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SCIENCE

Geology of the Classical Karst Region (SW Slovenia–NE Italy)

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ABSTRACT
The paper aims to present the geology of the western part of the Classical Karst (NW Dinarides), located at the border between Slovenia and Italy. The work is based on archive, published and new data collected by Slovenian and Italian researchers within several scientific national and Cross Border Cooperation projects. The map, produced at a scale of 1:50,000, summarizes the lithological and structural setting and is supplemented by three geological cross-sections of the study area.

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1. Introduction

The Classical Karst Region (Kras–Carso) extends across the border between SW Slovenia and NE Italy and has a special place among karst regions in the world. After the name of this landscape, the international scientific term karst is generally adopted, along with the first idea that karst is a rocky barren land with a high density of dolines (Gams, 2003).

Geological investigations of the region date back to the seventeenth century and continued during the eighteenth and in the beginning of the nineteenth centuries, when studies were focused on karst phenomena. In the second half of the nineteenth century, Austrian geologists produced a solid basemap of the geologic structure of the Classical Karst Region and created the first geological map at a scale 1:75,000 (Stache, 1889a, 1889b), connected to a synoptic geological map of the Austro-Hungarian Empire. After World War I, Italian geologists (Blasig, 1921; D'Ambrosi, 1953; Martinis, 1951; Sacco, 1922) studied the Classical Karst Region. After World War II, within the context of the Basic Geological Maps of the former Yugoslavia, at a scale 1:100,000, significant progress in understanding the lithological characteristics and geological structure of the area was made (Buser, 1968, 1973; Buser, Grad, & Pleničar, 1967, 1970; Pleničar, Polšak, & Šikić, 1969, 1973; Šikić & Pleničar, 1975; Šikić, Pleničar, & Šparica, 1972).

The last period of geological research of the Classical Karst Region began in the 1990s and after more than two decades of intensive geological research, a large number of detailed geological maps of the Slovenian (Jurkovšek, 2008, 2010, 2013; Jurkovšek et al., 1996; Jurkovšek, Cvetko Tešović, & Kolar-Jurkovšek, 2013) and the Italian sides (Regione Autonoma Friuli Venezia Giulia, Servizio Geologico [RAFVG], 2008a, 2008b) were produced, together with a number of scientific and professional papers (Drobne et al., 1995; Korbar, 2009; Košir, 2003; Ogorelec, Dolenec, & Drobne, 2007; Ogorelec, Drobne, Jurkovšek, Dolenec, & Toman 2001; Ogorelec et al., 1996; Otoničar, 2007; Tunis et al., 2011; Palci, Jurkovšek, Kolar-Jurkovšek, & Caldwell, 2008 and references therein for Slovenia; Caffau, Pleničar, Pugliese, & Drobne, 1998; Caffau, Tsakiridou, Colizza, Melis, & Pugliese, 2001; Colizza, Cucchi, & Ulcigrai, 1989; Cucchi, Pirini Radrizzani, & Pugliese, 1989; Cucchi, Pugliese, & Ulcigrai, 1990; Pugliese et al., 1995; Tarlao, Tunis, & Venturini, 2005; Tewari et al., 2007 and references therein for Italy).

The Cross Border Cooperation (CBC) Programme Italia-Slovenia 2007-2013 – project HydroKarst and the CBC IPA-ADRIATIC 2007-2013 Programme – project RoofOfRock allowed harmonization and unification of the structural data, stratigraphical units and formations of the Classical Karst Region (Cucchi, Biolchi, Zini, Jurkovšek, & Kolar-Jurkovšek, 2015; Novak et al., 2015).

Based on all archive and published material along with new surveys, this work aims to present the geological map at a scale of 1:50,000 of the Classical Karst Region with the related legend, a stratigraphic column and three geological cross-sections. The map covers both the Slovenian and Italian sides of the Region and is of great importance for its further development, for example for hydrogeological perspectives due to the high fragility of karst land, where the direct connection between surface and subsurface implies very high vulnerability (Parise, Closson, Gutierrez, &

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Stevanovic, 2015). Moreover it can be useful for the planning of engineering works, natural stone extraction, active tectonics studies, paleontological investigations as well as a base tool for the geo-tourism development.

2. Study area

The Classical Karst Region lies in the northwestern part of the External Dinarides, which stretch in a northwest–southeast direction. It represents the northernmost sector of the karst territory of the Eastern Adriatic. The Classical Karst Region plateau is *sensu stricto* attributed only to the limestone and dolomite area, which is bordered on the west and southwest by alluvial deposits of the river Soča/Isonzo and the flysch sediments of the Trieste Gulf, and on the northeast side by the flysch zone of the Vipava valley. In the east, the plateau extends to the valley of the river Reka and the flysch zone of the Brkini area, whereas on the south, it is bordered by the Matarsko Podolje and Čičarija (Figure 1(a)). The karst plateau, known as the 'Trieste-Komen plateau', develops for about 60 km in length and 15 km in width for an area of about 750 km^2 and is SE–NW oriented (Kranjc, 1997).

