UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 24 (new series) – 2023
Vol. 24 (serie nouă) – 2023

EMMANUEL DE MARTONNE'S GLACIAL GEOMORPHOLOGY RESEARCH IN PARÂNG MASSIF (THE SOUTHERN CARPATHIANS)

CERCETĂRI DE GEOMORFOLOGIE GLACIARĂ ALE LUI EMMANUEL DE MARTONNE ÎN MASIVUL PARÂNG (CARPAȚII MERIDIONALI)

Emil MARINESCU[1], Sidonia MARINESCU[2]
10.52846/AUCSG.24.01

Abstract: We are publishing this article in 2023, the year when the 150th anniversary of the birth of the French geographer is celebrated, the article being a tribute to Emmanuel de Martonne's work in Romania, especially for his contribution to the research of the Transylvanian Alps (the Southern Carpathians). Of the two doctoral theses that the French geographer elaborated on the territory of Romania, the last one, defended in 1905 and published in 1907 at the Sorbonne University in Paris, was dedicated to the geomorphological evolution of the Transylvanian Alps (the Southern Carpathians). Of the 14 field campaigns that Emmanuel de Martonne carried out in Romania, eight were carried out in the Southern Carpathians (Banat Massif, Transylvanian Massif) and in the neighboring regions closely related in their paleogeographical evolution to the Transylvanian Alps (the Subcarpathian area of Oltenia, the Subcarpathian area of Muntenia, and Mehedinți Plateau). For the French geographer, the transverse valleys of the Southern Carpathians were examples indicating the extensive tectonic movements that affected the territory of Romania in the Paleogene and Neogene. Glacial influences and relief forms in the high part of the Southern Carpathians became the main concern of the French geographer for at least a decade of research in Romania. More obviously, in some parts of the Southern Carpathians, the action of glaciation cut out specific shapes within *the platform of the high peaks (Borăscu planation platform).* In the research in Parâng Mountains, Emmanuel de Martonne aimed to identify some key evidence of glaciation: glacial cirques, lakes, valleys, thresholds, glacial grooves, glaciated knobs, and moraines. Above all, the French geographer believed that the general topography of the valleys and cirques is the fundamental element that certifies glaciation and the presence of lateral cirques justifies the succession of glacial periods.

Key-words: *glacial relief, glacial cirque, moraines, glaciated knobs, Parâng Mountains, Emmanuel de Martonne.*
Cuvinte cheie: *relief glaciar, circ glaciar, morene, roci mutonate, Munții Parâng, Emmanuel de Martonne.*

[1] University of Craiova, Geography Department, 13 A.I. Cuza Street, 410087, Craiova, Dolj, Romania, email: emilmrnsc@yahoo.com (correspondent author)
[2] University of Craiova, University Library, 13 A.I. Cuza Street, 410087, Craiova, Dolj, Romania

1. INTRODUCTION

The French geographer Emmanuel de Martonne (1873-1955) had a vast, systematic, recognized worldwide work in the field of Geography. He belonged to the French school of Geography, initiated in Paris by Paul Vidal de la Blache (1845-1918) – the scientific personality who was the mentor of many generations of French geographers.

If Vidal de la Blache developed French human and regional geography, Emmanuel de Martonne had the merit of developing both regional and physical geography. Physical geography was mainly approached in his work through two of its sub-branches - climatology and, especially, geomorphology.

The French geographer was the author of the first *Treatise on Physical Geography* (Sorbonne, Paris), which was published in four editions (1909, 1913, 1921, 1927). As regional monographs had become increasingly numerous and detailed in France, although Vidal de la Blache advocated for much more synthetic monographs, Emmanuel de Martonne's *Treatise on Physical Geography* remained for a long time unrivalled in the other field of geography, namely human geography (Calberac, 2012, p.160).

Throughout his prestigious career, Emmanuel de Martonne's studies materialized in 224 scientific works (treatises, books, articles, cartographic materials) in various branches of geography: geomorphology, climatology, hydrology, population and settlement geography, cartography, regional geography, toponymy, geopolitics (Hallair, 2007, p. 15-24). Of the 224 works published by the famous geographer, almost a third, 61 works (27%), are dedicated to the Romanian space. Among the studies dedicated to Romania, 24 publications (40%) refer to the Transylvanian Alps (the Southern Carpathians) (de Martonne 1899a, b, c, 1900a, b, 1901a, b, c, 1902a, 1903a, b, 1904a, b, 1905a, b, 1906a, b, c, 1907, 1914).

The special concern about the studies of glacial geomorphology (Martonne 1910a, 1910b, 1911, 1926, 1931, 1945) was reflected in the 37 publications from this field (16.5% of published works), while 10.7% of the works published by the geographer were studies of glacial geomorphology dedicated to the Carpathians, mountains where Martonne began to research the glacial and periglacial relief.

Apart from his contributions in geomorphology, the geographer Emmanuel de Martonne is also well-known in Romania for his contributions in the field of population and settlement geography, regional geography, and political geography.

