Publ. Astron. Obs. Belgrade No. 100 (2021), 375 - 386 *Poster*

CORRESPONDENCE BETWEEN MILUTIN MILANKOVIĆ AND ELSE WEGENER–KÖPPEN

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Abstract. Milutin Milanković (1879–1958) had a very close collaboration with famous climatologist Wladimir Köppen (1846–1940) and genial geophysicist Alfred Wegener (1880–1930). Else Wegener–Köppen (1892–1992) was the daughter of Wladimir Köppen and the wife of Alfred Wegener.

Correspondence between Milutin Milanković and Else Wegener-Köppen is in the legacy of Milutin Milanković, archived in the Serbian Academy of Sciences and Arts in Belgrade.

For the first time, as far as the authors know, in 1930 she addressed Milanković with a request to send her information about the journals she needed while translating the biography of Carl Anton Bjerknes (1825–1903) from Norwegian.

To supplement the biography of Wladimir Köppen, she asked Milanković in 1949 to describe to her how his collaboration with Köppen began on the book *Climates of the Geological Past* and about their correspondence in general. Milanković answered that he presented his personal impressions in the German edition of the book *Through the Universe and Centuries*, and about scientific cooperation in the *Canon*. That scientific cooperation lasted from 1921 until Köppen's death.

The correspondence is short, but the content of the letters is interesting and contributes to the study primarily of Wladimir Köppen, as well as to the participation of other important scholars who assisted Else Wegener in the work on his biography.

1. INTRODUCTION

Milutin Milanković had a very rich correspondence with many scientists, about which he wrote in his *Memories, Experiences, and Knowledge from 1909 to 1944* (Milanković, 1952). Later the content of the letters translated into Serbian was also published (Milanković, 1997). However, one part of the correspondence remained unpublished and unprocessed for a long time. Among them is the long-term correspondence with Vojislav Mišković (1892–1976), the director of the Astronomical Observatory in Belgrade. This significant correspondence between the two academics has recently been processed, presented at conferences and published (Janc et al., 2018a,

2018b, 2019). Milutin Milanković's letters to Vojislav Mišković, Vojislava Protić-Benišek were kindly received from the Mišković family, while Vojislav Mišković's letters to Milutin Milanković are in the Serbian Academy of Sciences and Arts (SASA) in Belgrade. During the processing of this correspondence, in the post scriptum of the letter that Milanković sent to Mišković on November 24, 1930, a letter he received from Elsa Wegener was mentioned. This gave the idea to find the mentioned letter of Else Wegener and to check whether there was more correspondence between Milutin Milanković and Else Wegener. During the review of Milutin Milanković's legacy in SASA, this Elsa Wegener's letter was not found, but it was a pleasant surprise that several other letters of Else Wegener and Milanković's drafts of his responses have been preserved. Correspondence between them was conducted in German, and Milanković's drafts are also in German.

Milutin Milanković had scientific cooperation and family ties with Wladimir Köppen and Alfred Wegener that started in 1921. Because of that, Else Wegener–Köppen in the course of writing the biography of her father, asked Milutin Milanković to help to complete data about their mutual cooperation.

2. ELSE WEGENER–KÖPPEN

Else Wegener–Köppen was the daughter of Wladimir Köppen. Wladimir Köppen was vitally interested in developing physics of the atmosphere. As Else recalled, her father wanted the whole family to share his excitement in development of his "young science" telling them "we need in meteorology these days the kind of minds coming our way from physics; it is now the time to comprehend and explain, from the standpoint of physics, the atmospheric processes we have discovered in the course of our kite and balloon ascents" (Greene, 2015). In this way, under her father's influence, she developed a great interest for the natural sciences.

The triennial meeting of the German Meteorological Society (Deutsche Meteorologische Gesellschaft) was held from 28th to 30th September 1908 in Hamburg. At the meeting, Wegener presented at talk about his research in Greenland, illustrated with slides. Else, then sixteen, got permission to stay away from school to attend Wegener's lecture. She also got an invitation to the official banquet and she was to be Wegener's guest at the table. After the meeting, Köppen invited Wegener for an informal dinner with family and friends at his home (Greene, 2015). That was the beginning of their relationship (Fig. 1).