3. Methods

The lithological features represented on the Slovenian side are mainly derived from the geological maps published by Jurkovšek et al. (1996) and Jurkovšek (2008, 2010, 2013), while for the Italian side from Cucchi and Piano (2013) and Cucchi et al. (2015). Tectonic features provided by Placer (1981, 2008, 2015), Placer, Vrabec, and Celarc (2010), Del Ben, Finetti, Rebez, and Slejko (1991), Busetti et al. (2010a, 2010b, 2013), Caputo, Poli, and Zanferrari (2010), Carulli (2011), Furlani et al. (2011) and Biolchi, Furlani, Covelli, Busetti, and Cucchi (in press) have been considered and revised.

Over the last few decades, numerous sedimentological, micro- and macropaleontological analyses were carried out and were presented in the monograph *Geology of Kras* (Jurkovšek et al., 2013), along with an extensive collection of thin sections, field notes and manuscript geological maps housed at the Geological Survey of Slovenia. The collection serves as an important source database.

Colors and symbols draw inspiration from the guidelines proposed by the Geological Survey of Italy (ISPRA – http://www.isprambiente.gov.it/it/servizi-per-lambiente/il-servizio-geologico-ditalia/index).

4. Paleogeographic evolution

The Classical Karst Region, in paleogeographic terms, is constituted of sediments of the former Adriatic-Dinaric Carbonate Platform (Jurkovšek et al, 1996; Vlahović, Tišljar, Velić, & Matičec, 2002, 2005) (Figure 1(b)). Through the Jurassic and Cretaceous periods, the platform was relatively stable and successfully maintained a balance between global sea-level changes and syn-sedimentary tectonics within the dynamic area between the Laurasian and Gondwana continents. In the shallow-water depositional setting, a thick carbonate succession was deposited. The similarities between carbonate rocks of the Classical Karst Region which were formed on the inner part of the carbonate platform, and rocks from many other adjacent areas of the External Dinarides, suggest that the platform in the Early Cretaceous and in the lower part of the Late Cretaceous was paleogeographically homogeneous. In addition, the close correlation of most stratigraphic levels, members and formations with global eustatic events is particularly evident. The events are well expressed in the platform sediments. More pronounced differentiation of the sedimentary environments started in the upper part of the late Cretaceous, just before disintegration of the northern part of the platform.

5. Structural setting

The Classical Karst Region lies on the northern edge of the Adria lithospheric microplate, which was initially connected to the African plate. From the Mesozoic onwards it became an independent plate (Vrabec, Šmuc, Pleničar, & Buser, 2009).

The Classical Karst Region, which is the northwesternmost part of the External Dinarides, forms an NW–SE oriented anticlinorium, also named the 'Trieste-Komen anticlinorium' (Buser, 1973; Jurkovšek et al., 1996; Poljak, 2007). In a strict tectonic sense, it can also be referred to as the 'Komen thrust sheet' (Placer, 1998). Toward the north and northeast, it passes in the Gorizia and Vipava synclinorium, and to the southwest in the Rijeka synclinorium structure. The anticlinorium is dissected into smaller tectonic blocks with numerous steep strike-slip faults NW–SE oriented (Dinaric direction). Among them, the Divača, Tomačevica and Raša faults dominate. Important lower order faults, which are also NW–SE oriented, are the Lukovec, Kobjeglava and Jamlje-Colle Nero faults, whereas the Brestovica fault develops approximately in an E–W direction. The western border of the Classical Karst Region facing the Gulf of Trieste, in the Italian side, is characterized by the Dinaric frontal ramp system. The latter is constituted by the NW–SE segments of the Palmanova Line (Carulli, 2011) that is connected towards the south to the Črni Kal Thrust, and by the Karst Thrust (Bensi, Fanucci, & Podda, 2009) that is connected to the Petrinje Thrust (Slovenia). A system of minor thrusts is located offshore and along the flysch slopes (e.g. Socerb, Zanigrad and

