

Alticola Formation

ANNALISA FERRETTI, HANS-PETER SCHÖNLAUB, CARLO CORRADINI, MARIA G. CORRIGA,
MONICA PONDRELLI, LUCA SIMONETTO & PAOLO SERVENTI

Österreichische Karte 1:50.000
Blatt BMN 197 Kötschach
Blatt BMN 198 Weißbriach
Blatt BMN 199 Hermagor

Carta Topografica d'Italia 1:50.000
Foglio 018 Passo di Monte Croce Carnico
Foglio 031 Ampezzo
Foglio 032 Tolmezzo
Foglio 033 Tarvisio

Blatt UTM 3109 Oberdrauburg
Blatt UTM 3110 Kötschach-Mauthen
Blatt UTM 3116 Sonnenalpe Naßfeld
Blatt UTM 3117 Nötsch im Gailtal

Definition

Gray and pink to red nautiloid bearing limestone (wackestone-packstone) with rare interbedded layers of gray shale, black micritic and grayish bioclastic limestone (wackestone-grainstone) at the top.

Description

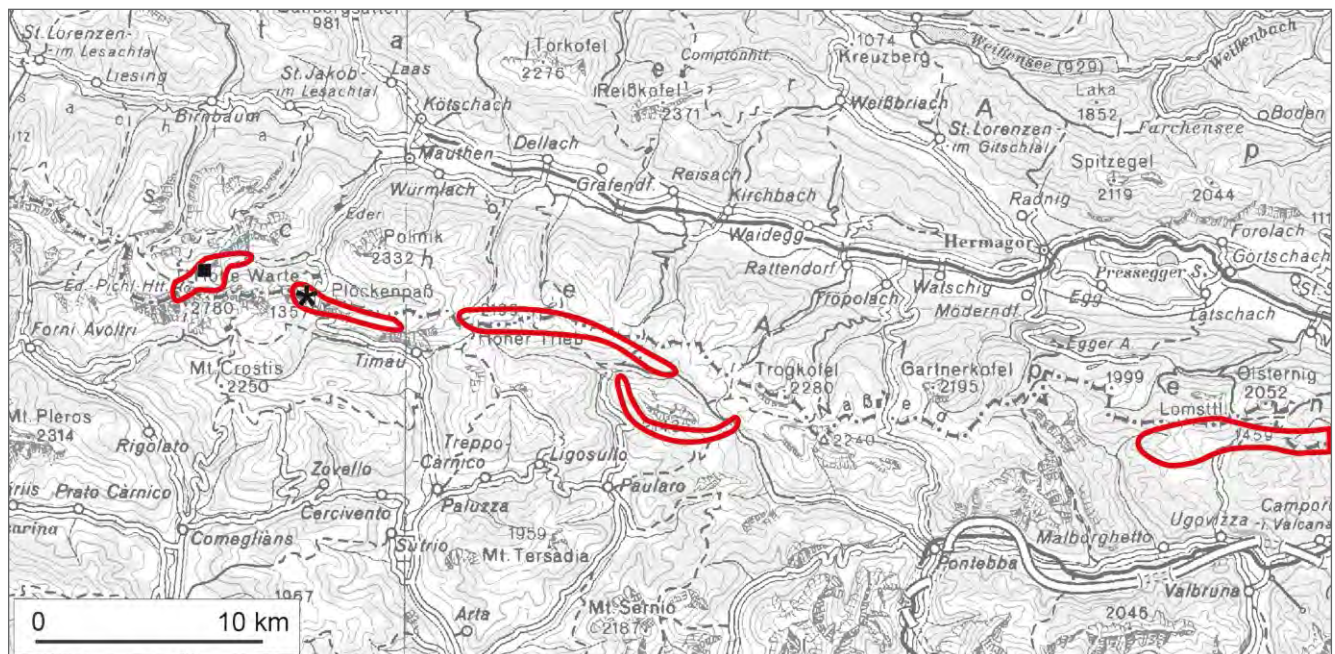
The Alticola Formation is represented by a distinctly bedded cephalopod-bearing limestone with scattered large cephalopod conchs at the base. The unit, that gets upward darker owing to a more micritic content, comprises the Silurian/Devonian boundary. Shallow, neritic facies at the top of the Alticola Formation are documented by brachiopod and bryozoan associations, to record a lowstand to initial transgression.

