

Overview of the geological mapping in Transylvania in the 19th century

Enikő Korodi

Babeş-Bolyai University, Faculty of Geography, Cluj-Napoca, Romania,
korodi.eniko@yahoo.com

Extended Abstract

In Transylvania (as part of the Habsburg Empire and later the Austro–Hungarian Monarchy), the systematic and detailed geological mapping was started in the mid-19th century. These were the times when the scientific conception of geology – as a separate branch of science – completed itself, and simultaneously it developed its own cartographic representation methods (which distinguish the geological formations according to their age, formation conditions and lithological compositions) most suitable for the purpose (Brezsnyánszky & Turczy 1998; Barczikayné Szeiler et al. 2009).

The first early geological maps (more precisely petrographic and geognostic maps) were plotted mostly by foreign travellers or naturalists (e.g. Townson 1797; Staszic 1815; Beudant 1822; Lill von Lilienbach 1833; Boué 1834) using the earlier mining maps as well as topographic maps showing the occurrences of some mineral resources, e.g. the map by Marsigli (1741); the map by Wappler (1780); the map by Korabinszky (1791) (Brezsnyánszky 1985, 1996, Brezsnyánszky & Turczy 1998, Brezsnyánszky & Síkhegyi 2007). The compilation of the latter was stimulated by the economic booming of the regions liberated from the Turkish rule, and also by the increasing economic importance of mining (Barczikayné Szeiler et al. 2009). Based on geological data and earlier maps from the first half of the 19th century, Wilhelm Haidinger (1845) plotted the first overall geological (geognostic) map showing the entire Austrian Empire, including also Transylvania (Brezsnyánszky 1996; Barczikayné Szeiler et al. 2009).

The systematic geological mapping of the Habsburg Empire was also favoured by the foundation of the Imperial Geological Institute (Vienna, 1849) and of the Royal Hungarian Geological Institute (1869), as the industrial revolution required science-based geological researches (Pentelényi & Síkhegyi 2012).

The systematic geological mapping was based on the 1:28,000 map sheets of the 2nd Military Survey, however only the deduced 1:144,000 detailed maps (“Spezialkarten”) were published (Jankó 2007); consequently the first systematic geological mapping was performed also on the scale of 1:144,000, representing mostly the areas of the Empire rich in raw materials (Barczikayné Szeiler et al. 2009). However only one sheet (“Tasnád és Szilágy Somlyó”) related to Transylvania has been published. The compilation of this map series was interrupted after 1880, because meanwhile the surveying and publishing of the map series on the scale of 1:75,000 (“Geologische Karte”) – based on the topographic map sheets of the 3rd Military Survey – had started (Barczikayné Szeiler et al. 2009).

