https://doi.org/10.5194/hgss-2023-2
Preprint. Discussion started: 16 January 2023

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History of the Potsdam, Seddin and Niemegk Geomagnetic Observatories – Second Part: Seddin

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Abstract

The measurement series of the 3 geomagnetic observatories span over 130 years, starting in 1890. It is one of the longest, almost uninterrupted series of recordings of the Earth's magnetic field. Data users frequently emphasize the high quality of the data and its significance for geomagnetic base research. Very well-known outstanding geomagnetism scientists as Max Eschenhagen, Adolf Schmidt, Julius Bartels, Gerhard Fanselau and Horst Wiese directed the observatories during their existence. This paper describes the history of the Seddin Observatory, which was in operation from 1907 until 1932.

1 Introduction

The magnetic observatory of the Potsdam Prussian Meteorological-Magnetic Observatory was in operation since 1890 on the Telegrafenberg near by the town of Potsdam. In 1904 the town of Potsdam planned the electrification of the Potsdam horse tramway. Similarly, for the nearby Teltow Canal, constructed 1900-1906, a towing by electrical locomotives was intended to be used. Due to running both the rail establishments by DC leakage earth current influences on the magnetic observations seemed to be inevitable. The movement of the Potsdam Observatory became indispensable (Schmidt, 1910). It was decided to establish an additional station for variometer recordings at a location in secure distance to the DC powered railway traction vehicles (Linthe, 2022).

2. Seddin Magnetic Observatory

Test recordings 13 km south of Potsdam near by the village of Seddin, performed June-December 1906 (Venske, 1909), proved the applicability of the location for a sub-observatory

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free of technical noise, which was established approximately 180 m northward of the Seddin Lake and 250 m westward of the road Potsdam - Beelitz. Its operation started in 1907. Adolf Schmidt required successfully the funding for the sub-observatory from the Teltow Canal Society.

2.1 Seddin Magnetic Observatory Buildings

Fig. 1 shows the ground plan of the Seddin observatory. The compound was a rectangular, fenced area of about 150 m by 130 m (Schmidt, 1908). A massive house containing two offices and two accommodation rooms was constructed near by the South-Eastern corner of the compound for service. Fig. 2 shows its photo.

The ordinary observatory building was located slightly displaced in North-West direction from the centre of the compound. The wooden building rested on a basement made from non-magnetic limestone. The pillars for the instruments consist of the same material as the basement. Any fitting assemblies are made from brass, the nails are copper ones. Fig. 3 shows a photo of the observatory building.

At Fig. 4 the ground plan of the observatory building is depicted. The building is oriented geographically. The circumferential corridor (Umgang) protects the instrument rooms from outside temperature variations. The loft and the big projection of the roof shields the walls from solar radiation (see Fig. 3).

The photographic recording equipment (Reg.-App.) was to be handled from the vestibule (Vorraum). Its sketch is shown at Fig. 5. Two instrument rooms are available. The instruments for the current observations of the declination (D), vertical intensity (Z), North (X) and East component (Y) were placed on separate pillars in the Northern room. In the Southern room a horseshoe-shaped table, resting on several pillars, was available for temporal placement of portable precise instruments. The building did not have any heating. In a distance of 15 m from the building in Northern direction a pillar for absolute measurements was constructed.

From the beginning it was intended to construct a building for absolute measurements. Negotiations with the town of Potsdam to provide the necessary funding seemed to result in a successful result in 1913, but the begin of World War I blocked this plan.

In 1925 the service house was enlarged, a small store shed and a wooden house of 5.8 m by 4.3 m floor space and 5 m height for absolute measurements were constructed. The former

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outdoors pillar was encased by the absolute house and a second pillar inside was added (Venske, 1927). Absolute measurements were performed in August 1926 and from July 1928 onward in this house. An azimuth mark target was fixed at the service house. The azimuth value was determined by means of solar observations.

After the termination of the observations in Seddin from 12 May 1932 onward both wooden observatory buildings were removed, transported to Niemegk and rebuild at the location of the new observatory (Nippoldt, 1933 and 1934). The service house still exists. It was handed over to the forestry administration.

2.2 Observatory Instruments

As already mentioned, Seddin observatory was mainly in use to record the variations of the Earth's magnetic field. Due to the termination of the observations in Potsdam in 1928 the absolute measurement instrument set was moved to Seddin.