Fossil content

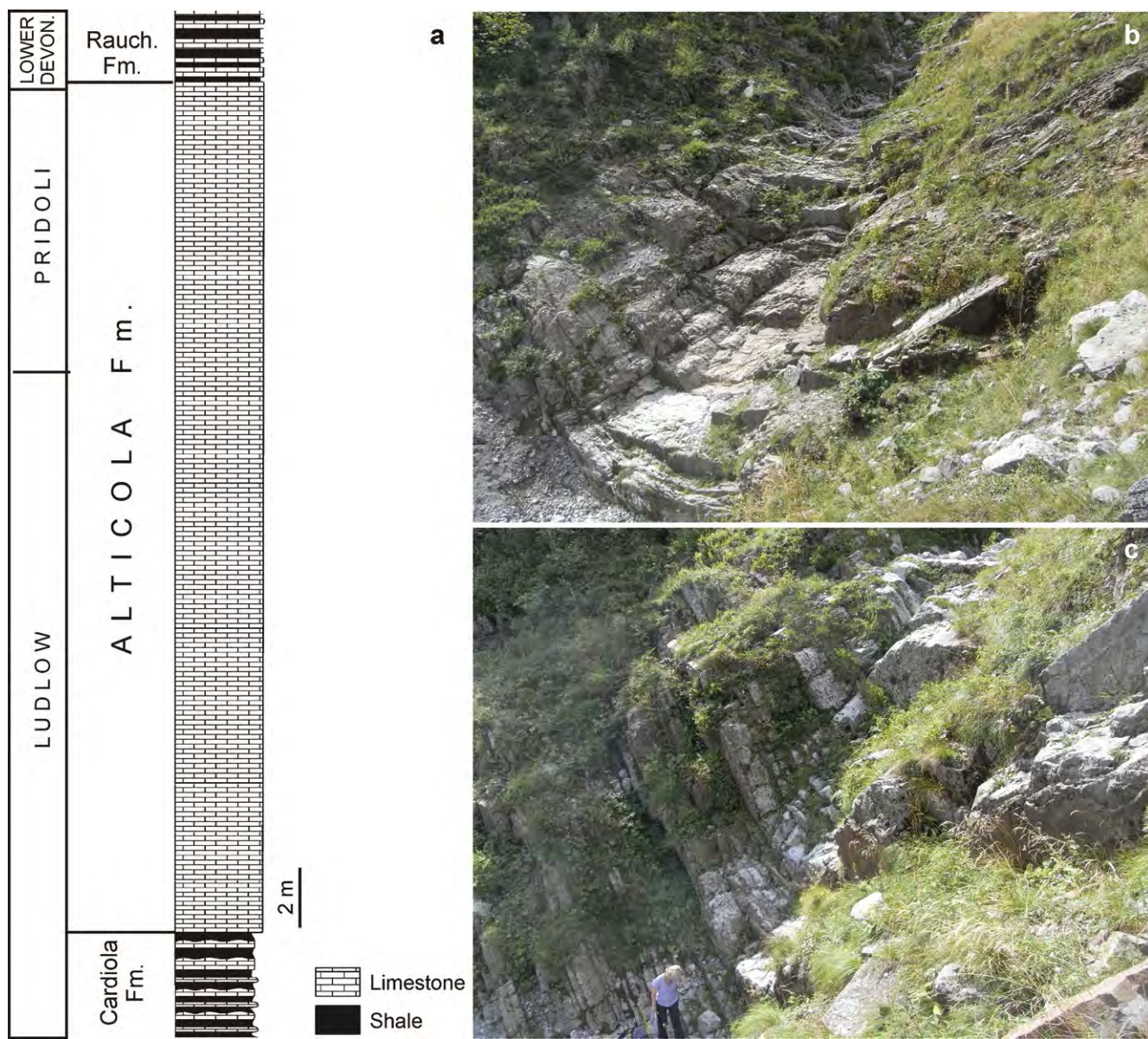
Acritarchs, bivalves, brachiopods, bryozoans, cephalopods, chitinozoans, conodonts, corals, echinoderms, enigmatic phosphatic plates, foraminifers, gastropods, graptolites, ostracodes, scolecodonts, scyphocrinids, trace fossils, trilobites.