Because of Alfred's expedition to Greenland, the couple postponed their wedding plans until November 1913 (Wegener–Köppen E. and Thiede J. (Eds), 2018). So, while waiting for him to return, Else traveled to Oslo and lived with the Bjerknes family teaching Bjerknes' children the German language (Fig. 2a) (Wegener–Köppen E. and Thiede J. (Eds), 2018). This way, boys would be ready to move to Germany, where their father Vilhelm Bjerknes[1] had taken up the Leipzig professorship in 1912 (Greene, 2015). That stay enabled Else to develop friendly relationship with the Bjerknes family.

[1]Vilhelm Friman Koren Bjerknes (1862–1951) was a Norwegian meteorologist who did much to found the modern practice of weather forecasting. He formulated the simple (basic) equations that are still in use in numerical weather prediction and climate modeling.

Figure 1: Newlyweds Else and Alfred Wegener, a picture from the late 1913. She was 20 and he was 33 years old. (https://www.pinterest.com/pin/408068416210428586/)

Else Wegener was in 1992 appointed a honorary member of the German Society for Polar Research (Deutsche Gesellschaft für Polarforschung) (Wegener–Köppen E. and Thiede J. (Eds), 2018).

3. CORRESPONDENCE

Else Wegener worked on biographies of Carl Anton Bjerknes, a Norwegian mathematician and physicist, well-known for his studies in hydrodynamics. For the first time, as far as the authors know, in 1930 she addressed Milanković with a request to send her information about the journals she needed while translating Bjerknes' biography from Norwegian (Janc et al., 2018a). That letter is not in SASA, but it is known indirectly from the letter of Milutin Milanković sent November 24, 1930 to Vojislav Mišković (1892–1976), the director of the Astronomical Observatory in Belgrade (Janc et al., 2018b).

Universitet Matematički institut Beograd, 24. XI 1930.

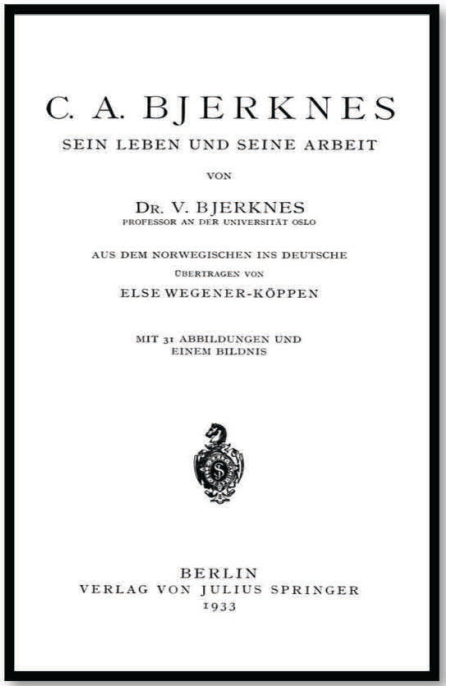
Mathematical Institute of the University, Belgrade, 24 November 1930

Dear Mišković,

(. . . The full text of the letter is here omitted)

Your Milanković

a)



b)

Figure 2: a) Vilhelm Bjerknes with his wife Honoria and their first two sons Karl Anton and Jacob Aall Bonnevie, circa 1898. (Wikipedia https://creativecommons.org/licenses/by-sa/4.0/deed.en.) b) C. A. Bjerknes, Sein Leben und seine Arbeit, von Dr. V. Bjerkens, Übertragen von Else Wegener–Köppen, Berlin, Verlag von Julius Springer, 1933.

P.S. Now I just got one letter from Mrs. Wegener. She translates from Norwegian a biography of C. A. Bjerknes, to be supplemented with some quotes from Lagrange, which came out in the journal Lindenau–Bohnenberger, Zeitschrift für Astronomie, somehow around the years 1816–1818. She asks if we have that journal here, because she could only get the volumes 5 and 6; the others are gone. I have no doubt that this journal is not available, but I'm asking you if you don't happen to know more about this journal that came out in just six to eight volumes.