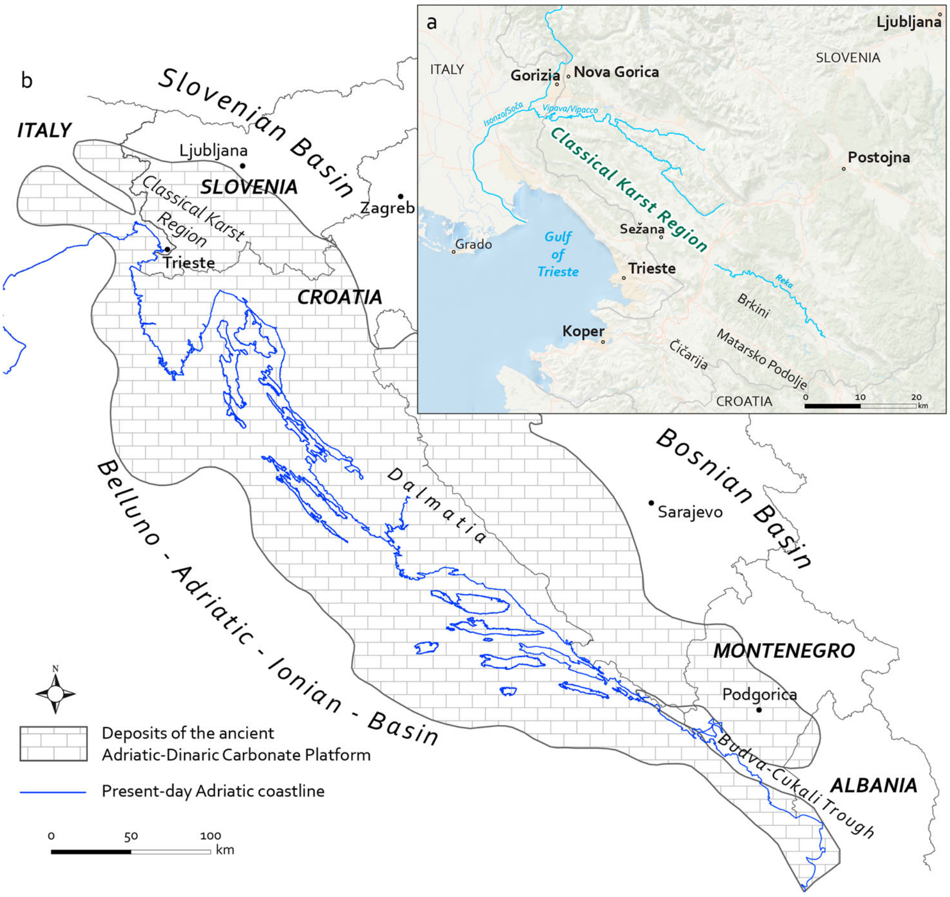

Figure 1. (a) Geographical setting of the study area; (b) present day area covered by the Adriatic-Dinaric Carbonate Platform deposits (modified from Dragičević & Velić, 2002 and Velić, 2007).

Hrastovlje thrusts; Placer et al., 2010). The main effect of the compression is the overthrusting of the carbonate platform succession on the turbiditic one.

Locally, the distal part of the thrusts is displaced by tear-faults, which are strike-slip faults with NE-SW or ENE-SWS orientation (Cucchi & Piano, 2013).

6. Lithostratigraphic units of the Classical Karst Region

Nine lithostratigraphic units are represented on the Geological Map (Main Map). The starting point for this division is a detailed sequence stratigraphy, which allows local, regional and interregional correlation of carbonate sequences built from genetically related facies associations. In the past, the same lithostratigraphic units, on both sides of the state boundary, had different range and names that are taken into account herein. For the purpose of this Geological Map a simplification and unification was needed and informal units are written with quotation marks.

6.1. The Brje formation

The oldest carbonate rocks belong to the Brje formation, which was deposited mainly in a shallow calm shelf environment with lagoonal characteristics. In the lower, dolomitic, part of the Brje formation there are no preserved fossils, so according to the stratigraphic superposition the lowermost dolomite beds could belong to the Berriasian stage. In the limestone above the dolomite, favreinas, belonging to the Neocomian coprolite horizon, appear abundantly. Among microfossils of the upper part of the Brje formation, there is the important lower Aptian species *Palorbitolina lenticularis* (Blumenbach), whereas just below the Aptian–Albian emersion boundary, the alga *Salpingoporella dinarica* Radoičić massively occurs (Figure 2(a)).

The total thickness of the Brje formation is probably more than 500 m, of which about 200 m belong to the older dolomite part.

6.2. The Povir formation

The Aptian–Albian eustatic sea-level drop below the edge of the carbonate platform and the subsequent reestablishment of shallow-marine conditions caused the sedimentation of the Povir formation and the beginning of a new megasequence. The emersion boundary between the Brje and Povir formations is characterized by a breccia layer, which is also evident in many other parts of the Adriatic-Dinaric Carbonate Platform.