Depositional environment

Moderately deep shelf.



Main areal distribution of the Alticola Formation in the central Carnic Alps with indication of the stratotype (asterisk) and of the reference section (square).



The Cella Section. a) log of the section; b-c) global views of the Alticola Formation in the section (photos C. CORRADINI) in the lower exposed part (b) and in the Pridoli part (c).

Stratotype

Cella Section (beds 25-47B in WALLISER, 1964), located in the eastern slope of Mt. Cella/Creta di Collinetta, at coordinates N 46°36'32", E 12°56'30".

Reference sections

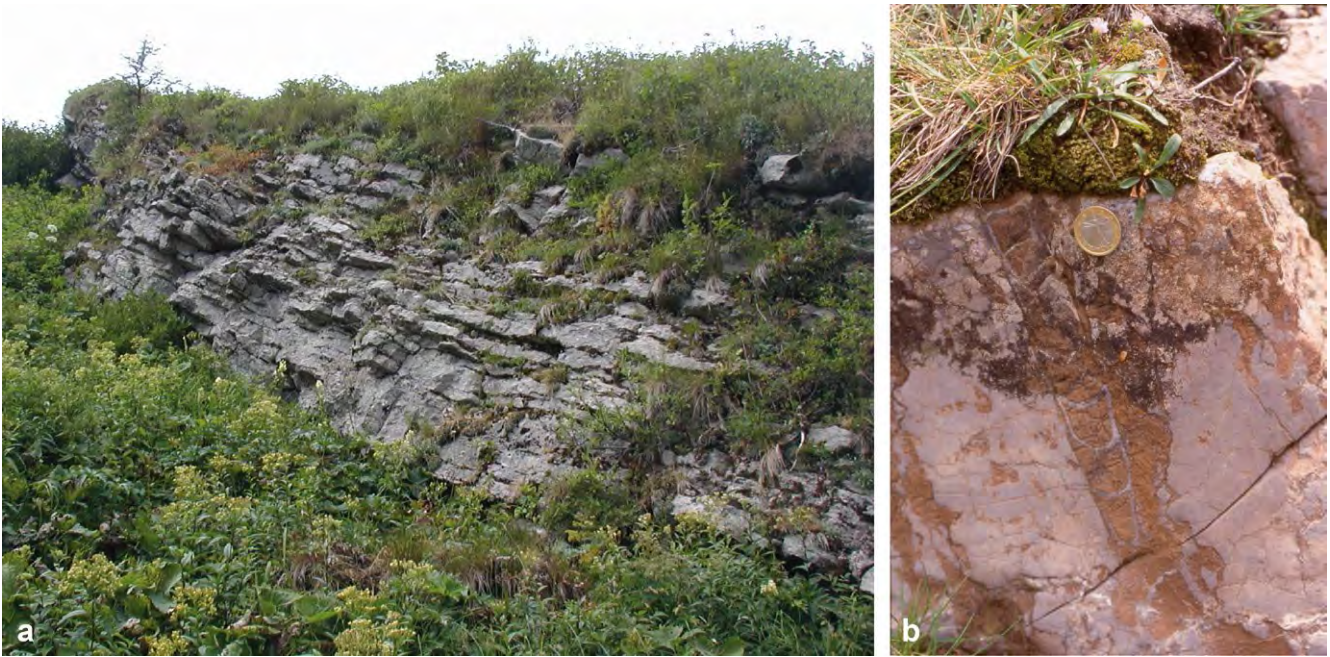
Rauchkofel Boden Section (beds 326-331 in SCHÖNLAUB, 1980), located in the southern flank of Mt. Rauchkofel at coordinates N 46°36'53.5", E 12°52'33.0", exposing a shallower facies than the stratotype.