The last letter to Else, Alfred Wegener wrote in September 1930 on his way to the polar station Eismitte. The next communication arrived more than a half year later as a cable from May 1931, informing her what had happened to her husband: "Death on the ice-sheet in the interior" (Voß, 1992). This shows that Milutin Milanković and Else Wegener exchanged letters not having any idea of the tragic destiny of Alfred Wegener at that time.

Else Wegener's translation of the Carl Bjerknes' biography was published in 1933, *C. A. Bjerknes, Sein Leben und Seine Arbeit*, von Dr. V. Bjerknes, Übertragen von Else Wegener–Köppen, Berlin, Verlag von Julius Springer (Fig. 2b).

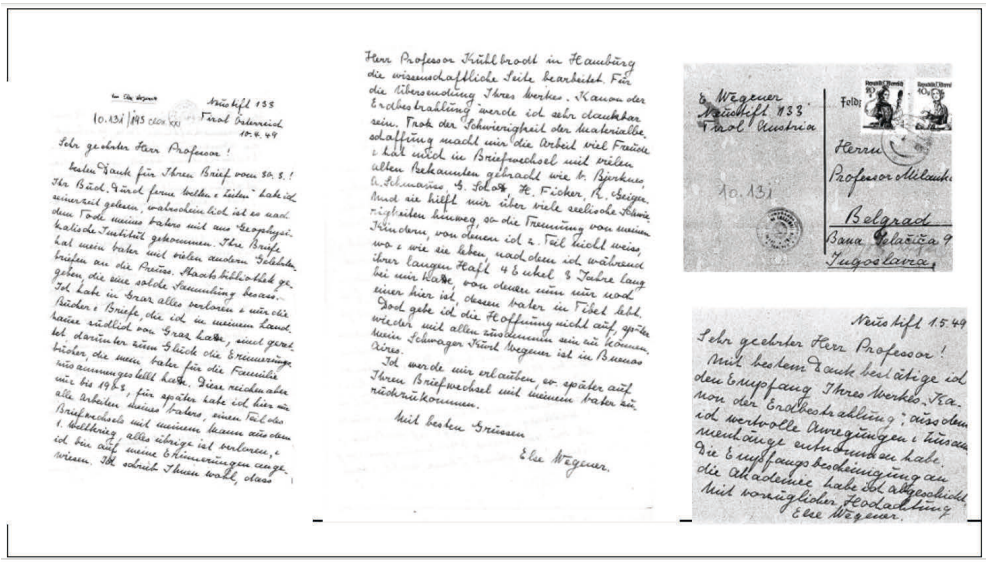


Figure 3: Facsimiles of several letters Else Wegener sent to Milutin Milanković.

About the last days of Wladimir Köppen, Else Wegener wrote to Milanković from Graz on September 28, 1940. In that letter Milanković added "received October 7, 1940."

Graz 28.9.40, (received September 7, 1940, – Milanković's note on the letter)

Dear Mister Professor!

In June I could not send you a death notice because the post office did not accept printed matter at the time. Thank you very much for your letter!

In May Papa was not doing very well after spending the winter so well that we hoped he could spend a few weeks with my sister in the summer, who moved to Graz in April. It then went downhill quickly with his powers. He was no longer able to read the second correction of his additions to the climates of the past, although I asked for it by telegraph to be accelerated and received it very quickly. (. . .)

Warm regards from home to home,

Else Wegener

After the deaths of her husband and father, Else Wegener devoted herself to writing about their lives and accomplishments. That helped her survive the painful separation from her children, as she wrote in a letter to Milanković.

Correspondence between Milutin Milanković and Else Wegener–Köppen is in the legacy of Milutin Milanković in SASA in Belgrade (Fig. 3).

