

# Kok Formation

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## Definition

Well bedded brownish ferruginous and gray to dark gray nautiloid limestone (wackestone-packstone), in the lower part alternating with marly shale. Also developed laterally gray echinoderm- and pinkish brachiopod- grainstone.

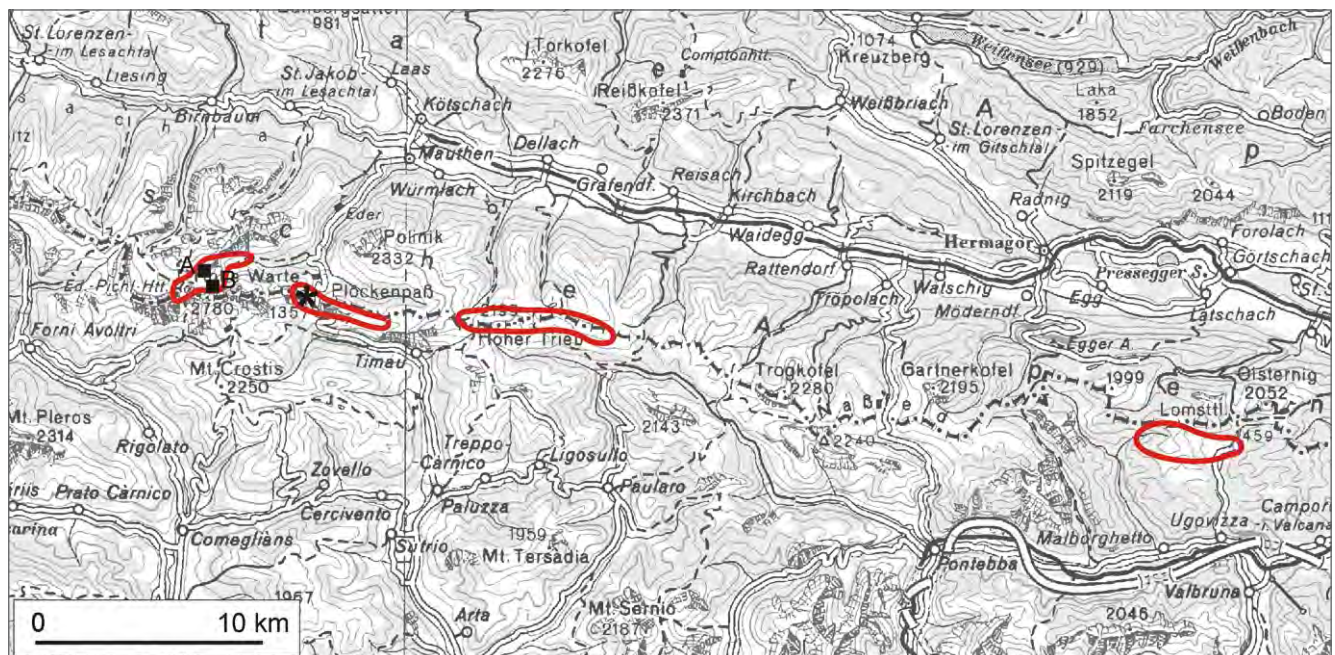
## Description

The lower portion of the Kok Formation is represented by a few meters of shale and thin ferruginous limestones ("lower shales and ferruginous limestone member" in BRETT et al., 2009) with local basal stromatolite-like iron-rich crusts. The remainder of the Kok Formation is represented by skeletal limestones, with cephalopod conchs embedded in a micritic matrix rich in bioclastic material with evidences of microbial activity. Argillaceous encrinitic and brachiopod accumulations are developed in distinctive beds.