2.2.1 Variation Recordings

The recording equipment had 4 drums for recording the variations of the declination (D), North component (X), East component (Y) and vertical intensity (Z), driven by a joint clockwork. It was installed in the wall between the vestibule and the instrument room (see Fig. 5). So any handling of it, as the change of the photographic paper, was possible without entering the instrument room. X, Y and Z were recorded generally, D only occasionally. Two petrol burning lamps (one for X, Y and Z; the other one for D) produced the recording light.

The variations of the two horizontal components X and Y were recorded by means of identical magnetometers, based on suspended magnets, while the vertical variation was recorded using a magnet mounted on a balance. Fig. 6 shows views of a horizontal magnetometer (left) and the vertical one (right). The Helmholtz coils mounted at each magnetometer allow the galvanic determination of the scale values. The magnetometers and the recording equipment were made by the well-respected enterprise Otto Toepfer & Sohn, Potsdam.

The Seddin photographic recordings of each component contain a baseline, 2 tracks of different projected sensitivities: 2 nT per mm and 8 nT per mm and the temperature track. Hourly the baseline was interrupted for 3 minutes as time marks, controlled by a non-magnetic pendulum clock. The 2 tracks of different sensitivity ensure the acquisition of the variations of the Earth's magnetic field in case of lower or higher magnetic activity (Schmidt,

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1910). Fig. 7 shows the photographic recordings of the North (X), East (Y) and vertical component (Z) of 7 February 1908 8 o'clock till 8 February 1908 8 o'clock.

The instruments and recording equipment, operated in the South room, were changed from time to time. An instrument set of decreased sensitivity allowed the depiction of the magnetic variations in case of magnetic storms at the usually used photographic paper. In 1928 finally a variometer set was installed for recording of the declination (D) and the horizontal (H) and vertical intensity (Z), made by Askania, Berlin and a photographic recording equipment, made by Otto Toepfer & Sohn, Potsdam as backup system.

2.2.2 Absolute Measurements

Absolute measurements took place in 1908 at the outdoors pillar and in August 1926 at the 2 pillars in the new absolute house by means of a set of journey instruments to compare the absolute levels of Potsdam and Seddin observatory. In 1928 theodolite Wanschaff was installed on one of the 2 pillars and the associated oscillation box found its place on a wooden tripod in the absolute house for the further measurements of D and H in Seddin. The Earth inductor Schulze No. 65, installed at the other pillar, was in use for the measurements of the inclination (Nippoldt, 1931). From the begin of the year 1930 the Earth inductor Schulze No. 1 was moved from Potsdam to replace the one No. 65 in Seddin.

2.3 Operation of the Seddin Observatory

The Seddin variometer recordings were used from 1 January 1908 onward for the data processing. The absolute measurements were further performed in Potsdam. The transformation of their results on Seddin was done by means of comparison of simultaneous recordings of the 2 stations during 2 night-hours of all magnetically quiet days (Schmidt, 1910). Occasionally absolute measurements were performed on the outdoors pillar. The change of the photographic paper and the petrol lamps was done regularly by an employee of the forestry administration. From 1920 onward an observatory-employed caretaker took over all the technical Seddin duties, living with his family in the service house.

The photographic paper was transported to Potsdam observatory for its development. The scientific and technical staff of Potsdam observatory had to travel to the Seddin station in case of any maintenance necessities. The data processing was done as described for the Potsdam observatory (Linthe, 2022). The observatory data were published regularly in the yearbooks.

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For the time period 1908-1927 the data of the 2 observatories Potsdam and Seddin were regularly published together in the yearbooks.

Since the beginning hourly values were published in the yearbooks. Cost cuts due to war forced to skip these tables from 1917 onward. This practice was continued until the closure of Seddin observatory in 1931. The publication of the hourly values of this time interval was made up leeway in 1959 (Fanselau, 1959).

2.3.1 Operational Problems and Termination

Around 1925 plans to electrify the Berlin suburban railway system by DC came to the public. It was further planned to enlarge the network to Potsdam main station. It became clear that the future of the Potsdam and Seddin observatories were at risk. The noise on the observations at Potsdam caused by the leakage currents was expected to be as strong to force its termination. Even Seddin came into risk to be disturbed in future in case of further enlargement of the Berlin suburban railway system. Such plans were under discussion (Nippoldt, 1929).

The railway company carried out a first test run of an electrical train on 24 April 1928. Fig. 8 shows its influence on the Potsdam variation recordings. That shows clearly that the fears of the observatory authorities were not without any reason. The shutdown of the Potsdam observations became inevitable with the opening of the regular operation of the electrical trains.