He participated as an expert in the Paris Peace Conference (1919) having an important role in the commissions that drew the western border of Romania after the end of the First World War (Martonne, 1921; Bariéty, 1996; Boulineau, 2001; Săgeată, 2010, 2023; Bowd, 2011; Bowd & Clayton, 2014; Budui, 2020).

After 1920, he taught courses at the *University of "Upper Dacia"* in Cluj and organized the geographical excursions of the Institute of Geography of the University of Cluj in numerous areas as: Bihor Massif, Poiana Ruscă Massif, Retezat, Godeanu, Metaliferi Mountains, Bucovina Alps, Northern Dobrogea (Martonne, 1922; Tufescu et al., 1985).

For the territory of Romania, he elaborated two doctoral theses.

La Valachie. Essai de monographie géographique (1902a) was the first regional monograph of Vidal de la Blache's geographic school and his first doctoral thesis submitted and defended on the territory of Romania. The work was appreciated by Lucien Gallois as "*not only an excellent scientific work but also a description of applied geographical method*" (Gallois, 1903, p. 77). It highlighted an overview of Romania, from geology, relief, hydrography to population, settlements, ethnography, traditions (Martonne, 1902a). Later, he also published an ethnographic map of the Romanian United Principalities (Martonne, 1920).

The research carried out for the first doctoral thesis later helped him to present Romania in the synthesis work entitled *Géographie Universale. Central Europe* (Martonne, 1932).

The secondary thesis that completed the methodology of the first doctoral thesis (Martonne, 1902b; Martonne, 1903a) actually represented the methodological approach in the mapping of settlements and the representation of the ethnic structure of the population (with application to "*Muntenia*"). In this work, Martonne's analysis focused exclusively on his own method of research and graphic representation, proposed for being used in population and settlement geography (Gallois, 1903; Calberac, 2012, p. 114).

The second doctoral thesis on the territory of Romania is *Recherches sur l'evolution morphologique des Alpes de Transylvania (Karpates Méridionales)*, was defended in Paris in 1905 and published in 1907 (Martonne, 1907). The work was the result of 14 months of documentation in Romania during the period 1898-1906 (Margerie, 1908; Niculescu, 1981; Calberac, 2012, p. 115; Ielenicz & Nae, 2013; Budui, 2020).

Seven scientific personalities accompanied the French geographer in the field research, in various periods, in Parâng and Retezat Mountains, Hațeg Depression, Petroșani Depression, and the Jiu Gorge: Professor Louis-Claude Duparc (University of Geneva) – the doctoral supervisor of the academician Ludovic Mrazec; the Romanian geologists and professors L. Mrazec, Ghe. Munteanu-Murgoci, V. Popovici-Hațeg, I. Popescu-Voiteşti (University of Bucharest), professor G. Szádeczky – geologist (University of Cluj), and Baron Franz Nopsca – an important authority in the geology and paleontology of Hațeg County.

Emmanuel de Martonne, being the exponent of the Paris school of geography, often appealed to the theory of the Davisian cyclic evolution of the relief in contradiction with the Grenoble school of geography, which supported the supremacy of the structural factor in the evolution of the relief (Calberac, 2012, p. 160). The debate started about the relief of the Alps, but Emmanuel de Martonne exemplified this theory in the Carpathians, as well.

The French geographer attended the classes of W.M. Davis at Harvard (USA), of F. von Richthofen (Berlin), and A. Penck (Vienna). This fact influenced his system of thought by which he sought to explain the genesis and evolution of the relief, an original system that the French geographer tried and succeeded in developing throughout his entire career.

He also attended the courses of the climatologist Julius Hann (Vienna), which influenced him in his subsequent concern for climatology (*De Martonne climatic index, South American arid diagonal*) and in the search for the relationship between the climatic factor and the evolution of the relief; thus, Martonne was a precursor of climatic geomorphology (Mac, 1974).

The work of Emmanuel de Martonne appeared over time in numerous publications from the two countries that offered him the widest field studies:

- France (Gallois, 1903; Margerie, 1908; Dresch, 1956; Bariéty, 1996; Boulineau, 2001; Palsky, 2002; Hallair, 2007, 2013; Bowd, 2011, 2012; Calberac, 2012; Bowd & Clayton, 2014);
- Romania (Tufescu, 1957; Dragomirescu, 1973; Ficheux, 1973; Mihăilescu, 1973; Morariu, 1973; Posea, 1973; Tufescu, 1973; Mac, 1974; Tufescu, 1981; Tufescu et al, 1981,1985; Săgeata, 2010; Ielenicz & Nae, 2013; Budui, 2020).

2. DATA AND METHODS

In the context of the geomorphological research in the Romanian Alps, Emmanuel de Margerie (1908) emphasized the relevance of the topographic surveys carried out by Emmanuel de Martonne and mentioned his first topographic survey in history at a scale of 1:10,000 that was made for the high mountains. This topographic survey represented the map of the eastern part of Parâng Massif (Martonne, 1900b; Margerie, 1908; Calberac, 2012, p. 115-116).