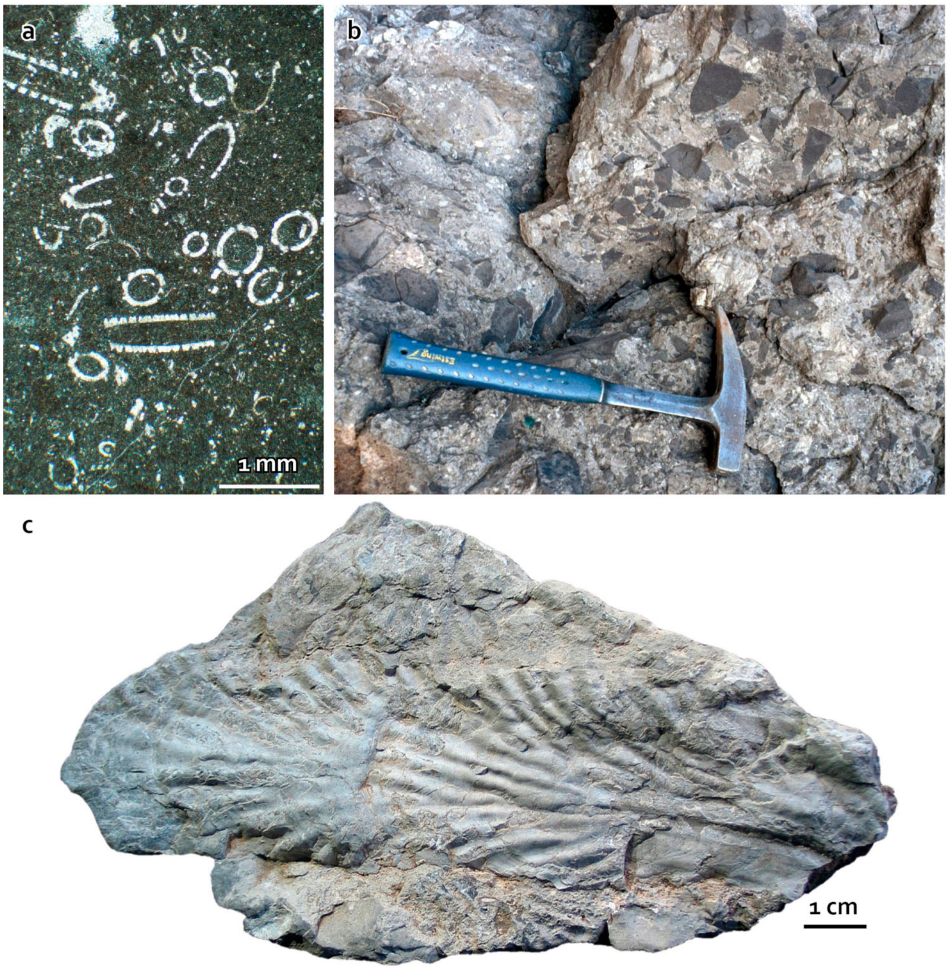

Figure 2. (a) Brje formation: algal wackestone with *Salpingoporella dinarica* Radoičić (W of Kreplje, Slovenia); (b) Povir formation: tectogenic-diagenetic breccia (W of Povir, Slovenia); (c) Povir formation: Chondrodonta joannae (Choffat) (N of Sežana, Slovenia).

Carbonate rocks of the Brje and Povir formations are seemingly alike, and this applies to both dolomite and limestone. Limestone of the lower part of the Povir formation, on the Italian side known as Monte Coste limestone (Cucchi et al., 1989), is medium stratified, rarely platy and mostly medium to dark olive gray in color. Locally, it includes thin packages and beds of crystalline-bituminous dolomite and limestone breccia.

The Albian (lower) part of the Povir formation generally shows slightly higher energy sedimentary environments. In the lowest part, the most important foraminifera is *Orbitolina* (*Mesorbitolina*) *texana* Roemer. The Albian-Cenomanian part of the Povir formation (Monrupino formation in Italy; Cucchi & Piano, 2013) is characterized mainly by dolomitic, post-sedimentary tectogeno-diagenetic breccia (Figure 2(b)) and bedded bituminous dolomite.

In the central and northern areas of the Classical Karst Region, the Cenomanian part of the Povir formation crops out. It includes individual thicker packages of grainy bituminous limestone and platy laminated Komen limestone. Besides rudists, that are the most common macrofossils in the Povir formation, chondrodonts are also abundantly represented (Figure 2(c)).

In the Cenomanian part of the Povir formation, in addition to chondrodonts, the foraminifera *Broeckina* (*Pastrikella*) *balcanica* (Cherchi, Radoičić & Schroeder) is of great stratigraphic importance (Jurkovšek et al., 2013; Velić, 2007).

The total thickness of the Povir formation carbonate succession, which includes the Komen limestone, ranges from 300 to 600 m.