The only chance for a continuation of magnetic observations was to move the observatory to a location free of anthropogenic noise, if possible for all the time, but not too far away from Potsdam, remaining the processing centre. Before and after going retired on 1 October 1928 Adolf Schmidt was occupied to find a suitable place for the new observatory. He found a promising location near by the small town of Niemegk in the region of Hoher Fläming, but the observatory construction started only in 1929. The regular electrical operation of the Berlin suburban railway started already on 11 June 1928, including runs to Potsdam main station. It became necessary to move the absolute measurements in a big hurry from Potsdam to Seddin. Fig. 9 shows the influence of the leakage currents on the Potsdam recordings, as an example of the night hours of 27 October 1928. Only during the daily shutdown of the railway service from 01:30 till 03:00 (Greenwich civil mean time) the recordings were undisturbed. The noise on the recordings during the remaining time interval was unauthorised high that the observations in Potsdam were finished finally on 17 May 1929.

Fig. 10 shows the influence of the electric trains of the Berlin suburban railways on the Seddin recordings of the time interval 26 October 1928 11 p.m. till 27 October 1928 7 a.m. (Greenwich civil mean time). The noise caused by the leakage currents is smaller than on the Potsdam Observatory, but clearly visible. Such disturbed recordings are not permanently acceptable. It was necessary to construct as soon as possible the new Niemegk Observatory. Only in the course of 1931 the new observatory became functioning. In fact it was intended to operate the Seddin and Niemegk observatories for a suitable time in parallel to ensure a smooth changeover. The time period of only 1 year provided this opportunity. On 9 May 1932 the last absolute measurements took place in Seddin, On the next day the variometer recordings were terminated (Nippoldt, 1933).

2.3.2 Affiliation and Directors of the Observatory

The Seddin Observatory was affiliated during its complete existence to the magnetic department of the Magnetic-Meteorological Observatory Potsdam of the Royal Prussian Meteorological Institute Berlin. The institute was renamed in 1919 into "Prussian Meteorological Institute Berlin".

Adolf Schmidt (1860-1944) became the director of the Potsdam observatory in 1902. He kept the director's position until his retirement on 1 October 1928. His portrait is shown at Fig. 11. Alfred Nippoldt (1874-1936) took over his position. Fig. 12 shows his portrait.

Appendix: Instrument Maker Related to the Observatory

Otto Toepfer (1845–1914) founded in Potsdam his mechanical workshop in 1873. He constructed scientific instruments for different Potsdam institutes. In 1896 Otto Toepfer handed over the supervision of the company to his son **Reinhold Toepfer (1873–1951).** Due to financial problems the company was taken over in 1919 into **Carl Bamberg**'s workshops for precision mechanics and optics, which was renamed in 1921 as **Askania AG**.

The Seddin observatory further purchased instruments from the mechanical workshop owned by **Gustav Schulze**, Potsdam. Unfortunately information about this company could not be found.

Acknowledgements

Kristian Schlegel strongly encouraged me to write this paper. I am very thankful to him for his patience. I further thank the Helmholtz Centre Potsdam GFZ German Research Centre for

https://doi.org/10.5194/hgss-2023-2
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Geosciences, which rendered possible to write the paper using its resources. I am especially thankful to Jürgen Matzka, group leader Geomagnetic Observatories of the Geomagnetism Section of the GFZ, for giving me the opportunity to work at the Niemegk Adolf Schmidt Geomagnetic Observatory. Since my official retirement end of 2014 I had the chance to use an office, a computer and all the observatory publications to collect the necessary information.

Competing Interests

I declare that I have no conflict of interest.

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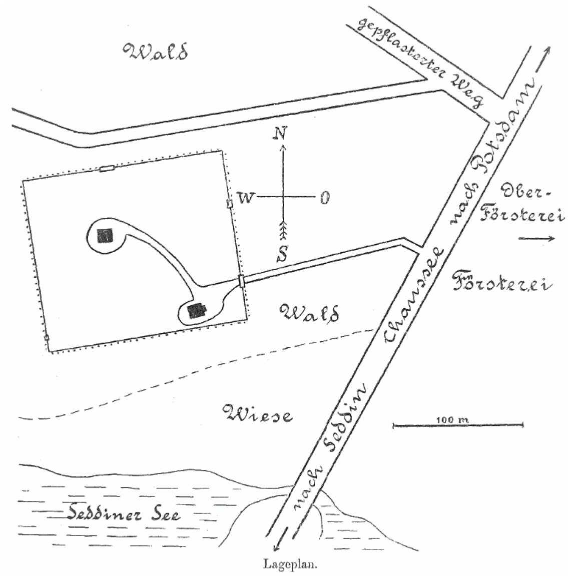

Fig. 1. Sketch of the Seddin observatory compound. Source: Schmidt, 1910.