To supplement the biography of Wladimir Köppen, Else Wegener–Köppen asked Milanković in 1949 to explain to her how his collaboration with Köppen on the book *Climates of the Geological Past* began and about their correspondence in general.

Figure 4: Milutin Milanković, *Canon* and the German edition of the book *Through the Universe and Centuries*.

Neustift 133, 6. 3. 1949. (received March 9, 1949 – Milanković's note on the letter)

Dear Mister Professor!

Since autumn I have been working on a biography of my father, which is to appear in a series of "Great naturalists." Up to 1903 I had 7 volumes of memory put together by my father, until 1919 I still had part of the correspondence between my husband and my father, but from then on only my work and my memory. Professor Kuhlbrodt in Hamburg provides me with information and excerpts from the scientific work, which luckily, I have almost all here. But, of course, I'm also interested in the suggestions for this work. May I ask you to tell me something about how you came to work with my father on the book "The Climates of Geological Past." Do you have any letters from my father that I could use for this that you could possibly have made extracts from? Or would you provide me with memories of your being with him in Graz or Belgrade? In what year did he visit you in Belgrade? As far as I remember my parents wanted to fly from Sofia to Belgrade back then, but it didn't work out because the plane didn't come due to bad weather. Is that correct?

You were kind enough to visit my parents in transit several times. Was there still a certain scientific collaboration at the time? I don't remember any of that.

Please forgive me for taking your inquiries, which I am sure, will take up your valuable time. It is important to me to give a well-rounded and truthful picture of his work and personality.

With best regards,

Else Wegener

Milanković answered that he presented his personal impressions in the German edition of the book *Through the Universe and Centuries*, and about scientific cooperation in the *Canon* (Fig. 4). That scientific cooperation lasted from 1921 until Köppen's death. Milanković received altogether 73 letters or postcards from Köppen, but he mostly kept only the drafts of his answers. Part of those contacts were near the end of Köppen's work at the Hamburg German Naval Observatory that dealt with meteorology, oceanography, geophysics, aeronomy, Earth magnetism, time service, instrument gauging, etc.

To Else Wegener, Neustift 133, Tirol, Oesterreich

30-III-1949 (March 30, 1949)

Highly esteemed Mrs. Professor,

I was very pleased with your kind letter, as I did not know where you were or how you have been. Now I know you are in a wonderful area and at work, describing your father's memories, to whom science was so close and whom I also admired as a person. I consider it a personal happiness to have lived and worked with him in friendship.

I described my personal experiences with your father in my book "Through the Universe and Centuries" Leipzig, Koehler & Amelang 1936, our scientific collaboration in my principal work "Canon of Earth Radiation." Of that first book, the second edition of which was destroyed by an air raid on Leipzig, I have not a single copy available, but I sent one to your father at the time; he had received it and read it. The second work was published after the death of your father. You will soon receive a copy of the same from our Academy of Sciences.

We did exchange letters. All letters that your father wrote to me are well preserved.

From 1921 until his death, I had a regular correspondence with your father and during this time I received and kept 73 letters and postcards from him. A part of my replies is a machine copy, the other part only exists as draft. Your father kept the originals of my letters and announced to me that he intended to hand them over to the State Library. I do not know what happened to these letters.

In an emergency, my typewritten copies and drafts are available if it should be for publication and scientific work or this correspondence, as it is of historical interest.

I started about a year ago just by writing down my memoirs. It is my intention in this book to present the friendship and cooperation with your father from my memory and from the correspondence received (that I have given to our Academy of Sciences). However, my work is progressing very slowly. I am still an active professor at our university, Vice President of the Academy of Sciences, and heavily burdened with other duties. Moreover, I am in my seventies; ... so I am with my life memories ... only when I was 18 years old up to the acquaintance with your father, when I was 43 years old.

You cannot, madam, of course wait until the turn of the chapter "Köppen" in my life recollections.

I would therefore like to ask you to read through the material about your father in my two mentioned works and see how I could be of further assistance to you.

I would be very happy to learn more about your personal well-being and if I could hear good news.