6.2.1. The Komen limestone of the Povir formation

Platy and laminated limestone crops out within different formations ranging from the Albian to the Campanian Age. Most of these strata are exposed in the surroundings of Komen, in the central part of the study area. It is represented by very thin beds, 2–15 cm on average, dark-colored micritic to biomicritic limestone with chert lenses. These units are identified in the literature by such various names as the 'Komen shale' and even 'Fish shale' (Figure 3), primarily due to the frequent finds of fossil fish (Gorjanović-Kramberger, 1895; Palci et al., 2008). A large part of the Komen limestone, which occurs within the Povir formation, was deposited in an intraplatform basin, in proximity to the exposed areas (tidal flats, supratidal environment). Bottom water in the basins was occasionally dysoxic to anoxic. Changing of different facies was the result of slight changes in sea level and local subsidence of the area. Total thickness of the Komen limestone, together with transitional beds which could be attributed to this member, does not exceed 100 m.

6.3. The Repen formation

The eustatic sea-level rise between the Cenomanian and Turonian, which is one of the major global events in the Cretaceous, almost entirely caused the drowning of the carbonate platform (Vlahović, Tišljar, Velić, & Matičec, 2005). The result was the Repen formation, which is characterized by the appearance of many pelagic fossils. The Repen formation (Zolla limestone on the Italian side, Cucchi et al., 1989) consists of three main types of limestones that pass laterally and vertically to each other. The basic core of the formation consists of stratified limestone that locally contains abundant calcispheres and the 'Komen limestone with pelagic fossils'. The latter indicates the Cenomanian–Turonian oceanic anoxic event. Part of the formation is composed of bioclastic limestone belonging to the so-called Repen/Kopriva member, which includes numerous displaced and locally fractured rudist shells. It provides economically very promising types of natural stone (Figure 4). The thickness of the Repen formation does not exceed 200 m.

6.4. The Sežana formation

Eustatic sea-level drop in the Turonian terminated the sedimentation of the Repen formation and reestablished shallow-water environments, where limestone of the Sežana formation was deposited. It is mostly medium- to thick-bedded biomicrite. The fossils are mainly represented by benthic foraminifera, which have a wide stratigraphic range and can also be found in the younger Lipica formation.

Limestone of the Sežana formation was deposited in a shallow restricted low-energy shelf, occasionally with littoral and lagoonal conditions, as well as with occasional pelagic influence. In Italy, it corresponds to the lower part of the Aurisina limestone (Cucchi et al., 2015).

The total thickness of the Sežana formation ranges from 230 to 500 m. Within the Sežana formation, Komen limestone with chert occurs. It is similar to the Komen limestone of the Povir formation. A small and insignificant benthic fauna, pyrite pigment and organic matter, indicate a lagoonal model of sedimentation with occasional anoxic and dysoxic conditions on the seabed. The thickness of the Komen limestone sequence in the Sežana formation varies from a few meters to a maximum 40 m.

Figure 3. Fossil fish *Coelodus vetteri* Gorjanovć-Kramberger in Komen limestone from Komen village, Slovenia (Museo Civico di Storia Naturale, Trieste, Italy).

6.5. The Lipica formation

In the Lipica formation, several types of bioclastic limestone occur. There are quite frequent bedded and massive biomicrites and biosparites with relatively large rudist fragments, complete rudist shells, rarely rudist bouquets, clusters or parts of rudist thickets (Pleničar & Jurkovšek, 1996, 1997, 1998). Due to the thick-bedded and massive structure and homogeneous texture, this limestone economically represents the most important part of the Classical Karst Region carbonate rocks (Figure 5(a,b)). Foraminiferal association in the Lipica formation is similar to those in the Sežana formation. *Keramosphaerina tergestina* Stache (Figure 5(c)), which is also present in the Sežana formation, is observed in a stratigraphically well-defined late Santonian horizon that can be traced throughout the investigated area (Caffau et al., 2001; Jurkovšek et al., 1996; Venturini, 2005). In the highest part of the Lipica formation the species *Calveziconus lecalvezae* (Claus & Cornella) and *Pseudocyclamina massiliensis* (Maync) indicate that the sedimentation in certain parts of the platform continued into the Campanian. In general, the limestone of the Lipica formation was deposited in different environments of the carbonate platform, mostly in the open part of the shelf, locally in its restricted part, as well as in an environment with littoral conditions. In Italy, the Lipica formation corresponds to the upper part of the Aurisina limestone (Cucchi et al., 2015).

Its thickness ranges from 150 to 400 m.