Type area

Carnic Alps.

Main outcrop areas

The Alticola Formation is well developed in the Carnic Alps, mainly in Lake Wolayer-Rauchkofel, Mt. Cella/Creta di Collinetta to Creta di Timau, Hoher Trieb/Cuestalta to Zuc di Malaseit and Monte Cocco to val Bartolo sectors.



Views of the Alticola Formation in the field. a) well bedded limestone of the unit exposed in the Cadin di Lanza II section (photo L. SIMONETTO); b) close view of a nautiloid, south-east of Cima val di Puartis (photo C. CORRADINI).

Thickness

About 25-30 m.

Boundaries

Underlying units – Cardiola Formation (conformable, sharp contact).

Overlying units – Rauchkofel Formation (conformable, gradual contact), Seekopf Formation (conformable, gradual contact).

Lateral units – Nölbling Formation.

Derivation of name

After the nautiloid *Orthoceras alticola* Barrande (FRECH, 1887).

Synonymy

Untersilurische Schichten [partim]: STACHE (1874).

Unterer rother Orthoceren Kalk, wechsellagernd mit grauem Kalke: FRECH (1887).

Zone des *Orthoceras alticola*: FRECH (1887).

Calcarei ad ortoceratidi: TARAMELLI (1895a).

Calcarei grigi e rossi mandorlati ad *Orthoceras potens* ed *Orth. alticola* [partim]: TARAMELLI (1895b).

Bunte Flaser-oder Bänderkalke und Kalkphyllite des Obersilur [partim]: GEYER (1899).

Calcarei reticolati – facies a Cefalopodi: GORTANI & VINASSA DE REGNY (1909).

Calcarei reticolati – facies a Brachiopodi: GORTANI & VINASSA DE REGNY (1909).

Calcarei reticolati grigiastri e rossastri con *Orthoceras alticola* Barr. e *Tornoceras* [partim]: GORTANI (1913).

Gotlandiano: le facies calcaree [partim]: GORTANI (1926).

Siluriano superiore - Calcarei mandorlati rossastri e bruno nerastri, calcari a Crinoidi, calcari corallini selciferi [partim]: GORTANI & DESIO (1927).

Orthoceren-(*alticola*-) Kalke: GAERTNER (1931).

Rhynchonella megaera-Schichten: GAERTNER (1931).

Orthocerenkalk: HABERFELNER & HERITSCH (1932).

Rh. megaera-Schichten: WALLISER (1957).

Kalk mit *H. megaera*: PÖLSLER (1967).

Calcarei e marne nere alternati, talora con argilliti ai Graptoliti; calcari rossicci o nerastri ad “*Orthoceras*”, calcari nodulari [partim]: BRAGA et al. (1971).

Alticola Limestone: SCHÖNLAUB (1980).

Black nodular Limestones: SCHÖNLAUB (1980).
Megaerella Beds: SCHÖNLAUB (1980).
Calcari ad Alticola: SPALLETTA et al. (1982).
Strati a Megaerella: SPALLETTA et al. (1982).
Alticola Formation: KREUTZER (1992).
Megaerella Formation: KREUTZER (1992).
Megaerella Limestone: SCHÖNLAUB & KREUTZER (1994).
Calcari a *Orthoceras* [partim]: VAI et al. (2002).
Calcari ad *Orthoceras* [partim]: CARULLI (2006).
Calcari e marne [partim]: VENTURINI (2006).