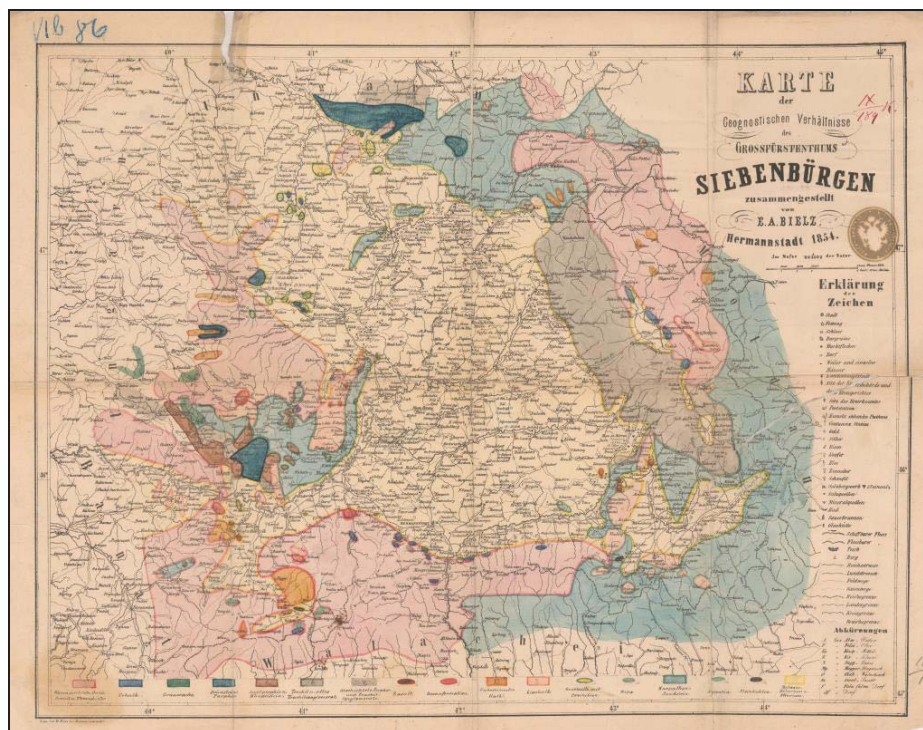


Figure 1. Karte der geognostischen Verhältnisse des Grossfürstenthums Siebenbürgen, 1:864,000 (Bielz 1854a) (Source: Collection of the Library of the Geological Survey of Austria).

In the mid-19th century, the topographic map sheets on the scale of 1:144,000 related to Transylvania were still not available (Brezsnyánszky 1996), because here the surveying activities started later, in 1853 (Jankó

2007). For this reason the geological mapping was based on the deduced general maps of the 2nd Military Survey on a scale of 1:288,000 and 1:576,000 („*Generalkarten*“) (Jankó 2007, Brezsnýánszky 1996, Barczikayné Szeiler et al. 2009), and in the beginning even on the 1:864,000 overall maps of the 1st Military Survey. The geological researches as well as the mapping work were directed by Franz Ritter von Hauer (1822–1899) and Ferdinand Richthofen (1833–1905), with the participation of Eduard Albert Bielz (1827–1898), Karl Ferdinand Peters (1825–1881), Guido Stache (1833–1921), Dionys Štur (1827–1893) etc. (Brezsnýánszky 1996).

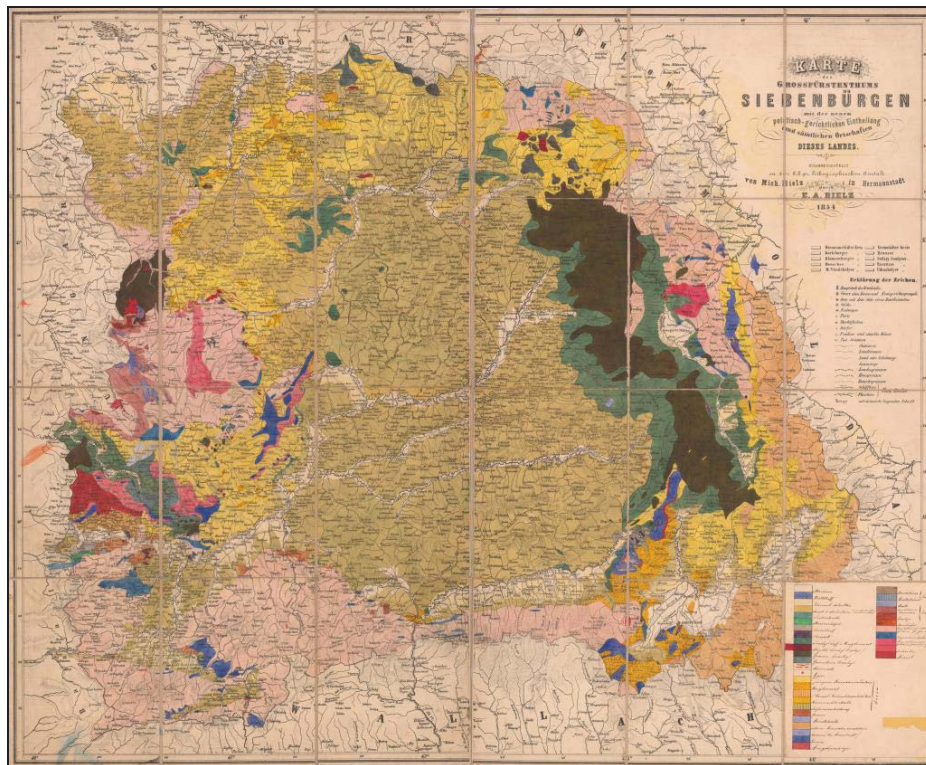


Figure 2. Karte des Grossfürstenthums Siebenbürgen mit der neuen politisch-gerichtlichen Eintheilung und sämtlichen Ortschaften dieses Landes (Geologische Übersichtskarte von Siebenbürgen), 1:432,000? (Bielz 1854c) (Source: Collection of the Library of the Geological Survey of Austria).