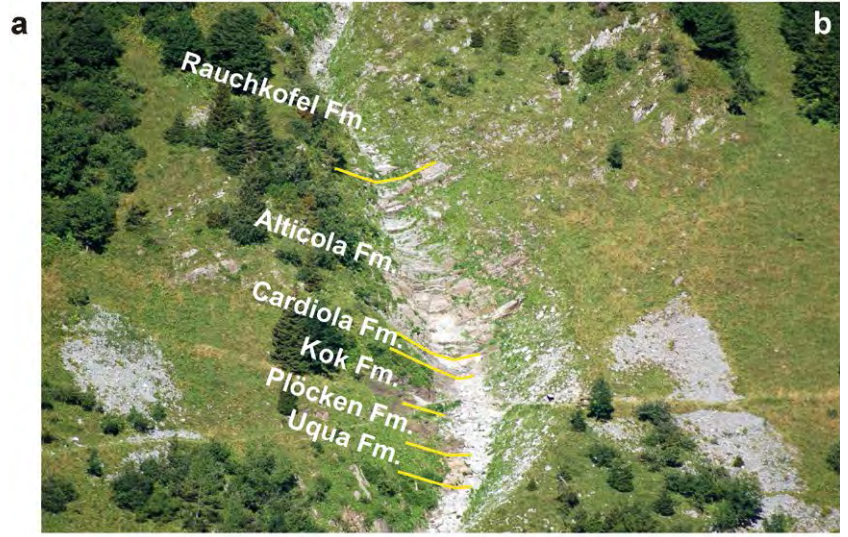
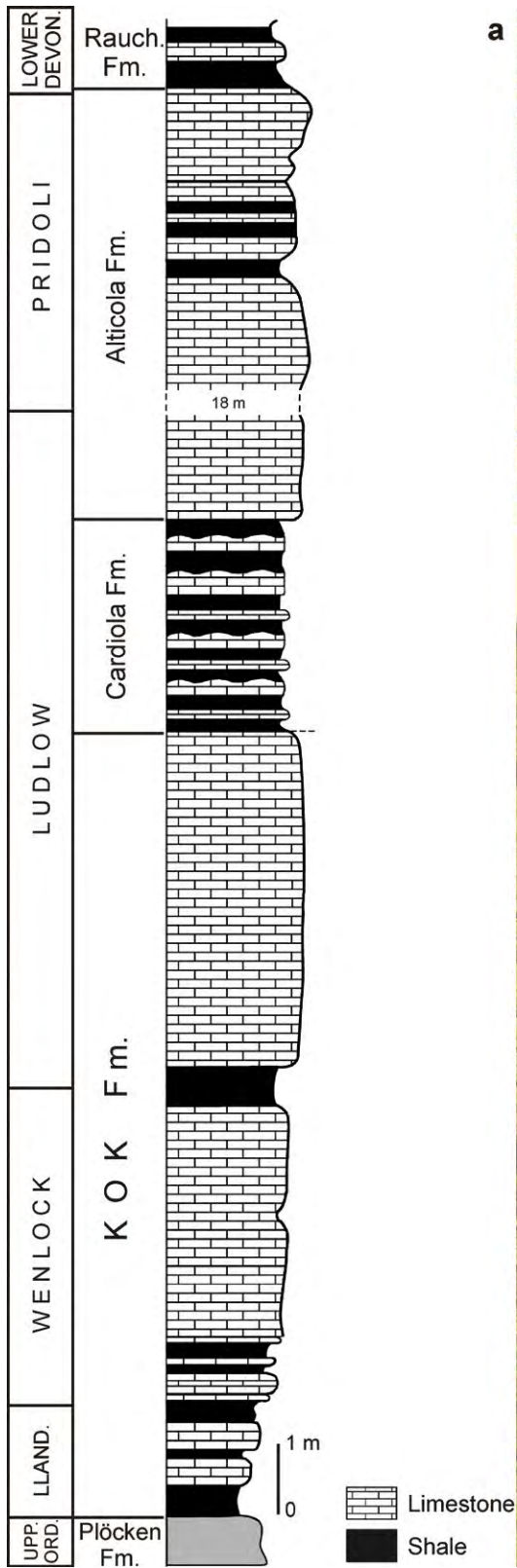
Remarkable is the sedimentary gap present at the base of the Kok Formation, with a hiatus embracing at least the uppermost Hirnantian and parts of the Llandovery, but of higher amplitude in other sections.

## Fossil content

Acritarchs, bacteria, bivalves, brachiopods, cephalopods, chitinozoans, conodonts, conularids, corals, crinoids, foraminifers, gastropods, graptolites, machaeridians, ostracodes, scolecodonts, trace fossils, trilobites.



Main areal distribution of the Kok Formation in the Western Carnic Alps with indication of the stratotype (asterisk) and of the reference sections (squares). Asterisk: Cellon Section; A: Rauchkofel Boden Section; B: Valentintörl Section.



The Cellon Section. a) lithostratigraphic column of the section (adapted from BRETT et al., 2009); b) main units there exposed (photo H.P. SCHÖNLAUB); c) global view of the Kok Formation (photo A. FERRETTI).



Views of the Kok Formation in the field (photos H.P. SCHÖNLAUB). a) cross-sections of orthoceratid nautiloids from the lower to middle part of the Kok Formation at Cellon Section; b) randomly oriented longitudinal sections of *Orthoceras*-bearing Kok Formation from Mt. Rauchkofel; c) longitudinal sections of orthoceratids showing internal chambers and parts of the siphon from the Rauchkofel Boden Section; d) longitudinal section with infilling (telescoping) and partly dissolved proximal part of the conch from the Kok Formation at the Bodentörl section.