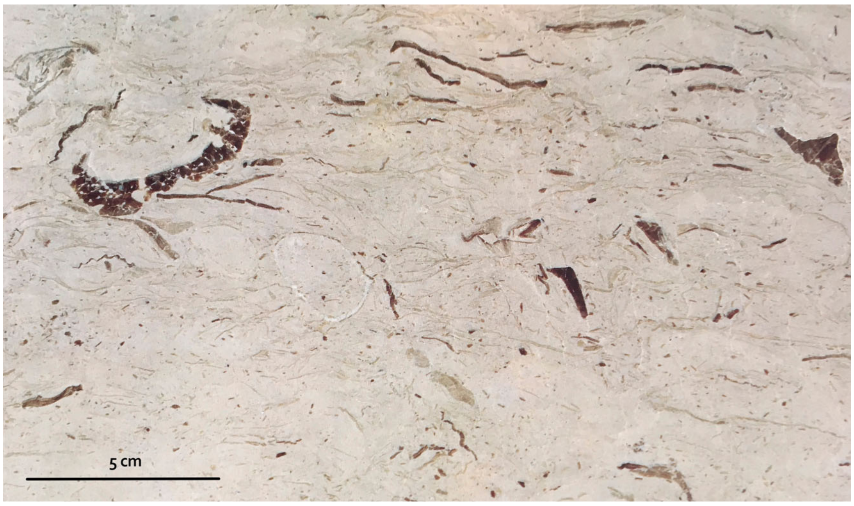

Figure 4. Repen formation: bioclastic limestone of the 'Repen Classico tipo Zolla', carved in a Monrupino/Repen quarry (Italy).

6.5.1. The Tomaj limestone

Within the Lipica formation, in the central part of the Classical Karst Region, platy and laminated Tomaj limestone occurs, usually containing thin chert lenses or layers. The chert in the limestone was formed during late diagenesis. Bioclastic intercalations with gradually decreasing grain size, slumping structures, absence of primary benthos and the presence of pelagic micro- and macrofossils testify to a deeper environment and good connection with the open sea (Cavin, Jurkovšek, & Kolar-Jurkovšek, 2000; Jurkovšek & Kolar-Jurkovšek, 1995, 2007; Summesberger, Jurkovšek, & Kolar-Jurkovšek, 1996a, 1996b). Nectonic and planktonic organisms lived in the water column just above the anoxic or dysoxic bottom of the lagoon. Fossil macroflora with dominant conifers originating from nearby land, that by the late Santonian had begun to form south of the 'Tomaj lagoon' (Dobruskina, Jurkovšek, & Kolar-Jurkovšek, 1999).

The Tomaj limestone ranges from a few meters up to 40 m in thickness.

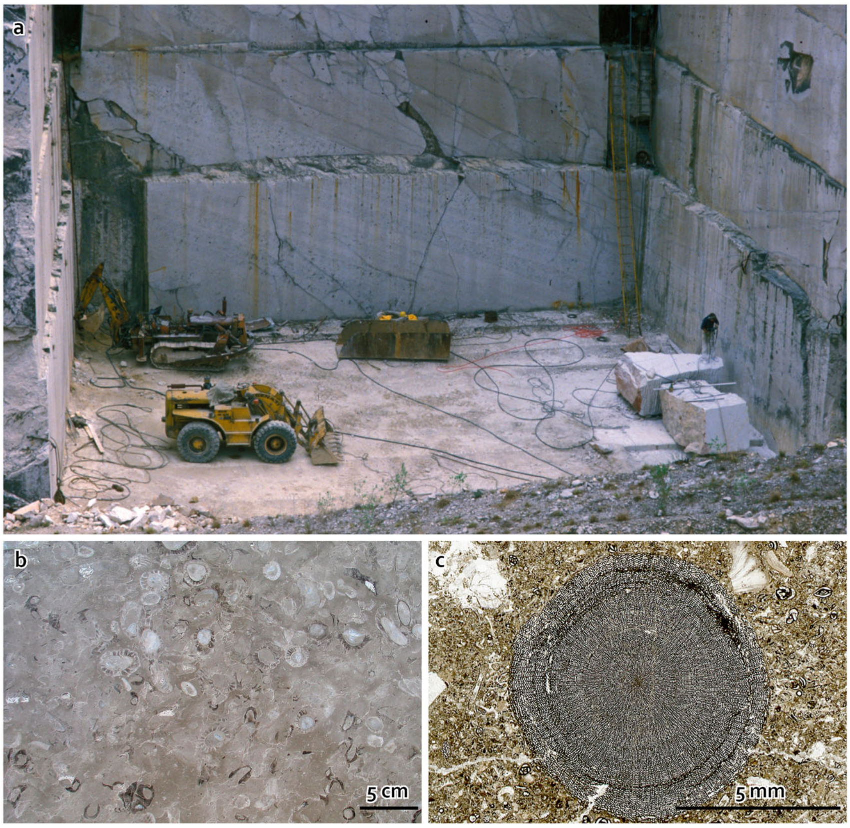

Figure 5. (a) Upper part of the Aurisina limestone: Cava Romana quarry (Aurisina/Nabrežina, Italy); (b) Lipica formation: (b). polished surface of the 'Fiorito' type of Lipica stone (Lipica, Slovenia); (c) *Keramosphaerina tergestina* Stache (SE of Krajna vas, Slovenia).