Two maps compiled by Eduard Albert Bielz (Bielz 1854a,b) are rather geognostic maps and besides the distribution of the different rock types

they show the occurrences of the most important mineral resources and other geographic data (Figure 1), or – in addition to these – also the location of salt occurrences and saline springs (Brezsnyánszky 1996, Barczikayné Szeiler et al. 2009).

In contrast, the map published by his father, Michael Bielz (1787–1866) also in Sibiu (Bielz 1854c) (Figure 2) reflects much better the cartographic representation methods of the second half of the 19th century, and contains geochronological data, just like the map plotted by Karl Ferdinand Peters (Peters 1858) (Figure 3), as a result of a scientific expedition in the Apuseni Mountains.

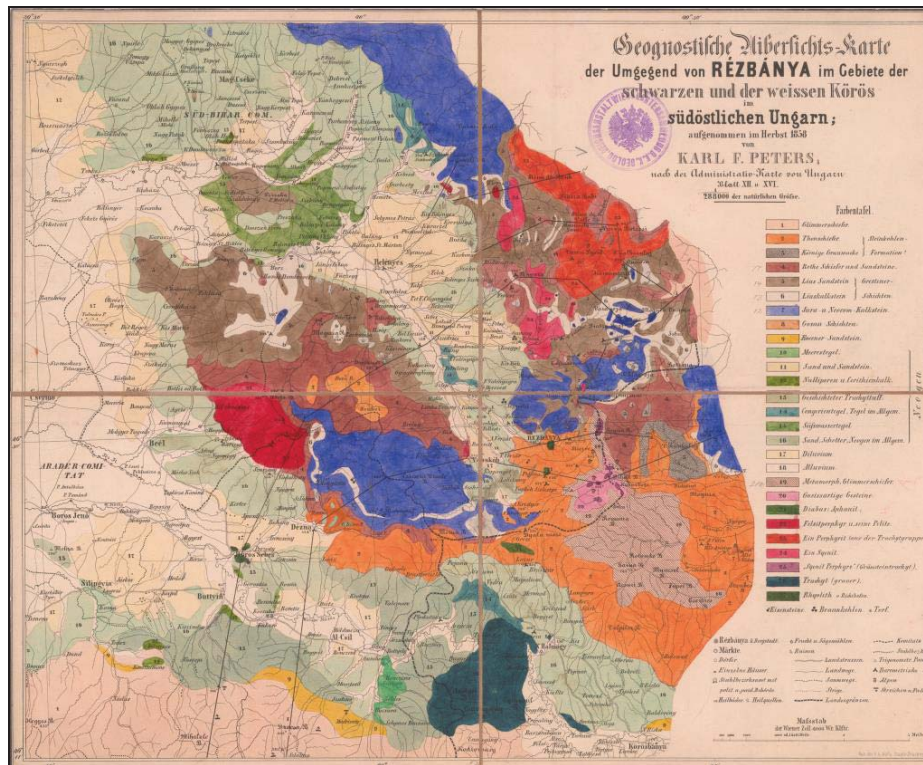


Figure 3. Geognostische Uebersichts-Karte der Umgegend von Rézbánya im Gebiete der schwarzen und der weissen Körös im südöstlichen Ungarn, 1:288,000 (Peters 1858) (Source: Collection of the Library of the Geological Survey of Austria).

In 1861, Franz Ritter von Hauer (with the participation of Eduard Albert Bielz, Ferdinand Richthofen, Guido Stache and Dionys Štur) published in Sibiu the overall geological map of Transylvania on a scale of 1:576,000

(Hauer 1861) (*Figure 4*); then in 1863, after the publication of the general map of Transylvania (MGI 1863), reedited it – with the involvement of co-authors – on a scale of 1:288,000 (Hauer et al. 1863) (*Figure 5*). The legend of this last map is based on the stratigraphic time scale classification system and distinguishes 43 different rock types and stratigraphic units using different colours, lines and surface signs. The map regarding its stratigraphic conception and up-to-date features exceeds considerably the level of the previous ones (Brezsnyánszky 1996).

