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Extending Offer of Options for Tourism in Orava Region with Geotourism Localities

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Abstract. Orava, a formerly underdeveloped region, is currently resuming the status of an interesting centre of tourism. Its popularity began to boom there in the second half of the 20th century, particularly thanks to the Orava Reservoir. The region was also affected by the geopolitical changes back at the end of the 1980s. The region never had much industry and thus the landscape may now offer many beauties of both the animate and inanimate nature. The geological structure and geomorphology of the ground also offer a number of tourist destinations. The paper mentions several of these, namely the klippes in Podbiel, the Orava Castle, the Orava Reservoir and its surroundings with the discoveries of meteoritic iron, Pucov plum-pudding stone, and the geothermal spring in Oravice. The paper also describes one technical monument, František’s ironworks in Podbiel. An offer of geomontane/geotourist trails through Orava may attract a wide spectrum of visitors to the region.

1. Introduction
Orava is an area found predominantly in the Slovak Republic and partially in Poland. Historically, the area was a Hungarian province. When the Orava Reservoir was completed in 1953, in the following decades the area became a favourite summer tourist destination for domestic and foreign tourists, especially those from the socialist block. After the regime in Czechoslovakia changed in 1989, the number of tourists began to drop. The current efforts to attract new visitors should aim at the exploitation of the natural potential of the area, including the new forms of tourism, such as geotourism. Some interesting localities are presented to visitors repeatedly, the klippe of the Orava Castle, but some have remained unknown even to local people. Some of these interesting attractions were discoveries of large pieces of meteoritic iron in the surroundings of the Orava Reservoir in the 19th century.

2. Brief description of the geology and geomorphology of the area
From the geological point of view [1] [2], [3], [4], [5], Mesozoic to Quaternary rocks are found on the surface of the area of interest. In the bedrock there are the rocks of the crystalline complex and the Triassic. Jurassic to Cretaceous sediments occur in the inner klippen zone. Klippes, as tectonic shreds, vary in height and are prominent geomorphological features in the landscape. The Jurassic is represented by the Middle to Upper Jurassic, which later passes to Lower to Upper Cretaceous. Rock sedimentation
occurred in various sea levels, which is documented by various types of rocks (limestone, radiolarites, etc.). The Paleogene is represented by flysch units, Bystrica and Orava-Magura (Krynica) Zone (see Figure 1). The end of Paleogene was followed by a period of tectonic movements, which affected the current form of the area. The Neogene and Quaternary may be found on the bottom of the Orava Reservoir. The lacustrine Neogene also contains beds of lignite, which may be found exposed in some places on the slopes of the reservoir. The Quaternary positions of peat used to be as 3 m thick but were extracted before the reservoir was filled. There are still frequent peatbogs, mainly raised bogs with interesting flora and fauna. From the geomorphological point of view, the region of Orava belongs to the geomorphological subprovince of Outer Western Carpathians, the geomorphological area of Central Beskyds and Podhale-Magura Region.

3. Brief history of the region
The first evidence of land settlement are Palaeolithic discoveries of reindeer hunters’ stone tools in some localities of Upper Orava. Since the Neolithic, the region was settled northwards by farmers. The discoveries of ceramics and metal objects from copper, bronze and iron point at the continuous development of settlement in the area. The area was later settled by Celts and Teutons. The Slavs came in the 8th and 9th century. In the 11th century the area and inhabitants were subjected by the Hungarian Empire and for long they became the property of the Hungarian king. Later, Tartar attacks made the Hungarian king strengthen the border area and build castles. This way, the Orava Castle became one of the most important cornerstones of Orava. As for the local settlements, the first settlement documented in writing is Tvrdošín, which was a customs station on the commercial route through the Orava River valley. At the beginning of the 14th century, the administrative zoning of the area was completed and in the second half of the 14th century, Orava became an independent county. This development may be greatly attributed to the Thurz Family. This family was responsible for setting up 24 new villages and for the rise of the least populated area in Slovakia. Some of the older settlements gradually obtained town privileges. On the contrary, a decay in the development and settlement of Orava was caused by uprising, unrest, famine and plague epidemics, which significantly weakened the county. In the second half of the 19th century, there was a big wave of emigration, similarly to the neighbouring regions. Along with the fall of the Austrian-Hungarian Empire and formation of a new state, the region experienced a
slight development, which began to accelerate by the end of the 1940s. This was significantly influenced by the industrialization of a predominantly agricultural region. Since 1996 Orava has belonged to the Žilina Region, which makes of the Slovak Republic [6], [7], [8], [9], Chyba! Nenašiel sa žiaden zdroj odkazov.

4. Selected sights and localities of Geotourism character
Orava offers many natural sights of interests. To start up the development of geotourism in the area, it is suitable to select some unique localities which should not be omitted, when designing the tourist trails [11], [12], [13],[14], [15], [16], [1], [17], [18], [19], [20]