Chronostratigraphic age

Silurian – Devonian: Ludfordian to lowermost Lochkovian.

Biostratigraphy

Conodonts. – *Polygnathoides siluricus* (unpublished data) to *Icriodus hesperius* zones (WALLISER, 1964; CORRADINI et al., 2015 and references therein).

Graptolites. – *M. parultimus* - *M. transgrediens* zones (JAEGER, 1975).

Chitinozoans. – *Eisenachitina barrandei-Urnochitina urna* zones (PRIEWALDER, 1997).

Complementary references

Sequence stratigraphy. – BRETT et al. (2007, 2009).

Taphonomy, sedimentology and microfacies analysis. – FLÜGEL (1965); KREUTZER (1992); FERRETTI (2005); FERRETTI et al. (2012); HISTON (2012, and references therein).

Geochemistry. – TIETZ (1976); FERRETTI et al. (2012).

Isotopes. – SCHÖNLAUB (1994); WENZEL (1997).

Remarks

The Silurian/Devonian boundary occurs in the uppermost part of the unit, marked by the first occurrence of the conodont *Icr. hesperius* (WALLISER, 1964; CORRADINI et al., 2015).

The unit was also previously referred as “Alticola” (lower part) and “Megaerella” (upper part) limestones. K-bentonite levels were described and discussed by HISTON et al. (2007).

References

- BRAGA, G.P., CARLONI, G.C., COLANTONI, P., CORSI, M., CREMONINI, P., FRASCARI, F., LOCATELLI, D., MONESI, A., PISA, G., SASSI, F.P., SELLI, R., VAI, G.B. & ZIRPOLI, G. (1971): Note illustrative della Carta geologica d'Italia. Foglio 4c-13 M. Cavallino-Ampezzo. – Ministero dell'Industria, del Commercio e dell'Artigianato, Direzione Generale delle Miniere, Servizio Geologico d'Italia, 108 p., Roma.
- BRETT, C., FERRETTI, A., HISTON, K. & SCHÖNLAUB, H.P. (2007): Eustasy and Basin Dynamics of the Silurian of the Carnic Alps (Austria). – Yangtze Conference on Ordovician and Silurian (June, 2007). Nanjing, China, 27 - 30 June 2007, Acta Palaeontologica Sinica, **46** (Suppl.), 43–49, Beijing.
- BRETT, C., FERRETTI, A., HISTON, K. & SCHÖNLAUB, H.P. (2009): Silurian Sequence Stratigraphy of the Carnic Alps, Austria. – Palaeogeography, Palaeoclimatology, Palaeoecology, **279**/1–2, 1–28, Amsterdam.
- CARULLI, G.B. (2006): Note illustrative della Carta geologica del Friuli Venezia Giulia, scala 1:150.000. – Regione Autonoma Friuli Venezia Giulia, Direzione Centrale Ambiente e Lavori Pubblici, Servizio Geologico Regionale, 44 p., Firenze.
- CORRADINI, C., CORRIGA, M.G., MÄNNIK, P. & SCHÖNLAUB, H.P. (2015): Revised conodont stratigraphy of the Cellon section (Silurian, Carnic Alps). – Lethaia, **48**/1, 56–71, Oslo.
- FERRETTI, A. (2005): Ooidal ironstones and laminated ferruginous deposits from the Silurian of the Carnic Alps, Austria. – Bollettino della Società Paleontologica Italiana, **44**/3, 263–278, Modena.
- FERRETTI, A., CAVALAZZI, B., BARBIERI, R., WESTALL, F., FOUCHER, F. & TODESCO, R. (2012): From black-and-white to colour in the Silurian. – In: FERRETTI, A., HISTON, K., MCLAUGHLIN, P.I. & BRETT, C.E. (eds.): Time-specific facies: the colour and texture of biotic events. – Palaeogeography, Palaeoclimatology, Palaeoecology, **367–368**, 178–192, Amsterdam.
- FLÜGEL, H. (1965): Vorbericht über mikrofazielle Untersuchung des Silurs des Cellon Lawinenrisses (Karnische Alpen). – Anzeiger der Österreichischen Akademie der Wissenschaften, mathematisch-naturwissenschaftliche Klasse, **1965**, 289–297, Wien.
- FRECH, F. (1887): Über das Devon der Ostalpen, nebst Bemerkungen über das Silur und einen palaeontologischen Anhang. – Zeitschrift der Deutschen geologischen Gesellschaft, **39**, 659–738, Berlin.