In his work on the "*géographes de terrain*" of the 20th century in France, Yann Calberac remarked the appreciation of Emmanuel de Martonne's research made by two contemporary geographers, Lucien Gallois (1903) and Emmanuel de Margerie (1908): ”*Unlike Lucien Gallois, Emmanuel de Margerie places De Martonne's work in the realm of the known: far from being a pioneer, Emmanuel de Martonne is part of a methodological tradition. His topographic surveys are carried out with precision equipments belonging to the geologist. Over time, De Martonne's approach lost its pioneering character, but De Margerie emphasizes the accuracy with which the topographic data were recorded and the abundance of collected data*" (Calberac, 2012, p. 116). This remark proves, once more, that based on his topographic surveys of the Transylvanian Alps, the French geographer was not only a fine observer of the terrain, but also an excellent topographer. These qualities together with the rigorous knowledge of geology (he attended the courses of Richthofen, Penck, Fouqué) and the collaboration with the eminent Romanian geologists (Mrazec, Murgoci, Popovici-Hațeg, Popescu-Voitești) have led to the elucidation of many aspects of the evolution of the Carpathian relief, ever since the early years of the 20th century.

The topographic surveys of Emm. de Martonne in the Transylvanian Alps on a scale of 1:25,000 (Făgăraş, Retezat, Parâng, Godeanu, Țarcu, Bucegi) and partly 1:10,000 (Parâng, Retezat) were carried out with the plane table 40 cm x 50 cm, the ruler with Colonel Goulier's clinometer, supplemented and interpolated by data collected with the compass and with three frequently calibrated Naudet aneroids.

Finally, he ordered Mr. Perron, in Geneva, to build "*le modèle en gardin"* for the high relief in Parâng, a model executed according to the map of Parâng, scale 1:25,000, whose author was himself. This cartographic document revealed the 18 glacial cirques from Parâng that were confirmed by subsequent research (Iancu, 1970, appendix, figure 64).

He considered this stepped relief model not only as a scientific demonstration, but also as an excellent teaching tool. "*It allows students to understand the contrasts between glacial topography and subaerial erosion topography, the influence of exposure and relief on the development of local glaciers, the role played by the cirque in the development of high mountain forms, the characteristics of a raised peneplene, finally the variety of stadial moraines*" (Martonne, 1906c, p. 1583). Due to these qualities of Parâng relief model, it was distributed by Emmanuel de Martonne to 25 museums and university institutes in France, Belgium, Switzerland, Germany, Romania, Hungary, Austria, and the United States.

In his doctoral thesis on the Transylvanian Alps, Emmanuel de Martonne not only provided graphic documents that illustrated the descriptions and gave thoroughly justified textual explanations of the evolution of the relief, but highlighted numerous details that could had been overlooked (Margerie, 1908, p. 405-406, cited by Calberac, 2012, p. 116).

His field campaigns in the Transylvanian Alps gathered over a thousand of photographic images, a series of panoramic sketches and field notebooks (Hallair, 2013). Unfortunately, only a relatively small number of them were reproduced in the doctoral thesis (eg. only 9 photos from Parâng Massif). Nowadays, there is a huge challenge for all Martonne's biographers to recover and publish all the photos and maps he took in the Carpathians in the period 1898-1906.

Important initiatives in the publication of photographic materials, field notebooks, panoramic sketches, and cartographic products made by Emmanuel de Martonne have recently been noted (Hallair, 2013; Hallair & Verdier, 2017-2020; Hallair & Stan, 2023; https://catalogue.bis-sorbonne.fr/Emmanuel de Martonne/Bibliothéque Interuniversitaire Sorbonne; https://gallica.bnf.fr/geographie/emmanuel-de-martonne/Bibliothéque Nationale de France; https://nubis.univ-paris1.fr/ecole_francaise_de_geographie: Hallair, Stan. L'album de Cluj offert au géographe Emmanuel de Martonne en 1930, Bibliothéque Numérique).

Unfortunately, the notebooks and photographs taken by the French geographer during the first part of his studies in the Transylvanian Alps (period 1898-1906) have not yet been published.

3. RESULTS AND DISCUSSIONS

In his doctoral thesis *Morphological Evolution of the Transylvanian Alps (the Southern Carpathians)*, the French geographer looked for evidence and issued arguments to prove the glaciation of the high part of this Carpathian area. From the

studies dedicated to Romania, 24 publications referred to the Transylvanian Alps (the Southern Carpathians).