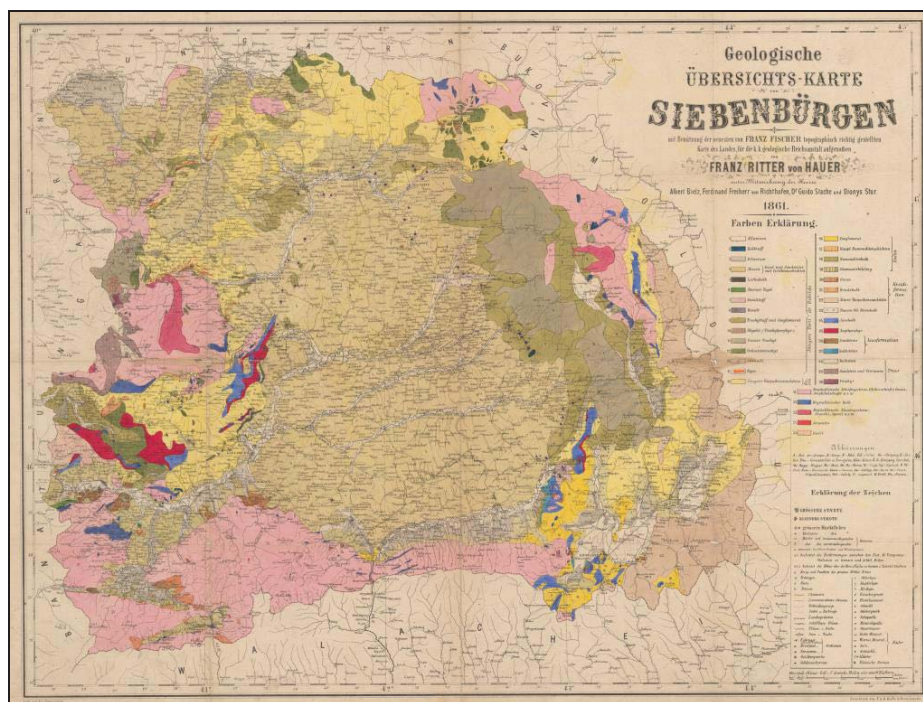


Figure 4. Geologische Übersichts-Karte von Siebenbürgen, 1:576,000 (Hauer 1861) (Source: Collection of the Library of the Geological Survey of Austria).

Franz Ritter von Hauer also compiled an overall geological map showing the entire Austro–Hungarian Monarchy (Hauer 1867–1871) on a scale of 1:576,000, based on the previously presented maps and other local, as well as systematic, sheet-by-sheet surveying results (Brezsnyánszky 1985, 1996, Brezsnyánszky & Síkhegyi 2007, Barczikayné Szeiler et al. 2009).

The geological map of the Szeklerland (*Figure 6*) by Ferencz Herbich (1821–1887) (Herbich 1878a) was published by the Royal Hungarian

Geological Institute, as an appendix to the author's monographic work (Herbich 1878b). The map has a scale of 1:288,000 and its topographic basis was derived from the map series based on the Second Military Survey (Galambos & Unger 2009).

Beside the study of the legend and nomenclature of the old geological maps the analysis and exploration of their topographic basis (projection, geodetic datum, prime meridian) is also extremely important because it is the key for georeferencing and thus for the GIS applications (Galambos 2009, 2010). Integration of the historical geological maps into a GIS database makes possible the analysis and comparison (both in quantitative and qualitative ways) of old geological data with modern ones, and consequently the tracking of the evolution of the geological knowledge.

