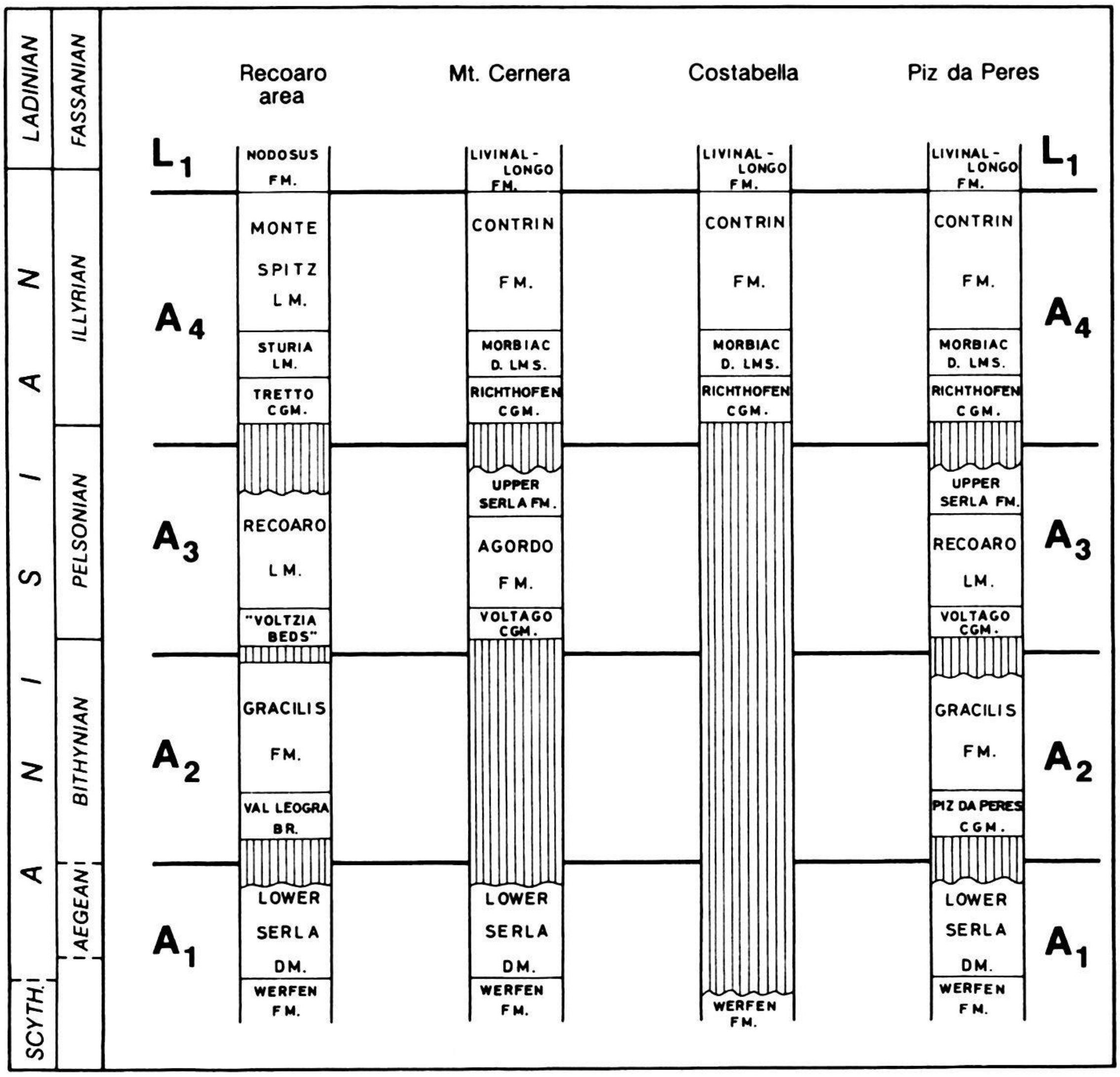


Fig. 6. Chronostratigraphic and sequential correlation between some Anisian sections in the western Dolomites and in the Recoaro area.

features (cfr. Doglioni, 1984). In spite of sin-depositional extensional tectonics, which influences the accomodation space, it seems to be demonstrated that, with the available biostratigraphic control, the eustatic signal is always recognizable.

What we have proposed was partly implicit in the geologic literature. However, it is worth while underlining this result for its clearness and for its importance in paleogeographic, paleotectonic and palinspastic restorations.

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