Of the 14 field campaigns that Emmanuel de Martonne carried out in Romania, in eight of them he did research in the Southern Carpathians (Banat Massif, Transylvanian Massif) and in neighboring regions closely related in their paleogeographic evolution to the Transylvanian Alps (the Subcarpathian area of Oltenia, the Subcarpathian area of Muntenia, Mehedinți Plateau). Some field campaigns exceeded 2 months. The longest research period was August-October 1899. Glacial influences and glacial landforms in the high part of the Southern Carpathians then became the main concern of the French geographer for at least a decade of research.

In all his research, Emmanuel de Martonne aimed to identify glacial key evidence to confirm the glaciation of the high areas of the Southern Carpathians (Retezat, Parâng, Țarcu-Godeanu, Făgăraș, etc.). The geographer believed that the general topography of the valleys and cirques in the high area and other geomorphological evidence (glacial cirques, lakes, glaciated knobs, glacial grooves, moraines, etc.) were the fundamental elements that certified glaciation and the presence of lateral cirques on almost all glacial valleys in the Carpathians, and justified the succession of two glaciations (Martonne, 1900a).

The main articles about the glaciation in the Transylvanian Alps can be found in the journals: *Bulletin de la Société Géologique de France, Comptes rendus de des séances de l'Académie des Sciences, Bulletin of the Romanian Geographical Society*, and other publications in French published in Paris and Bucharest in the period 1899-1906.

The synthesis of the research was included at the end of the doctoral thesis *The Morphological Evolution of the Transylvanian Alps* (1907).

In Parâng Massif, which was in his sphere of interest from the beginning (1898), he noted the lack of detailed maps for this massif and set out to create such maps that he considered essential for highlighting the glacial topography and the elements that demonstrated the presence of old glaciers in the high area. At first, he made *Le levé topographique des cirques de Găuri et Câlcescu (Massif du Parângu) on a scale of 1:10,000 (August-September 1899)* (Martonne, 1900b). This was followed by the topographic survey of the high part of the Parâng Mountains at a scale of 1:25,000 (1900-1906) (Martonne, 1906a, 1906c), the determination of some morphometric elements of all the glacial cirques and the highlighting of the elements that certified the Pleistocene glaciation in these mountains (Martonne, 1900a).

The profiles raised in the glacial cirques Găuri and Gâlcescu (Martonne, 1900a) demonstrated that the glacial sills in Parâng were not located at petrographic discontinuities, but were created by the action of glaciers (which is why the edge of the sills are marked by glaciated knobs).

In order to highlight as many of the relief accidents and glacial topography elements as possible, Emm. de Martonne assigned new toponyms in memory of some scientific and political personalities (Martonne, 1900b).

After having completed the topographic survey of Găuri and Gâlcescu cirques, he made the 1:25,000 topographical elevation of the southern slope of the massif located in *La Valachie* and then went to Transylvania to map the cirques of the Jieț basin so that, in the end, he achieved the detailed map for the entire high part of Parâng Mountains. He also published the characteristics of the cirques in Parâng Massif determining important morphometric elements: their exposure, surface area, average slope, cirque bottom elevation, number of lakes, minimum elevation, and the number of lateral cirques in each glacial valley (Martonne, 1900a, p. 311).

He identified glacial grooves (striations) in Ieșu, Găuri, Gâlcescu cirques (often on glaciated knobs) and noted the rarity of the well-preserved ones on the bedrock.

Martonne considered that well-preserved moraines were very rare and "*Bottom moraines are missing (local Pyrenean-type glaciers are generally devoid of bottom moraines)*". He indicated only frontal and lateral moraines (Găuri, Cărbunele, Iezer, Slivei) (Martonne, 1900a, p. 287). To confirm a moraine, there must "*be enough space behind it for a glacier to have formed it; and another way to distinguish moraines from debris is the study of their petrography*", said Martonne and confirmed such moraines in Găuri cirque where "*on an area of several hundred square meters, the limestones disappear under a layer formed by large blocks of gneissic granite and a debris formed by the same elements*" (Martonne, 1900a, p. 286-288). In connection with this subject, he also referred to his previous contributions regarding the interpretation of the debris accumulations (Mrazec, 1899, p.15).

He identified glaciated knobs in the cirques Găuri, Gâlcescu, Ieșu, Roșiile, Silivei, Muntinu, Urdele and concluded that their position on site could only be explained by glacial erosion (they always have the steep side towards the edge of the major terrain slope). He noted their abundance on the sides and edge of each "*cirque palier*" where glacial pressure and erosion were most intense.

He confirmed the erratic blocks from Cărbunele – large blocks of gneiss, also reported by Murgoci (Munteanu-Murgoci, 1898, p. 69). Being angular and having no trace of glacial striations, he considered the blocks to be debris from a largely modified and destroyed lateral moraine. In the analysis of the glacial traces, he insisted on the importance of the petrographic study (Martonne, 1900a, p. 292) and on the analysis of the morphology of lacustrine depressions and of the sediments within them (Martonne & Murgoci, 1901a).