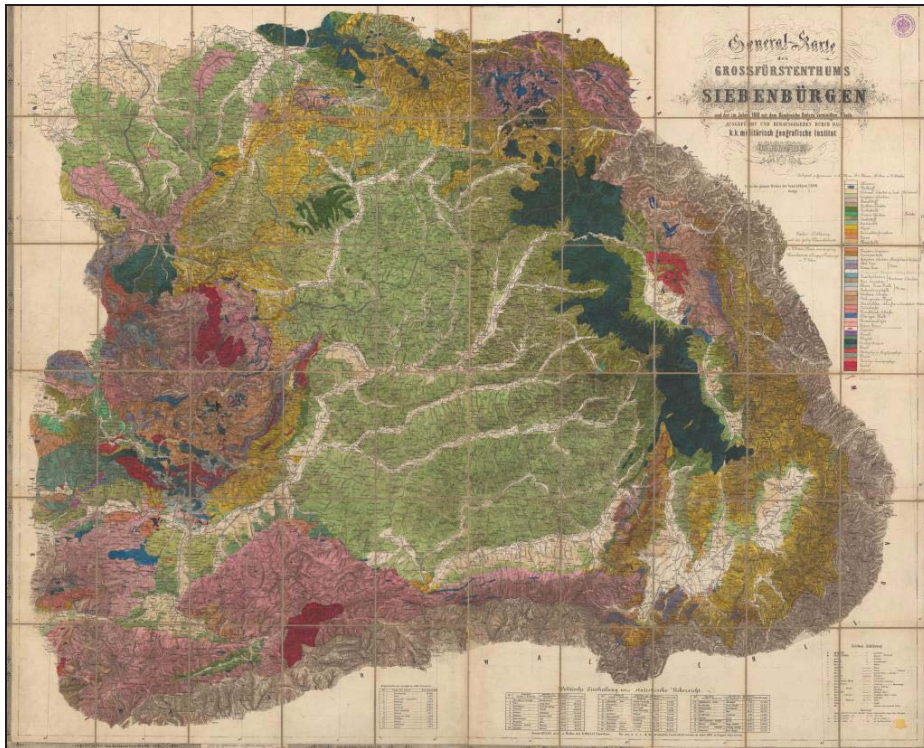


Figure 5. General-Karte des Grossfürstenthums Siebenbürgen und der im Jahre 1861 mit dem Königreiche Ungarn vereinigten Theile (Geologische Übersicht-Karte von Siebenbürgen), 1:288,000 (Hauer et al. 1863) (Hauer 1861) (Source: Collection of the Library of the Geological Survey of Austria).