- GAERTNER, H.R. von (1931): Geologie der Zentralkarnischen Alpen. – Denkschrift der Österreichischen Akademie der Wissenschaften, mathematisch-naturwissenschaftliche Klasse, Abteilung 1, **102**, 113–199, Wien.
- GEYER, G. (1899): Über die geologischen Aufnahmen im Westabschnitt der Karnischen Alpen. – Verhandlungen der kaiserlich-königlichen Geologischen Reichsanstalt, **1899/3**, 89–117, Wien.
- GORTANI, M. (1913): La serie devoniana della giogaia del Coglians (Alpi Carniche). – Bollettino del Regio Comitato Geologico d'Italia, **43/3–4**, 235–280, Roma.
- GORTANI, M. (1926): Guida geologica del Friuli. Parte generale. – Stabilimento Tipografico Carnia, 64 p., Tolmezzo.
- GORTANI, M. & DESIO, A. (1927): Note illustrative della carta geologica delle Tre Venezie. Foglio "Pontebba". – Ministero dei Lavori Pubblici. Ufficio Idrografico del Regio Magistrato alle Acque. Sezione Geologica, 86 p., Padova.
- GORTANI, M. & VINASSA DE REGNY, I. (1909): Fossili Neosilurici del Pizzo di Timau e dei Pal nell'Alta Carnia. – Memorie della R. Accademia delle Scienze dell'Istituto di Bologna, **1909**, 183–217, Bologna.
- HABERFELNER, E. & HERITSCH, F. (1932): Obersilurische Lydite am nördlichen Valentintörl, Karnische Alpen. – Verhandlungen der Geologischen Bundesanstalt, **1932/7–8**, 113–116, Wien.
- HISTON, K. (2012): The Silurian nautiloid-bearing strata of the Cellon Section (Carnic Alps, Austria): Color variation related to events. – In: FERRETTI, A., HISTON, K., MCLAUGHLIN, P.I. & BRETT, C.E. (eds.): Time-specific facies: the colour and texture of biotic events. – Palaeogeography, Palaeoclimatology, Palaeoecology, **367–368**, 231–255, Amsterdam.
- HISTON, K., KLEIN, P., SCHÖNLAUB, H.P. & HUFF, W.D. (2007): Lower Paleozoic K-bentonites from the Carnic Alps, Austria. – Mitteilungen der Österreichischen Geologischen Gesellschaft, **100**, 26–42, Wien.
- JAEGER, H. (1975): Die Graptolithenführung im Silur/Devon des Cellon-Profiles (Karnische Alpen). – Carinthia II, **165**, 111–126, Klagenfurt.
- KREUTZER, L.H. (1992): Photoatlas zu den variszischen Karbonatgesteinen der Karnischen Alpen (Österreich/Italien). – Abhandlungen der Geologischen Bundesanstalt, **47**, 1–129, Wien.
- PÖLSLER, P. (1967): Geologie des Plöckentunnels der Ölleitung Triest-Ingolstadt (Karnische Alpen, Österreich/Italien). – Carinthia II, **77**, 37–58, Klagenfurt.
- PRIEWALDER, H. (1997): The distribution of the Chitinozoans in the Cellon Section (Hirnantian – Lower Lochkovian) – A preliminary report. – In: SCHÖNLAUB, H.P. (ed.): IGCP-421 North Gondwanan Mid-Palaeozoic Biodynamics, Guidebook. – Berichte der Geologischen Bundesanstalt, **40**, 74–85, Wien.