He classified the lakes of Parâng into: *glacial lakes* (eg. Gâlcescu, Roșiile), *lakes in debris* (eg. Slivei, Găuri) and *lakes in sinkholes* (eg. Găuri valley - high-altitude karst, actually a glaciokarst, with small lakes nestled in karst sinkholes).

The topographic survey of the eastern part of Parâng (1:25,000) highlighted the distribution of ”*the platform of high peaks*” (Borăscu planation surface) and identified Miocene and Pliocene planation surfaces in this massif (Martonne, 1907).

The French geographer named a series of lakes in Parâng (e.g. *Lacul lui Vidal* and *Lacul lui Pencu*, from Gâlcescu glacial cirque, as a tribute to his professors from the Sorbonne and Vienna universities: Paul Vidal de la Blache and

Albrecht Penck, respectively). Together with the geologist Ghe. Munteanu Murgoci, he created the first bathymetric map of a glacial lake in Romania (Gâlcescu Lake) in 1900.

The author of the map noted the abundance of anthroponyms in the Parâng Mountains (eg. *Costa lui Rus(u), Plaiul lui Godeanu, Pârâul lui Burtan, Dâlma lui Dăncilă, Vârful lui Pătru, Dunga lui Stăncioi*). He also observed the significant differences in the toponymy of the southern and northern slopes within the same mountain (eg. *Cibanu* vs. *Huluzu*, *Parâng* vs. *Mândra*) and highlighted the local toponymy of the glacial cirques ("*zănoagă*", "*căldare*") used by the shepherds, which originated in the names of the valleys, not in the names of the peaks (eg. *Zănoaga Slivei, Căldarea Gâlcescu, Căldarea Gherești, Căldarea Roșiile*). Martonne also published an interesting and well documented article in which he described the pastoral life and transhumance in the Southern Carpathians (Martonne, 1904b).

The observations of Emm. de Martonne and the principles stated by him in the succession of glacial periods in Parâng Massif were the basis of a synthesis of the glacial relief in the Southern Carpathians (Puchleitner, 1901) and of a detailed study of the glacial relief in the upper basin of the Jieț River published by Hungarian geographers (Schréter, 1908).

4. CONCLUSIONS

Emmanuel de Martonne is a forerunner of the large-scale topographic survey that allows geographers to identify the accidents of the glacial relief (glacial thresholds, moraines, glaciated knobs, lacustrine depressions). From this point of view, he is not only a fine observer of the terrain geomorphology, but also an outstanding topographer. Thus, he makes numerous topographical surveys in the Southern Carpathians, most of which he carries out in Parâng Massif: Găuri and Gâlcescu glacial cirques (1:10,000), the revision of the topographical survey of Roșiile and Slivei cirques (1:25,000), the compass and aneroid altimeter-based survey of all the cirques from the south and east (Muntinu, Urda, Iezeru, Mohoru, Pleșcoaia, Iești, Gruiu) (1:25,000) (Martonne, 1906b).

In his studies, Emmanuel de Martonne aims to identify glacial key evidence: 1. glaciated knobs, 2. glacial grooves, 3. moraines, 4. glacial lakes, but above all, he reckons that the general topography of valleys and cirques is the fundamental element that certifies glaciation and the presence of lateral cirques is the element that indicates the succession of glacial stages.

He maps 20 lakes in the high part of Parâng, in Găuri and Gâlcescu (only one was previously mentioned on military maps) and 12 lakes in the Jieț basin. He considers that not all lakes are of glacial origin (eg. Gherești, Lacul lui Pompiliu, the small sinkhole-lakes in Găuri).

The lateral cirques are his arguments that prove two glacial periods in Parâng: the period of valley glaciers and the period of cirque glaciers. In this sense, he brings as arguments the lateral cirques from Slivei and Gâlcescu. In Parâng, the

ridge line is constantly formed by the edge of the escarpments of the northern cirques. Considering all the glacial traces, the cirque is the last to disappear.

The topographic survey in the east of Parâng allows him to clearly identify the existence of the three planation surfaces that he subsequently finds in each massif of the Southern Carpathians: "*plateforme des hauts sommets - plateforme Boresco (Paléogène – Miocène), Râu-Șes (Miocène) et Gornovița (Pliocène)*" (Martonne, 1907, p. 180-182).

The scientific observations and results of Emmanuel de Martonne were developed and extended by the geomorphological studies conducted afterwards in Parâng (Iancu, 1970; Vuia, 2002); Retezat (Urdea, 2000), Godeanu (Niculescu, 1965), Făgăraș (Florea, 1998; Nedelea, 2006; Simoni, 2011), Bucegi (Micalevich-Velcea, 1961), etc. or in synthesis papers on the geomorphometry of glacial cirques in the Romanian Carpathians (Mîndrescu, 2016). All subsequent studies were based on the revolutionary vision of the great French geographer Emmanuel de Martonne regarding the Pleistocene glaciation of the Transylvanian Alps and also on his scientific rigour and commitment, which ensured him the accomplishment of a valuable research more than a century ago, when the topographic instruments were still rudimentary.