6.6. The Kras Group

The gradual paleogeographic differentiation, which in the Santonian and later in the Campanian already heavily influenced the sedimentary environments of the Adriatic-Dinaric Carbonate Platform, continued into the Maastrichtian and Paleogene. After subaerial exposure of this part of the platform, and paleokarstification of the Lipica formation limestone sedimentation, the carbonates of the Kras Group were deposited. They represent the beginning of the new megasequence. Paralic and shallow-marine carbonates of the Kras Group ('Liburnia formation' and 'Alveolinid-Nummulitid limestone') are, at their lower boundary, clearly limited with the regional discordance, whereas at the upper boundary the Kras Group succession is limited with the basinal clastites.

According to Košir (2003), in the Kras Group are the 'Liburnia formation', Trstelj formation and 'Alveolinid-Nummulitid limestone'. In preparing this Geological Map a unification and simplification of some units was needed and thus, the lower part of the Trstelj formation (Miliolid limestone = Slivje formation) ranges from the 'Liburnia formation', and the upper part of the Trstelj formation (= Operculina limestone) to the 'Alveolinid-Nummulitid limestone'.

6.6.1. The 'Liburnia formation'

The 'Liburnia formation' was deposited on the distinct paleokarst relief during the Maastrichtian and Paleocene. The sediments are characterized by interchanging shallow marine, brackish and freshwater environments. The marine facies is characterized by rudist genera *Gyropleura*, *Apricardia*, *Bournonia*, *Biradiolites*, and the foraminifera *Rhapydionina liburnica* Stache (Figure 6). In the freshwater and brackish phases of sedimentation, coal beds were formed (Hamrla, 1960). They are associated with characeans and gastropods of the genus *Stomatopsis*. The Cretaceous-Tertiary boundary is characterized by breccia with micritic matrix and *Microcodium* structures (Jurkovšek, Kolar-Jurkovšek, & Ogorelec, 1997; Košir, 2004; Ogorelec et al., 1995; Tewari et al., 2007). The Paleocene parts of the formation are characterized by darker, locally marly limestone with frequent thin-shelled bivalves, tiny gastropods, ostracods, characeans and miliolids. In between, there are stromatolitic laminae and *Microcodium*. In the uppermost part of the formation, bioclastic limestone with numerous miliolids, that are on the Slovenian side occur in the miliolidal limestone of the Slivje member (Jurkovšek et al., 1996) or the Lower Trstelj beds (Jurkovšek, 2010). The most common benthic foraminifera in this part belong to the genera *Periloculina*, *Miscellanea*, *Coskinon* and *Fallotella*. The genera *Clypeina* and *Cymopolia* are present among dasycladaceans. These beds were deposited in a shallow-marine environment of the innermost ramp with occasional emersions and shoals. The Benthic community in these beds suggests Thanetian age (Zamagni, Mutti, & Košir, 2008).

6.6.2. The 'Alveolinid-Nummulitid limestone'

The 'Alveolinid-Nummulitid limestone' lies above the 'Liburnia formation'. The lowest part is commonly composed of Coral-algal limestone, which appears in the form of lenticular bodies of different thickness throughout the Classical Karst Region. This part is also characterized by bioclastic limestone with larger foraminifera that inhabited different niches within the slightly deeper part of the carbonate ramp. Among foraminifera, important genera are: *Assilina*,

Figure 6. 'Liburnia formation': limestone with abundant *Rhapydionina liburnica* Stache, Maastrichtian in age (Vrabče, Slovenia).