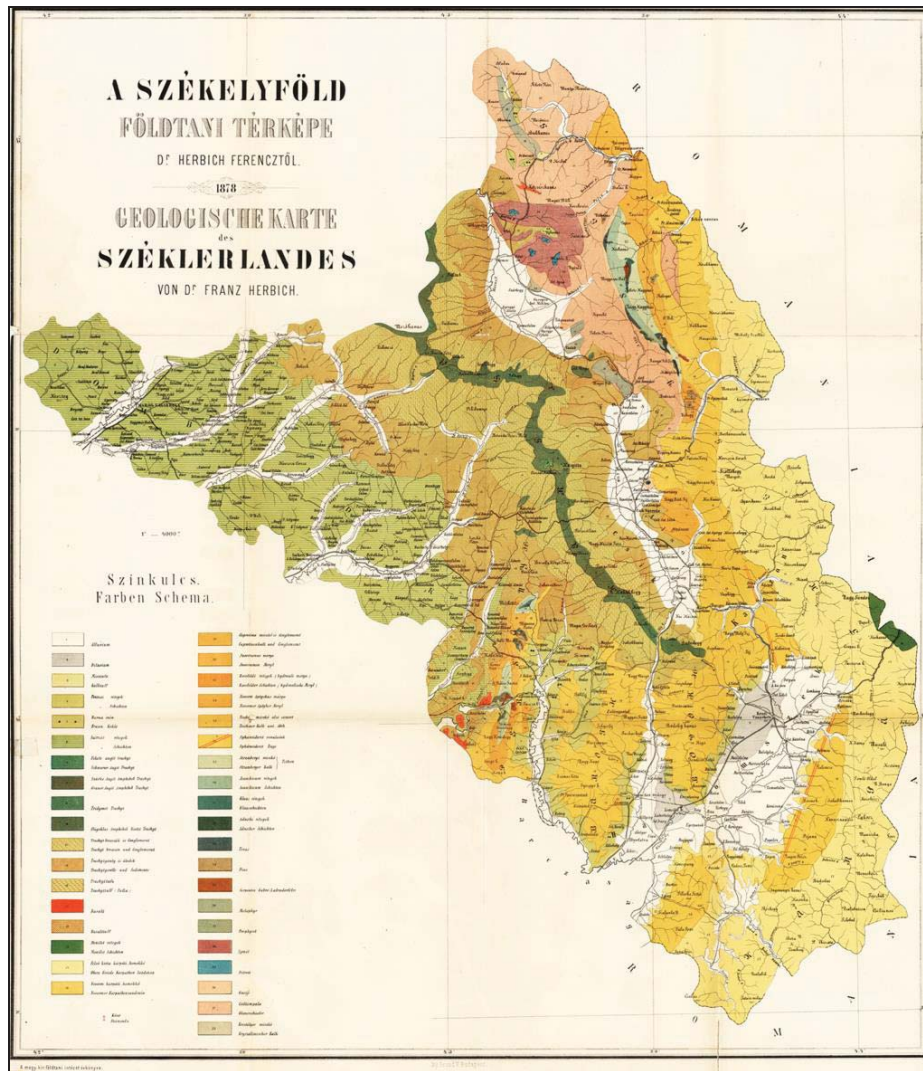


Figure 6. A Székelyföld földtani térképe, 1:288,000 (Herbach 1878a) (Source: Collection of the Library of the Geological and Geophysical Institute of Hungary).

Acknowledgements

Most of the maps used in this study are properties of the Library of the Geological Survey of Austria. I would like to thank Christian Cermak and Thomas Hofmann for their accessibility. One of the maps is the property of

the Library of the Geological and Geophysical Institute of Hungary; hereby we thank the staff of the library for the accessibility.

This paper is a result of a doctoral research made possible by the financial support of the Sectoral Operational Programme for Human Resources Development 2007-2013, co-financed by the European Social Fund, under the project POSDRU/187/1.5/S/155383- “Quality, excellence, transnational mobility in doctoral research”.

References

- Barczikayné Szeiler R, Gyalog L, Hegyiné Rusznyák É, Viktor Zs, Orosz L, Pentelényi A, Sikhegyi F (2009) A földtani térképezés 140 éve – Térképválogatás a XVIII. századtól napjainkig. MÁFI kiadás – DVD, Budapest
- Beudant F S (1822) Carte Géologique de la Hongrie et de la Transylvanie avec une partie des pays limitrophes. Map, scale: M=1:1,000,000. In: Voyage minéralogique et géologique en Hongrie, pendant l'année 1818, Paris
- Bielz EA (1854a) Karte der geognostischen Verhältnisse des Grossfürstenthums Siebenbürgen. Map, scale: M=1:864,000, Hermannstadt (Sibiu)
- Bielz EA (1854b) Karte der Verbreitung der Salzquellen und des Steinsalzes in Siebenbürgen mit Rücksicht auf die geognostischen Verhältnisse dieses Landes. Map, scale: M=1:864,000, Hermannstadt (Sibiu)
- Bielz EA (1854c) Karte des Grossfürstenthums Siebenbürgen mit der neuen politisch-gerichtlichen Eintheilung und sämtlichen Ortschaften dieses Landes (Geologische Übersichts-Karte von Siebenbürgen). Map, scale: M=1:432,000?, Hermannstadt (Sibiu)
- Boué A (1834) Carte Géologique de la Transylvanie du Marmarosh et d'une partie de la Bukowine. Map, scale: M~1:1,900,000. In: Memoires de la Société Géologique de France, Paris
- Breznysnyánszky K (1985) Neogene Mineral Resources in the Carpathian Basins. In: VIIIth RCMNS Congress – Hungary, Hungarian Geological Survey 27–43, Budapest
- Breznysnyánszky K (1996) Austro–Hungarian geological mapping before 1869. Advances In Austrian–Hungarian Joint Geological Research 25–32, Budapest
- Breznysnyánszky K & Turczy G (1998) Geological Maps – from Litography to GIS. Földtani Közlöny 128/1: 145–156, Budapest
- Breznysnyánszky K & Sikhegyi F (2007) Das Ungarische Geologische Institut, eine herausragende Werkstatt der thematischen Kartographie. Nova Acta Leopoldina NF 94 349:47–69
- Galambos Cs (2009) History of the Hungarian Geological Maps – An Overview from the 18th Century to Nowadays. In: Gartner G & Ortog F (Eds.) Proceedings of the First ICA Symposium for Central and Eastern Europe 2009. Vienna University of Technology, 713–724, Vienna
- Galambos Cs (2010) Projection analysis and geo-reference of the old Hungarian geological maps. In: Gartner G & Livieratos E (Eds.) Proceedings of the 5th International Workshop on Digital Approaches in Cartographic Heritage. Vienna University of Technology, 183–188, Vienna