Fig. 2. Seddin Observatory service house. Source: Helmholtz Centre Potsdam - GFZ

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Fig. 3. Photo of the Seddin observatory building. Source: Helmholtz Centre Potsdam – GFZ.

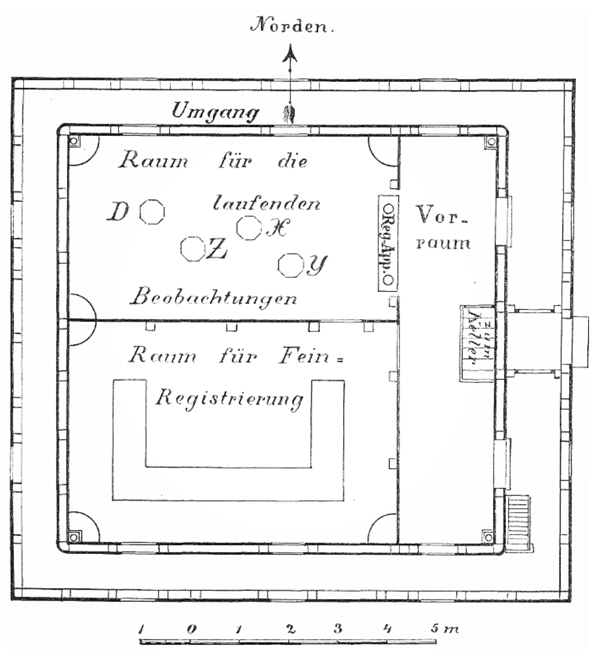

Fig. 4. Ground plan of the Seddin Observatory building. Source: Schmidt, 1910.

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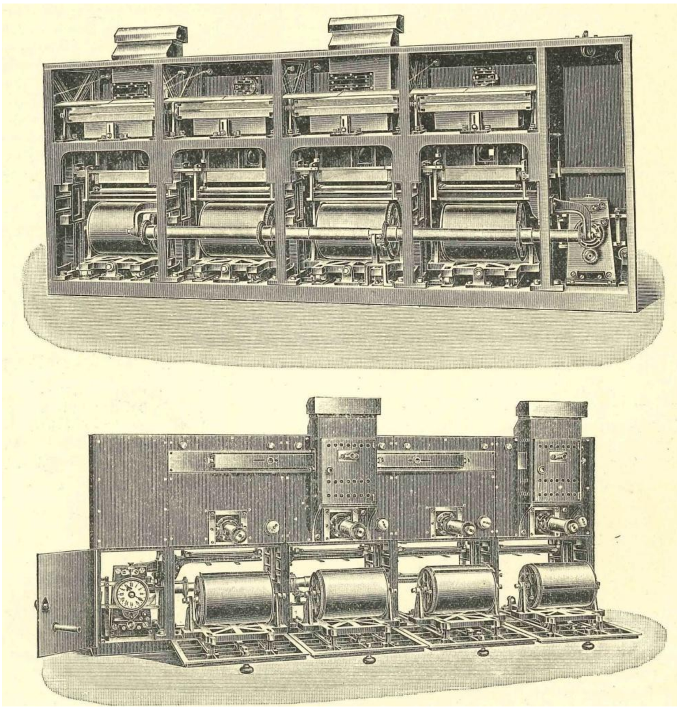

Fig. 5. Recording equipment of the observatory building North room. View from the instrument room (up) and view from the vestibule (down). Source: Schmidt, 1910.