4.1. Magura meteorite
Among the less known, but world important, tourist attractions, there are discoveries of big pieces of meteoritic iron at the foot of the north-western spur of the Oravská Magura. Many small shreds of the originally big meteorite fell westwards off the currently flooded municipality Slanica. The exact time of the meteoric shower is not known. Dated are discoveries of heavy pieces of quality iron ore of as much as 40 kg by forests workers between 1830 and 1840. The ore was subsequently processed in the local ironworks. About 1600 kg of such iron was processed predominantly into tools. Soon, it was proved by the Austrian geologist and mineralogist Wilhelm von Haidinger that it was not the case of normal iron ore. The analyses of the meteorite also led to the discovery of two new minerals, namely schreibersite described by W. Haidinger in 1847, and cohenite described by E. Weinschenk in 1889. Already then the meteorite became popular among scientists and was recognized as a very important discovery. At present, specimens of different sizes can be found in many museums worldwide. The biggest specimen of over 45 kg is found in the collection of University in Tübingen. Smaller specimens may be found in collections in Vienna, Budapest, Berlin, London and Prague. The Slovak National Museum in Bratislava gained a small specimen (181 g) in 2001 within an exchange with the National Museum in Prague. A project implemented in Orava in 2012 resulted in a nature trail “Along the traces of the meteorite” in the municipality of Vavrečka, found at the foot Oravská Magura, where fragments of the meteorite are still expected to be found. The information panels on the trail were also placed on the Slanica isle of art of the Orava Reservoir, which is very popular with tourists.

4.2. Červený kameň (red stone) Klippe in Podbiel
The klippe is found in the municipality Podbiel, which is a live open-air museum of the local folk architecture, where the buildings are listed. A bedded exposure of the klippe, which was called after the red colour of the Jurassic deposits, mounts north-northwestwards behind the Orava River. The bedded sequence of the exposure is reversed. When standing in front of the exposure, the beds inclining westwards (50°) on the left are stratigraphically the oldest (the upper part of the Lower Jurassic). They form sallow and red, partially nodular limestone and smaller positions of red crinoidal limestone. Left, there are positions of higher deposits ranking to Middle Jurassic to lower part of the Upper Jurassic. They are formed by sallow, brown to red heavy-bedded siliceous limestone and radiolarites. They are followed by red nodular limestone and radiolarites of the middle part of the Upper Jurassic. The highest in the lower part are sallow heavy-bedded weakly marlaceous limestone of the Lower Cretaceous. The locality provides sufficient palaeontological material. As for macrofauna, brachiopodes prevail (see Figure 2 and 3).
Figure 2: Lower Cretaceous limestone with an aptychus (*Puncaptychus punctatus*) from the locality Červený kameň (Podbiel) (collected by M. Duraj, 2017)

Figure 3: Jurassic limestone with an ammonite (*Arietites bucklandi*) from the locality Červený kameň (Podbiel) (collected by M. Duraj, 1982)
4.3. František’s Ironworks in Podbiel
Efforts to build ironworks, which would process iron ore from Podbiel and its surroundings, can be traced to the beginning of the 19th century. The first mines were opened in 1803. Despite the fact the mining office issued a permit, the construction under the supervision of a British developer Newbuild started in 1836. Problems with the transport of ore, low-quality fragile iron, decline of the ironworks company that built the ironworks in 1840, obsolescence of the machinery and the economic crises between 1851 and 1861 meant that the ironworks closed down in 1863. Preserved to date have been only the outer walls of the neo-Classical factory hall, the blast furnace, the lade and waste channel, and an iron ore dump behind the building. In 1963 the building was listed as a national monument.

4.4. The Klippe of the Orava Castle
The Orava Castle belongs among typical landmarks of Orava. It is one of the most visited castles in Slovakia. Many times, it served as a filming location, e.g. already in 1922 in the film called the Vampire of Nosferat. The klippe is a syncline with a steep dip. Stratigraphically, there are similar deposits as in the previous locality. The Jurassic limestone is abundant in ammonite fauna, which is exhibited in the exposition on inanimate nature of the Orava Castle.

4.5. Geothermal spring in Oravice
Oravice is a small settlement on the border of Western Tatras and Skorušinské hills. It became popular, when its thermal spring began to be exploited. A geothermal well released warm water of 58 °C from the height of 1611 m. The water must be cooled to 28 – 38 °C. It is very rich in minerals, e.g. calcium, magnesium, manganese, lithium, iron, sulphates and hydrogen carbonates. It has beneficial influence on human organism and meets the requirements for medicinal spring. At present, there is a modern thermal Meander Park, which makes part of the Meander Resort. This resort offers 9 pools as well as 7 km of ski slopes nearby the pools.

4.6. Pucov plum-pudding stone
It is an interesting geological locality. It has been listed as a natural monument since 1990 because of the Paleogene plum-pudding stone of the Orava Highlands, significant from scientific, educational as well as cultural points of view. The locality falls in the cadastre of Pucov. Coarse-grained plum-pudding stone forms prominent rock faces as high as 100m. It is the case of Mezozoic polymictic plum-pudding stone, where the boulder material is made up by limestone, sandstone, hornstone and the matrix is clayey of a red to grey colour. Flysch strata are located in the overlying rocks. The origin of the plum-pudding stone has not been clarified to date and has thus been subject of continuous research.

5. Conclusion
The current development of new forms of tourism may greatly enrich the offer of tourist destinations worldwide. Some popular destinations are crowded, suffer from climatic changes, sea and ocean pollution and other influences. As a result, new interesting localities for the development of tourism are sought. The Slovak efforts aiming at an intense development of tourism have already led to some success in certain regions. Recently, the development of geotourism worldwide and in Slovakia has been reported in many works [21], [22], [23], [24], [25]. In the past, Orava provided many opportunities for summer tourism. This distinctive Slovak region aims to widen its offer of new touristic sights for different clients all year long. The geological sights of Orava have not been systematically considered or offered to wide public. Therefore, it is important to inform people interested in geotourism as well as the general public at least about the most important ones.

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