With this expectation and my high respect, I remain yours sincerely [. . .] MM

P.S. As I see from my diaries, your father was with me twice in Belgrade, the first time from October 16-19, 1928, after he was not able to take the plane from October 12 [. . .], the second time from October 12–15, 1929. I have myself visited him five times in Graz, as far as I can remember, the first time in July 1925, the last time in September 1936.

Else Wegener thanked Milanković for the letter in which she found information of interest to her. In addition, she informs Milutin Milanković that their family copy of the translation into German of *Through the Universe and Centuries* was sent with the legacy of Wladimir Köppen to the Geophysical Institute of the Prussian State Library in Berlin.

Writing her father's biography had brought Else Wegener in contact with many of her and Wladimir Köppen's old friends and distinguished scientists like Vilhelm Bjerknes, Gerhard Schott[2], August Schmauss[3], Heinrich von Ficker[4], Rudolf Geiger[5], and Erich Kuhlbrodt[6] (Fig. 5).

Else Wegener informed Milanković that Professor Erich Kuhlbrodt in Hamburg was working on the scientific side of her research, and she would be very grateful if Milanković sent her a copy of *Canon of Earth Radiation*.

Neustift 133, Tirol, Österreich, 10. 4. 1949. (October 4, 1949)

Dear Mister Professor!

Thank you for your letter from March 30th! I read your book "Through the Universe and Centuries" at the time, it probably came to the Geophysical Institute after my father's death. My father gave his letters to the Prussian State Library, which had such a collection, along with many other scholarly letters. I lost everything in Graz and only the books and letters that I had in my country house south of Graz have been saved, including luckily the souvenir books that my father had put together for the family. But these only cover the period until 1903, for later I only have all my father's work here, part of the correspondence with my husband from the First World War, everything else is lost, and I am dependent on my memories. I am writing to you that Professor Kuhlbrodt is working on the scientific side in Hamburg. I will be very

[2]Gerhard Schott (1866–1961) was a German geographer and oceanographer. He was the best-known ocean researcher in the world in his field. During an expedition when he was still a student, he discovered the relationship between the barometric pressure and the length of ocean waves.

[3]August Schmauß (1877–1954) was a German physicist, meteorologist, and climatologist. In the 1920s he introduced the notion of singularity in the research of regular meteorological phenomena.

[4]Heinrich von Ficker (1881–1957) was a German-Austrian meteorologist and geophysicist. He is known for his treatise *Foehn and Foehn Effects* in the Alpine regions and important research of cold fronts and heat waves that occur in Russia and northern Asia.

[5]Rudolf Geiger (1894–1981) was a German meteorologist, one of the leading pioneers in microclimatology. He researched and collected extensive measurement data through systematic experiments in Bavarian forests and about changes in the existing climate depending on exposure and about the influence of soil vegetation on the local climate.

[6]Erich Walter Gotthard Kuhlbrodt (1891–1972) was a German meteorologist with fundamental results in maritime aerology, maritime weather observations, and maritime climatology. He earned his PhD with the topic of meteorology and climatology of Macedonia (Kuhlbrodt, 1920).

Figure 5: Photos of August Schmauss, Erich Kuhlbrodt, Heinrich von Ficker, Rudolf Geiger and Gerhard Schott.

grateful for the submission of your work "Canon of Earth Radiation." Despite the difficulty of obtaining materials, I enjoy my work and it has brought me in contact with many old friends like V. Bjerkness, A. Schmauss, G. Schott, H. Ficker, R. Geiger. (. . .)

I will take the liberty of coming back to your correspondence with my father later.

Best regards,

Else Wegener

Milanković immediately sent the *Canon* through the Serbian Academy of Sciences. Else Wegener received the book and thanked Milanković and the Academy.

[Postcard] 10.131, [date and seal not readable...Republic of Serbia]

From: Else Wegener, Neustift 133, Tirol, Oesterreich

To: Herrn Professor Milanković, Belgrad, Bana Jelačića 9, Jugoslavia

Neustift 1.5.49 (May 1, 1949)

Very esteemed mister Professor,

With best thanks I confirm the receipt of your work "Canon of Earth Radiation," from which I have taken valuable suggestions and contexts. I sent the acknowledgement receipt to the Academy.