REFERENCES

1. Bariéty, J. (1996). Le Comité d'Etudes du Quai d'Orsay et les frontières de la Grande Roumanie, 1918–1919", *Revue Roumaine d'Histoire*, XXXV, 1–2, București, p. 43–51.

2. Boulineau, Emm. (2001). Un géographe traceur de frontières: Emmanuel de Martonne et la Roumanie, *L'Espace géographique*, tom. 30(4), Paris, p. 358-369.

3. Bowd, G. (2011). Emmanuel de Martonne et la naissance de la Grande Roumanie, *Revue Roumaine de Géographie*, vol. 55, 2, București, 216 p.

4. Bowd, G. (2012). Un géographe français et la Roumanie – Emmanuel de Martonne (1873-1955), L'Harmattan, Paris

5. Bowd, G., Clayton, D. (2014). Emmanuel de Martonne and the wartime defence of Greater Romania: Circle, set square and spine, *Journal of Historical Geography*, tom. XXX, p. 50-63.

6. Budui, V. (2020). Emmanuel de Martonne - moștenirea științifică, *Ėtudes Interdisciplinaires en Science Humaines*, vol.7, Iliauni Open Journal Systems, https://ojs.iliauni.edu.ge/index.php/eish/article/view/484/371 (accessed in December 2022)

7. Dragomirescu, Ș. (1973). Actualitatea concepţiei geografice a lui Emmanuel de Martonne, *Analele Academiei Române*, 107, IV, XXIII, București

8. Dresch, J. (1956). Emmanuel de Martonne (1873-1955), *Bul. Géol. de France*, VI, Paris

9. Ficheux, R. (1973). Emmanuel de Martonne, *St. Cercet. G.G.G.*, Geografie, XX, 1, p. 13-14, București

10. Florea, M. (1998). Munții Făgărașului. Studiu geomorfologic, Editura Foton, Brașov

11. Calberac, Y. (2012). Terrains de géographes, géographes de terrain. Communauté et imaginaire disciplinaires au miroir des pratiques de terrain des géographes français du XXe siècle, Université Lumière - Lyon II, NNT:C0021478, https://theses.hal.science/tel-00551481v2 (accessed in February 2023)

12. Gallois, L. (1903). La Valachie par E. de Martonne, *Annales de Géographie*, Paris, XII. p. 77 à 81. p. 77.

13. Hallair, G. (2007). Le géographe Emmanuel de Martonne et l'Europe centrale, PRODIG, Paris

14. Hallair, G. (2013). Les carnets de terrain du géographe français Emmanuel de Martonne (1873-1955): méthode géographique, circulation des savoirs et processus de visualisation, *Revue Belge de Géographie*, 2

15. Hallair, G., Verdier, N. (2017-2020). Emmanuel de Martonne Corpus. Phase1, https://geographie-cites.cnrs.fr/en/emmanuel-de-martonne-corpus-phase-1/

16. Hallair, G., Stan, A-M. (2023). CNRS UMR Géographie-Cités. Projet Corpus Emmanuel de Martonne (2017-2023) : résultats, bilan et perspectives de la valorisation des carnets de terrain et des photographies d'Emm. de Martonne, https://nubis.univ-paris1.fr/ecole_francaise_de_geographie

17. Iancu, S. (1970). Munții Parâng. Studiu geomorfologic, Teza de doctorat, Universitatea Babeș-Bolyai, Cluj-Napoca

18. Ielenicz, M., Nae, M. (2013). Le savant français Emmanuel de Martonne et la géomorphologie roumaine, *Analele Universității din București*, *Seria Geografie*, vol.1, București, http://www.annalsreview.geo.unibuc.ro/2013.html

19. Mac I. (1974), Emmanuel de Martonne, precursor al geomorfologiei climatice, SUBB-Geografie, XIX, I, p.43-46, București

20. Margerie, E. (1908). L'évolution morphologique des Alpes de Transylvanie (Karpates méridionales) d'après Mr. de Martonne, *Annales de Géographie*, Paris, XVII, p. 404 à 412. p. 406.

21. Martonne, Emm. (1899a). Sur la Période glaciaire dans les Karpates Méridionales, *C.R. des Séances de l'Acad. des Sc.*, Paris, CXXIX, p.894-897

22. Martonne, Emm. (1899b). Sur l'histoire de la vallée de Jiu, *C.R. des Séances de l'Acad. des Sc*., Paris, v. CXXIX, p. 978-980

23. Martonne, Emm. (1899c). Lapiez dans des gres cretaces, *Bulletin de la Société Géologique de France*, 3e Série, vol. XXVII, Paris, p. 28-32

24. Martonne Emm. (1900a). Contribution à l'étude de la période glaciaire dans les Karpates Méridionales, *Bulletin de la Société Géologique de France*, 3e Série, Tom. 28, p. 275-319, Société Géologique de France, Paris