## Depositional environment

Shallow to moderately deep shelf.

## Stratotype

Cellon Section (beds 9-19 in WALLISER, 1964), located in the eastern slope of Mt. Cellon/Creta di Collinetta, at coordinates N 46°36'32", E 12°56'30".

## Reference sections

Rauchkofel Boden Section (beds 310-325 in SCHÖNLAUB, 1980), located on the southern slope of Mt. Rauchkofel at coordinates N 46°36'53.5", E 12°52'33.0", where a shallower facies than the type section is exposed.

Valentintörl Section (SCHÖNLAUB, 1980) at coordinates N 46°36'50", E 12°52'48", where a peculiar facies indicating intense microbial activity is exposed.

## Type area

Carnic Alps.

## Main outcrop areas

The Kok Formation is well developed in the Carnic Alps, having the most spectacular outcrops in the Lake Wolayer-Rauchkofel area, Mt. Cellon/Creta di Collinetta to Freikofel, Hoher Trieb/Cuestalta to Cima val di Puartis and Monte Cocco sectors.

## Thickness

About 15 m.

## Boundaries

*Underlying units* – Plöcken Formation (unconformable contact), Wolayer Formation (unconformable contact).

*Overlying units* – Cardiola Formation (conformable, sharp contact).

*Lateral units* – Nölbling Formation.

## Derivation of name

After Kokberg (= Mt. Cocco).

## Synonymy

Untersilurische Schichten [partim]: STACHE (1874).

Rotheisenstein: SEELAND (1878).

Unterer Eisenkalk: FRECH (1887).

Grauer Netzkalk: GEYER (1894).

Thonschiefer: GEYER (1894).

Calcarei ad ortoceratidi [partim]: 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).

Unteres Orthocerenkalkniveau: GEYER (1903).

Calcare ad *Orthoceras*: VINASSA DE REGNY & GORTANI (1905).

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

Calcarei reticolati grigiastri e rossastri con *Orthocera 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).

Kokkalke: HERITSCH (1929).

Kokkalk [partim]: GAERTNER (1931).

Aulacopleuraschicht [partim]: GAERTNER (1931).

Trilobitenschiefer [partim]: GAERTNER (1931).

Krinoidenkalk [partim]: HABERFELNER & HERITSCH (1932).

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

Kok Limestone [partim]: SCHÖNLAUB (1980).

*Orthoceras* Limestone: SCHÖNLAUB (1980).

Trilobite and Aulacopleura Beds [partim]: SCHÖNLAUB (1980).

Calcare ad Aulacopleura: SPALLETTA et al. (1982).

Calcare del Cocco: SPALLETTA et al. (1982).

Marne a trilobiti: SPALLETTA et al. (1982).

Aulacopleuraschicht: SCHÖNLAUB (1985).

Crinoiden-Brachiopoden-Kalken: SCHÖNLAUB (1985).

Aulacopleura Limestone: SPALLETTA & VENTURINI (1989).

Calcarei a *Orthoceras* [partim]: VAI et al. (2002).

Formation del Cocco: CARULLI (2006).

Marne a Trilobiti: CARULLI (2006).

Calcarei e marne [partim]: VENTURINI (2006).

## Chronostratigraphic age

Silurian: Llandovery (Telychian) to Ludlow (Ludfordian).

## Biostratigraphy

*Conodonts*. – *Pterospirifer angustoides angulatus*-*Ancoradella ploeckensis* zones (WALLISER, 1964; CORRADINI et al., 2015 and references therein).

*Graptolites*. – *Cyrtograptus lapworthi*-*Cyrtograptus rigidus* zones (JAEGER, 1975).

*Chitinozoans*. – *Eisenackitina dolioliformis*-?*Angochitina elongata* zones (PRIEWALDER, 1997) (see remarks below).

## 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).

*Paleocommunities*. – VAI (1999).

*Geochemistry*. – FERUGLIO (1970); TIETZ (1976); PASAVA & SCHÖNLAUB (1999); FERRETTI et al. (2012).

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

## Remarks

The Kok Formation was usually assigned to as *Orthoceras* limestone by old authors owing to the abundant cephalopod fauna there present.

PRIEWALDER (1997) only tentatively referred the chitinozoan association from the upper part of the Kok Formation and the Cardiola Formation to the *Angochitina elongata* Zone due to the open nomenclature of many taxa there recovered.

Several K-bentonites levels were described and discussed by HISTON et al. (2007).

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