- SCHÖNLAUB, H.P. (1980): Carnic Alps. Field Trip A. with contributions from JAEGER, H., HOUSE, M.R., PRICE, J.D., GÖDDERTZ, B., PRIEWALDER, H., WALLISER, O.H., KRÍŽ, J., HAAS, W. & VAI, G.B. – In: SCHÖNLAUB, H.P. (ed.): Second European Conodont Symposium, ECOS II, Guidebook, Abstracts. – Abhandlungen der Geologischen Bundesanstalt, **35**, 5–57, Wien.
- SCHÖNLAUB, H.P. (1994): Stable Isotope Data. – In: SCHÖNLAUB, H.P. & KREUTZER, L.H. (eds.): Field Meeting Eastern + Southern Alps, Austria, Guidebook + Abstracts. – Berichte der Geologischen Bundesanstalt, **30**, 88–89, Wien.
- SCHÖNLAUB, H.P. & KREUTZER, L.H. (eds.) (1994): Field Meeting Eastern + Southern Alps, Austria, Guidebook + Abstracts. – Berichte der Geologischen Bundesanstalt, **30**, 1–156, Wien.
- SPALLETTA, C., VAI, G.B. & VENTURINI, C. (1982): La Catena Paleocarnica. – In: CASTELLARIN, A. & VAI, G.B. (eds.): Guida alla geologia del Sudalpino centro-orientale. – Guide Geologiche Regionali, Società Geologica Italiana, 281–292, Bologna.
- STACHE, G. (1874): Die paläozoischen Gebiete der Ostalpen. – Jahrbuch der kaiserlich-königlichen Geologischen Reichsanstalt, **24**, 135–274 (Heft II), 333–424 (Heft IV), Wien.
- TARAMELLI, T. (1895a): Osservazioni stratigrafiche sui terreni paleozoici nel versante italiano delle Alpi Carniche. – Rendiconti della Reale Accademia dei Lincei, s. 5, 4, 185–193, Roma.
- TARAMELLI, T. (1895b): Osservazioni sul Paleozoico delle Alpi Carniche. – Bollettino della Società Geologica Italiana, **14/2**, 277–280, Roma.
- TIETZ, G.F. (1976): Petrographische und geochemische Untersuchungen an einer kondensierten Kalkbank des unteren Silurs der Karnischen Alpen (Österreich). – Verhandlungen der Geologischen Bundesanstalt, **1976**, 207–242, Wien.
- VAI, G.B., VENTURINI, C., CARULLI, G.B. & ZANFERRARI, A. (eds.) (2002): Alpi e Prealpi Carniche e Giulie (Friuli Venezia Giulia). – Guide Geologiche Regionali della Società Geologica Italiana, **9**, 390 p., Milano.
- VENTURINI, C. (2006): Evoluzione geologica delle Alpi Carniche. – Edizioni del Museo Friulano di Storia Naturale, **48**, 208 p., Udine.
- WALLISER, O.H. (1957): Conodonten aus dem oberen Gotlandium Deutschlands und der Karnischen Alpen. – Notizblatt des Hessischen Landes-Amtes für Bodenforschung, **85**, 28–52, Wiesbaden.
- WALLISER, O.H. (1964): Conodonten des Silurs. – Abhandlungen des Hessischen Landes-Amtes für Bodenforschung, **41**, 1–106, Wiesbaden.
- WENZEL, B. (1997): Isotopenstratigraphische Untersuchungen an silurischen Abfolgen und deren paläozoozoographische Interpretation. – Erlanger geologische Abhandlungen, **129**, 1–117, Erlangen.