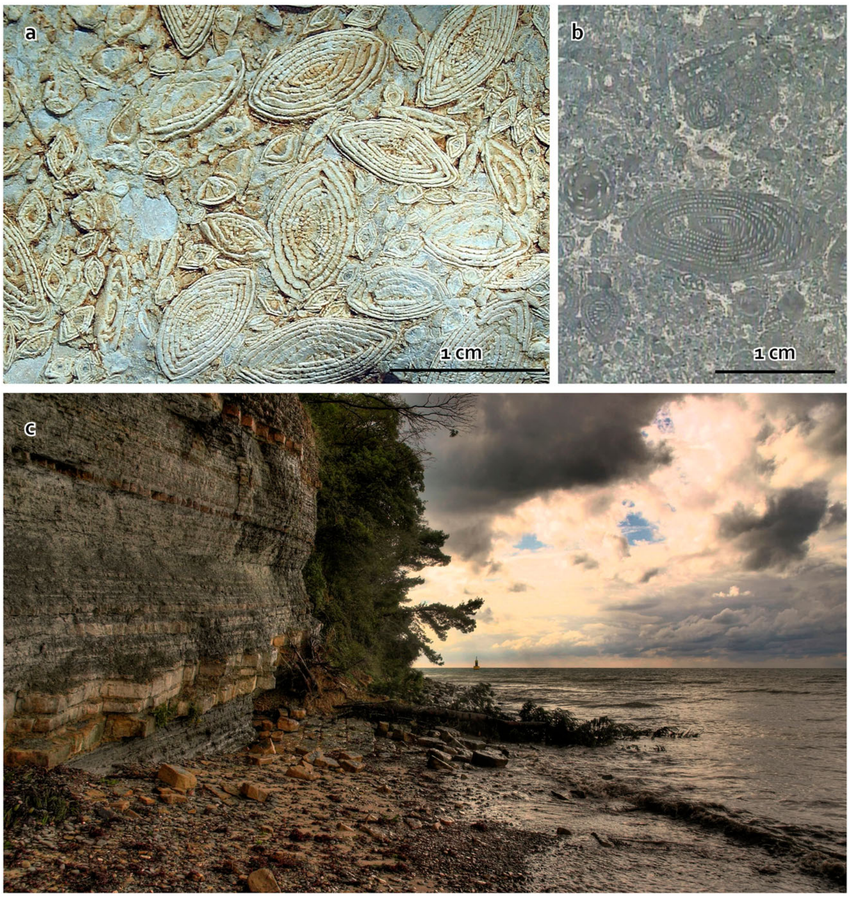

Figure 7. (a) 'Alveolinid-nummulitic limestone': Surface of a nummulitic limestone (Črni Kal, SW of Kozina, Slovenia); (b) Alveolina (Trieste, Italy); (c) Flysch: alternation of marlstone and sandstone (Debeli rtič/Punta Grossa, Slovenia).

Lacazina and *Pseudolacazina*. These layers are placed at the top of the Thanetian (Zamagni et al., 2008).

Above these strata, typical 'Alveolinid-Nummulitid limestone' with larger benthic foraminifera occur. It includes alveolinids, nummulitids, orbitolitids and discocyclinids (Figure 7(a,b)). The upper boundary is gradual or sharp, locally represented by hardgrounds.

This part of the 'Alveolinid-Nummulitid limestone' was formed largely in the middle part of the carbonate ramp. Based on benthic foraminifera, it is placed in the Ilerdian (Drobne, Ogorelec, Pavšič, & Pavlovec, 2009; Zamagni et al., 2008). The thickness of this unit in the studied region shows great lateral variability. Maximum thickness is 350 m.

6.7. The 'Transitional beds' and Flysch

This part of the carbonate platform was finally buried in the Eocene with the siliciclastic sediments of the advancing foreland basin, such as hemipelagic marls, marly limestones and re-sedimented carbonates ('Transitional beds') and with deepwater clastites (Flysch). The 'Transitional beds' are characterized by a high proportion of glauconite and planktonic foraminifera. In the higher parts of the 'Transitional beds', basal marls are locally developed. On the basis of foraminifera and nanoplankton, the 'Transitional beds' are placed in the middle Ypresian and lower Cuisian (Bensi, Fanucci, Pavšić, Tunis, & Cucchi, 2007).

Above the 'Transitional beds', or in some cases directly above the 'Alveolinid-Nummulitid limestone', a several hundred meters thick succession of sandstone, siltstone, claystone and marlstone occurs (Figure 7(c)). This clastic succession belongs to the Flysch formation (Lenaz & Princivalle, 1996 and references therein).

7. Quaternary deposits

Quaternary deposits are represented by alluvial–colluvial deposits, *terra rossa* in the karst area and cemented talus deposits (Biolchi et al., in press; Furlani et al., 2016). Colluvial deposits outcropping on the slopes are composed of heterometric, angular-subrounded clasts in a clayed-silty matrix. Their thickness can vary from less than 1 m on the slopes to several meters at the foot of the cliffs (Cucchi & Piano, 2013).

Quaternary deposits are grouped and represented as one lithostratigraphic unit called Quaternary deposits.

8. Conclusions

This paper and the related Geological Map (Main Map) provide a review of the lithostratigraphic units that constitute the Cretaceous-Paleogene carbonate platform succession outcropping in the Classical Karst Region, a karst area that is shared between SW Slovenia and NE Italy. The Geological Map is the first common representation of this territory after decades of separate research. The Geological Map is a result of the collaboration between Slovenia and Italy that was promoted by the CBC projects HydroKarst and RoofOfRock, funded by the European Union and is a great scientific achievement and a synthesis of long-term scientific work of researchers from both countries.

The Geological Map is of great importance from a scientific point of view as well as from an applied and development perspective since the area has an important geostrategic position. It occupies a tectonically and seismologically active region at the transition between tectonic plates, almost all the geological units provide an important source of quality natural stone with a long quarrying history since Roman times and finally, karst caves and other spectacular karst phenomena are recognized worldwide, so much so that the term 'Classical Karst' derives from this region. Moreover, from a hydrogeological perspective, the Classical Karst Region can be considered a crucial drinking water resource.

Software

The map was produced using Esri ArcGIS 10, Adobe Illustrator CS6 and Adobe InDesign CS6.

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