With great respect

Else Wegener

4. ABOUT COLLABORATION OF WLADIMIR KÖPPEN AND MILUTIN MILANKOVIĆ IN THE BOOK "WLADIMIR KÖPPEN — SCHOLAR FOR LIFE"

The first edition of the Köppen's biography that was written by his daughter Else Wegener–Köppen, was published in 1955 as "Wladimir Köppen, Ein Gelehrtenleben für die Meteorologie" in edition *Grosse Naturforscher*, edited by Hans Walter Frickhinger, published by Wissenschaftliche Verlagsgesellschaft in Stuttgart. The second, revised and augmented bilingual edition, in English and German, appeared in 2018 with editors Else Wegener–Köppen and Jörn Thiede[7] *Wladimir Köppen – Scholar for life / Ein Gelehrtenleben für die Meteorologie* with 313 pages and 54 illustrations; the publisher is Borntraeger Science Publishers, Berlin (Fig. 6). In the introductory part of the book, a paragraph 4. "Köppen, Wegener and Milankovich – a 'winning team' in paleoclimatology," was written about their collaboration on the book "The climates of the geological past" (Wegener–Köppen E. and Thiede J. (Eds), 2018). About that trinity Milanković wrote that "Köppen is a worldwide know climatologist, Wegener genius geophysicist and expert in everything connected to that science. And I realized: it was not a pure random event, but the causality of events that brought the three of us together" (Mijajlović 2013)[8].

When Else Wegener mentioned Milanković for the first time in this book, she explained in a footnote: "Milankovitch, Milutin, geb. 1879, jugoslawischer Mathematiker." (Milankovitch, Milutin, born 1879, Yugoslav mathematician.) (Wegener–Köppen E. and Thiede J. (Eds), 2018). In the book she does not mention explicitly her correspondence with Milanković, but knowing the content of the correspondence, there are parts clearly indicating that she was relying on it.

In 1920 Wladimir Köppen got acquainted with the work of Milanković *Théorie mathematique des phénomènes thermiques produits par la radiation Solaire* and later, Milanković provided Wladimir Köppen and Alfred Wegener with the mathematical means to review the glaciations and contribute to the basics of his calculations of solar radiation in the Quaternary and its results and table plus a diagram for their book *The climates of the geological past* published in 1924 (Wegener–Köppen and E. and Thiede J. (Eds), 2018). According to Else Wegener (2018):

"On this, a lovely correspondence ensued, which Milankovitch reports on in his book *Canon of the Earth's irradiation*.

"*Before I could get to work on this problem, a preliminary question had to be answered, namely, what meteorological element and what season was this ice age*?"

After an exhaustive discussion of all relevant boundary condition, Köppen answered Milankovitch's question in such a way, that the decrease of temperatures during the summer half of the year is decisive for glaciations."

Families Milanković, Köppen and Wegener became over time close friends that were visiting each other. For example, on their trip from Varna to Graz in 1930, Wladimir Köppen and his wife Marie, paid a visit to the Milanković family (Wegener–Köppen E. and Thiede J. (Eds), 2018).

[7]Jörn Thiede (1941–), geologist, paleontologist and university professor, a foreign member of the Russian and Norwegian academies of science. From 1997 until 2007 he was the director of the Alfred Wegener Institute.

[8]See http://legati.matf.bg.ac.rs/milankovic/paper.wafl?paper=saradnja_kepen_vegener

Figure 6: a) Else Wegener Köppen (1955): "Wladimir Köppen, Ein Gelehrtenleben für die Meteorologie" in edition Grosse Naturforscher, edited by Hans Walter Frickhinger, published by Wissenschaftliche Verlagsgesellschaft in Stuttgart. b) Else Wegener Köppen (Editor), Jörn Thiede (Editor), (2018): "Wladimir Köppen. Scholar for life / Ein Gelehrtenleben für die Meteorologie," edition by Borntraeger Science Publishers, Stuttgart.