25. Martonne, Emm. (1900b). Le levé topographique des cirques de Găuri et Câlcescu (Massif du Parângu)*, Buletinul Societății Inginerilor și Industriașilor de Mine*, vol. IV, fasc.1-2, București

26. Martonne, Emm., Murgoci, Ghe. (1901a). Sondage et analyse de boues du lac Gâlcescu (Carpates Méridionales), *Bulletin de la Société des Sciences de Bucarest***,** vol. 10. nr. 1-2, p. 932-935

27. Martonne, Emm. (1901b). Nouvelles observations sur la période glaciaire dans les Karpates Méridionales, *C.R. Académie des sciences*, t. CXXXII, Paris, p. 360-363

28. Martonne, Emm. (1901c). Sur la toponymie naturelle des régions de haute montagne en particulier dans les Karpates Méridionales, *Bulletin de géographie historique et descriptive*, nr. 1-2, Paris, p. 83-91

29. Martonne, Emm. (1902a). La Valachie. Essai de monographie géographique, Armand Colin, Paris, 387 p.

30. Martonne, Emm. (1902b). Qua arte formandae sint tabulae vere geographicae quae illustrent Rationem Distribuendorum Incolarum (adjunctue duae tabulae Valachiae exempli causa institutae), Condate Redonum Apud Oberthur Typographos, Paris

31. Martonne, Emm. (1903a). Recherches sur la répartition géographique de la population en Valachie avec une étude critique sur les procédés de représentation de la répartition de la population, Armand Colin, Paris; Socec et comp., București, 161 p., 2 cartes

32. Martonne, Emm. (1903b). Étude sur la crue du Jiu au mois d'Aout 1900 (Studiu asupra crescerei Jiului în luna august 1900), *Analele Institutului Meteorologic al României*, t.XVI, nr. 2, București, p. 77-96

33. Martonne, Emm. (1904a), Sur la plate-forme des hauts sommets des Alpes de Transylvanie, *C.R. Académie des Sciences*, t. CXXXVIII, p. 1440-1442.

34. Martonne, Emm. (1904b). La vie pastorale et la transhumance dans les Karpates méridionales et leur importance géographique et historique, *Zu Friedrich Ratzels Gedächtnis*, p. 227-245.

35. Martonne, Emm. (1905a). Sur les anciens glaciers des Karpates Méridionales, *C.R. du Congrès pour l'avancement des sciences*, Bucarest.

36. Martonne, Emm. (1905b), Sur le caractère des hauts sommets des Karpates Méridionales, *C.R. du Congrès pour l'avancement des sciences*, Bucarest, 6 p.

37. Martonne, Emm. (1906a). Notice sur les relief du Paringu et de Soarbele, Bulletin de la Société de Géographie de Bucarest, 27 p; Socec et comp., București

38. Martonne, Emm. (1906b). Recherches sur l`évolution morphologique des Alpes de Transylvanie (Karpates Méridionales), *Rev. de géogr. annuelle*, t. I, Paris

39. Martonne, Emm. (1906c). Sur deux plans en relief du Paringu et de Soarbele (Karpates Méridionales) exécutés d'après des levés topographiques inédits, Note de Emm. de Martonne présentée par M. de Lapparent, Acad. d. Sc. Paris, 25 iunie 1906, *C.R. Acad. d. Sc. Paris*, p.1583-1585

40. Martonne, Emm. (1907). Recherches sur l'evolution morphologique des Alpes de Transylvanie (Karpates Méridionales), Librairie Ch. Delagrave, Paris, 279 p.

41. Martonne, Emm. (1909). Traité de géographie physique, Armand Colin Paris, 910 p.

42. Martonne. Emm. (1910a). Sur la théorie mécanique de l'érosion glaciaire, *Comptes Rendus Académie des Sciences*, Paris, 150, p. 135-138.

43. Martonne, Emm. (1910b). Sur la genèse des formes glaciaires alpines. *Comptes Rendus Académie des Sciences*, Paris, 150, p. 243-246

44. Martonne, Emm. (1911), L'érosion glaciaire et la formation des vallées alpines, *Annales de Géographie*, 19, 106, p. 289-317, Paris

45. Martonne, Emm. (1914). Le Relief des Karpates Méridionales, *Bulletin de la Société Hongroise de Géographie*, Vol XLI, Budapest

46. Martonne, Emm. (1920). Essai d'une carte etnographique des Pays Roumains, *Annales de Géographie*, vol. XXIX, nr. 158, Paris, p. 81-98

47. Martonne, Emm. (1921). La nouvelle Roumanie dans la nouvelle Europe, Buletinul Societății Regale Române de Geografie, vol. 40, București

48. Martonne, Emm. (1922). Un semestre d'enseignement géographique a l'Université de Cluj (Roumanie), *Revue Internationale de l'enseignement*, nr. 3-4, Paris, p. 77-87