- Galambos Cs & Unger Z (2009) Geological Maps showing Transylvania from around 1900. *Geographia Technica* 1:31–39
- Jankó A (2007) Magyarország katonai felmérései 1763–1950. Argumentum, Budapest
- Haidinger W (1845) Geognostische Uibersichts-Karte der Oesterreichischen Monarchie. Map, scale: M=1:864,000, Wien
- Hauer FR (1861) Geologische Uibersichts-Karte von Siebenbürgen. Map, scale: M=1:576,000, Hermannstadt (Sibiu)
- Hauer FR (1867–1871) Geologische Übersichts-Karte der Österreichisch–Ungarischen Monarchie nach den Aufnahmen der k. k. geologischen Reichsanstalt. Map, scale: M=1:576,000, Wien
- Hauer FR., Štur D, Stache G (1863) General-Karte des Grossfürstenthums Siebenbürgen und der im Jahre 1861 mit dem Königreiche Ungarn vereinigten Theile (Geologische Übersichts-Karte von Siebenbürgen). Map, scale: M=1:288,000, Wien
- Herbich F (1878a) A Székelyföld földtani térképe. Map, scale: M=1:288,000. In: Herbrich F: A Székelyföld földtani és őslénytani leírása. Magyar Királyi Földtani Intézet, Budapest
- Herbich F (1878b) A Székelyföld földtani és őslénytani leírása. Magyar Királyi Földtani Intézet Évkönyve V/2, Budapest
- Korabinszky JM (1791) Novissima Regni Hungarie potamographica et telluris productorum tabula. Map, Wien
- Lill von Lilienbach K (1833): Geognostische Karte der Karpathen. Map, scale: M~1:2,200,000. In: Direction der Administrativen Statistik der Statistischen Centralcomission der Oesterreichischen Monarchie (Hsg.): Tafeln zur Statistik der Oesterreichischen Monarchie. 1833, Wien
- Marsigli LF (1741) Mappa mineralographica. Fodinas in Hungaria partibusque adhaerentibus feré omnes quae Danubium cominus aut eminus circumstant, et é quibus in eundem substantiae Mineralis defluunt, suis districtus charateribus ostendens. Map, scale: M~1:1,550,000
- MGI (1863) General-Karte des Grossfürstenthums Siebenbürgen. Map, scale: 1:288,000. Militärgeographisches Institut, Wien
- Pentelényi A & Síkhegyi F (2012) Hazai földtani térképeink topográfiai alapjai. In: A MÁFI évi jelentése 2010:81–95, Budapest
- Peters KF (1858) Geognostische Uibersichts-Karte der Umgegend von Rézbánya im Gebiete der schwarzen und der weissen Körös im südöstlichen Ungarn. Map, scale: M=1:288,000, Wien
- Staszic S (1815) Carta geologica totius Poloniae, Moldaviae, Transilvaniae, et partis Hungariae et Valachiae. Map, scale: M~1:1,250,000. In: O Ziemiorodoztwie Karpatow, i innych gor i rownin Polski. 1815, Warszawa
- Townson R (1797) New Map of Hungary, particularly its Rivers & Natural Productions. By In. Math. Korabinsky. Petrography and Post Roads added by the Author. Map, scale: M~1:1,260,000. In: Travels in Hungary with a short account of Vienna in the year 1793, London
- Wappler C G (1780) Geographische Mappe des Gross-Fürstenthums Siebenbürgen. Map, scale: M~1:646,000. In: Fichtel, J E: Beitrag zur Mineralgeschichte von Siebenbürgen (Theil I.), Nürnberg