5. CONCLUSION

The correspondence is short, but the content of the letters is interesting and contributes to the study primarily of Wladimir Köppen, as well as the participation of other important scholars who assisted Else Wegener–Köppen in the work on his biography, like Vilhelm Bjerknes, Gerhard Schott, August Schmauß, Heinrich von Ficker, Erich Kuhlbrodt, and Rudolf Geiger.

Despite the difficulties in obtaining materials, she was enjoying her work. Else Wegener–Köppen authored Wladimir Köppen's biography *Wladimir Köppen - Scholar for life*.

Wladimir Köppen was a well-established climatologist keen to support two young revolutionary researchers, Milutin Milanković and Alfred Wegener, who both significantly advanced geosciences. Köppen's authority played a crucial role in a long-term process of acceptance of these two "heretic" scientific approaches developed by Milanković and Wegener. Else Wegener–Köppen in her biographic works authentically preserved the memory of this important period in the development of earth sciences.

Acknowledgements

The authors thank Mirko Janc, PhD (mathematics) for the precious help in translating the correspondence between Milutin Milanković and Else Wegener and compiling and translating several resources from German language.

References

Greene, M. T.: 2015, Alfred Wegener, Science, Exploration, and the Theory of Continental Drift. *Johns Hopkins University Press, Baltimore*, 696.

Janc, N., Protić-Benišek, V., Benišek, V., Gavrilov, M. B., Popović, L. Č., Marković, C. B.: 2018a, Academicians Milutin Milanković and Vojislav Mišković: Correspondence about Alfred Wegener and Wladimir Köppen, *Astronomical and Astrophysical Transactions (AApTr): Journal of the Eurasian Astronomical Society*, **30** (4), 505–510.

Janc, N., Protić-Benišek, V., Benišek, V., Popović, L. Č., Gavrilov, M. B., Marković, S. B.: 2018b, Correspondence of Vojislav V. Mišković about his doctorate with Milutin Milanković, Miodrag Ibrovac and Oton Kučera, *Publications of the Astronomical Observatory of Belgrade*, **98**, 371–377.

Janc, N., Gavrilov, M. B., Marković, S. B., Protić-Benišek, V., Benišek, V., Popović, L. Č., Tomić, N.: 2019, Ice age theory: correspondence between Milutin Milanković and Vojislav Mišković, *Open Geosciences*, **11** (1), 263–272.

Kuhlbrodt, E.: 1920, Klimatologie u. Meteorologie von Mazedonien, Ein Beitrag zur Klimakunde d. Balkanhalbinsel. (Under Berücksichtigung d. Windverhältnisse in d. Höhe), Hamburg, 4. M. 45 tab. 61 OBr. (in German).

Mijajlović, Ž., Malkov, S., Mitić, N.: 2013, Digital legacies, NCD Review 148–152, 22 (see http://legati.matf.bg.ac.rs/milankovic/paper.wafl?paper=saradnja_kepen_vegener).

Milanković, M.: 1952, Reminiscences, Experiences and Knowledge 1909 to 1944, *Serbian Academy of Sciences, Special Editions, Book CXCV, Department of Natural and Mathematical Sciences, Book 6*, Belgrade, 229, (in Serbian, Cyrillic script).

Milanković, M.: 1997, Articles, speeches, correspondence, Correspondence with the Great Scientists, translation from the German language: Dr Milan Ćirić, translation from the French language: Dragan Mraović, *Institute for Textbooks and Teaching Aids*, Belgrade, (in Serbian, Cyrillic script).

Voß, J.: 1992, In Memoriam Else Wegener, 1 February 1892 – 27. August 1992. *Polarforschung* **61** (2/3): 183–184.1991 (published in 1992), (in German).

Wegener–Köppen, and Thiede, J. (Eds): 2018, Wladimir Köppen. Scholar for life / Ein Gelehrtenleben für die Meteorologie, *Borntraeger Science Publishers*, Berlin, 52 illustrations, 313, (English and German).