49. Martonne, Emm. (1926). Les Alpes. Armand Colin, Paris, 217 p

50. Martonne, Emm. (1931). Les Alpes: géographie générale, Armand Colin, Paris

51. Martonne, Emm. (1932). Europe centrale. Géographie Universale, tom.11, Armand Colin, Paris, 2 vol., 845 p.

52. Martonne, Emm. (1945). Glaciers et relief glaciaire, Collection Découverte, Paris

53. Micalevich-Velcea, V. (1961). Masivul Bucegi. Studiu geomorfologic, Editura Academiei, București

54. Mihăilescu, V. (1973). Contribuția lui Emmanuel de Martonne la dezvoltarea geografiei mondiale, *Analele Academiei Române*, IV, XXIII, București

55. Mîndrescu, M. (2016). Geomorfometria circurilor glaciare din Carpații Românești, Editura Universității Ștefan cel Mare Suceava

56. Morariu, T. (1973). Emmanuel de Martonne şi geografia românească, *Analele Academiei Române*, IV, XXIII, București

57. Mrazec, L. (1899). Sur l'existence d'anciens glaciers sur le versant Sud des Karpates méridionales, *Bul. Soc. des Science*., VIII, București

58. Munteanu-Murgoci, Ghe. (1898). Contribuții la studiul petrografic al rocelor din zona Carpaților Meridionali. IV. Serpentinele din Urde, Muntin și Găuri, București

59. Nedelea, A. (2006). Valea Argeșului în sectorul montan - studiu geomorfologic, Editura Universitară, București

60. Niculescu, Ghe. (1965). Munții Godeanu. Studiu geomorfologic, Editura Academiei, București

61. Niculescu Ghe. (1981). Emmanuel de Martonne și cercetarea Alpilor Transilvaniei, in Emmanuel de Martonne. Lucrări geografice despre România, vol I, Editura Academiei, București, p. 27-36

62. Palsky, G. (2002). Emmanuel de Martonne and the ethnographical cartography of central Europe (1917–1920), *Imago Mundi*, 54(1), p. 111–119.

63. Posea, Gr. (1973). Tratatul de geografie fizică a lui Emmanuel de Martonne – concepţie, principii, actualitate, *Analele Academiei Române*, IV, XXIII, București

64. Puchleitner, S. (1901). Die Eiszeit Gletscherspuren in den Südkarpathen, *Mitt.d. k.k. Geogr. Gesellschaft*, t.LII, p.124-139, Wien

65. Săgeată, R. (2010). The evolution of the Romanian-Hungarian state border, Analele Asociației Profesionale a Geografilor din România, vol. I, nr.1, București

66. Săgeată R. (2023). Emmanuel de Martonne et la frontiére occidentale de la Roumanie, *Rev.Roum.Géogr./Rom.Journ.Geogr.*, 67(1), București

67. Schréter, Z. (1908). A Páreng – hegység orográfiai és glaciologiai viszonyairól, *Földrajti Közlemények*, t.XXXVI, p. 135-150, Budapest

68. Simoni, S. (2011). Studiu geomorfologic al bazinului Râului Doamnei, Editura Universității din Pitești

69. Tufescu, V. (1957). Creaţia lui Emmanuel de Martonne în geografia fizică, *Analele Academiei Române*, VII, I, București

70. Tufescu, V. (1973). Amintiri despre Emmanuel de Martonne, *St.de G.G.G.*, Geografie, XX, 1.

71. Tufescu, V. (1981). Emmanuel de Martonne, făuritor al geografiei moderne şi rolul său în formarea geografiei româneşti, in *Emmanuel de Martonne. Lucrări geografice despre România*, vol. I., Editura Academiei Române, București

72. Tufescu, V., Niculescu, Ghe., Dragomirescu, Șt. (coord.). (1981, 1985). Emm. de Martonne. Lucrări geografice despre România, vol. I-II, Editura Academiei, București

73. Urdea, P. (2000). Munții Retezat. Studiu geomorfologic, Editura Academiei Române, Bucureşti

74. Vuia, F. (2002). Diferențieri morfometrice și morfografice ale circurilor glaciare din bazinul Jiețului (Munții Parâng), *Analele Universității de Vest din Timişoara, seria Geografie*, vol XI-XII, p.31-46, Timișoara

75. https://catalogue.bis-sorbonne.fr/Emmanuel de Martonne/Bibliothéque Interuniversitaire Sorbonne (accessed on 11 January 2023)

76. https://gallica.bnf.fr/geographie/emmanuel-de-martonne/Bibliothéque Nationale de France (accessed on 4 April 2023)

77. https://geographie-cites.cnrs.fr/en/emmanuel-de-martonne-corpus-phase-1/ (accessed on 23 May 2023)

78. https://nubis.univ-paris1.fr/ecole_francaise_de_geographie: Hallair, Stan. L'album de Cluj offert au géographe Emmanuel de Martonne en 1930, Bibliothéque Numérique (accessed on 1 February 2023)