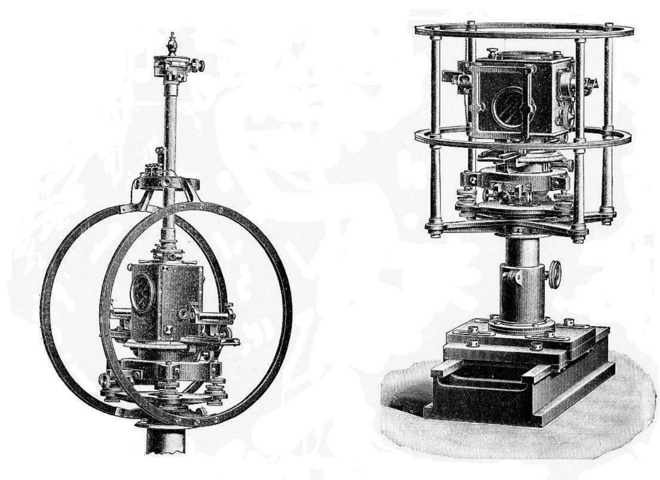

Fig. 6. Upper part of a horizontal magnetometer (left) and the vertical one (right). Source: Schmidt, 1910.

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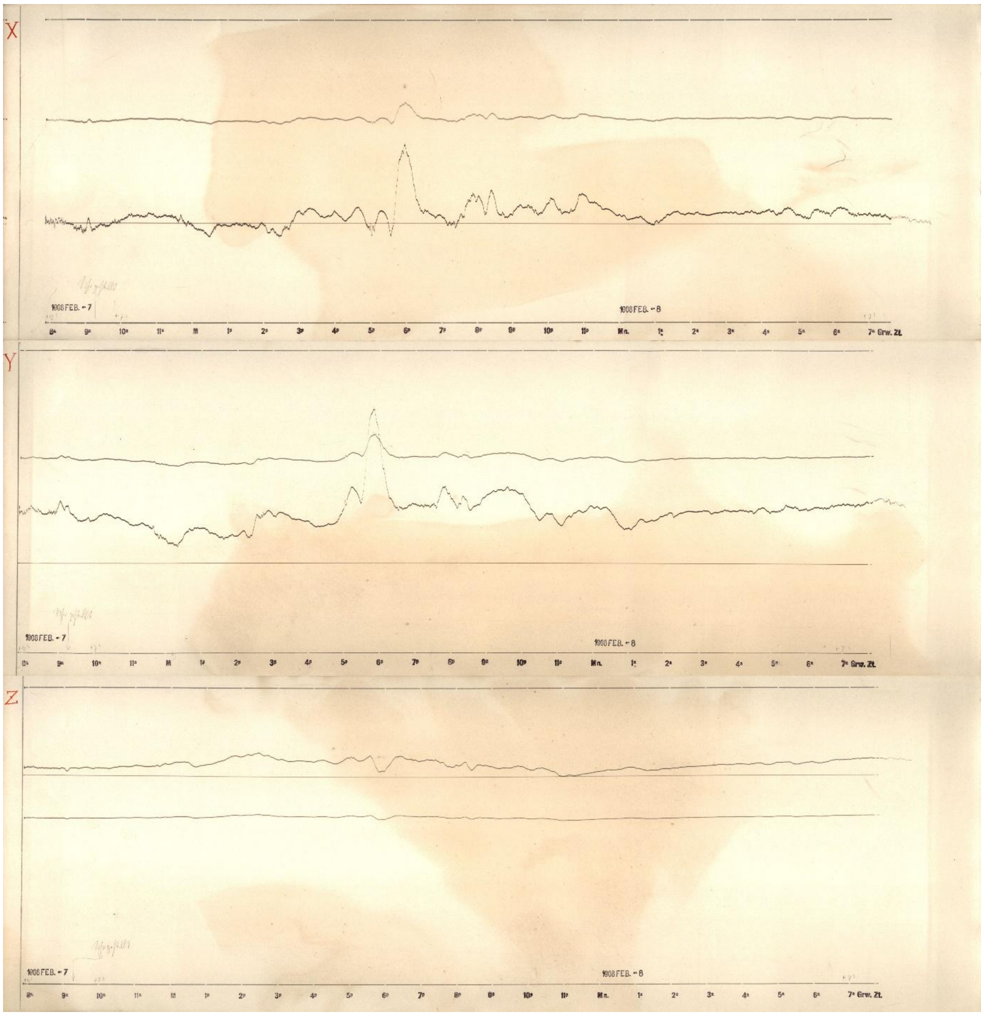

Fig. 7. Seddin Observatory photographic recordings of the North (top), East (middle) and vertical component (bottom) of the time interval 7 February 1908 8 a.m. till 8 February 1908 8 a.m. (Greenwich civil mean time). Source: Helmholtz Centre Potsdam - GFZ

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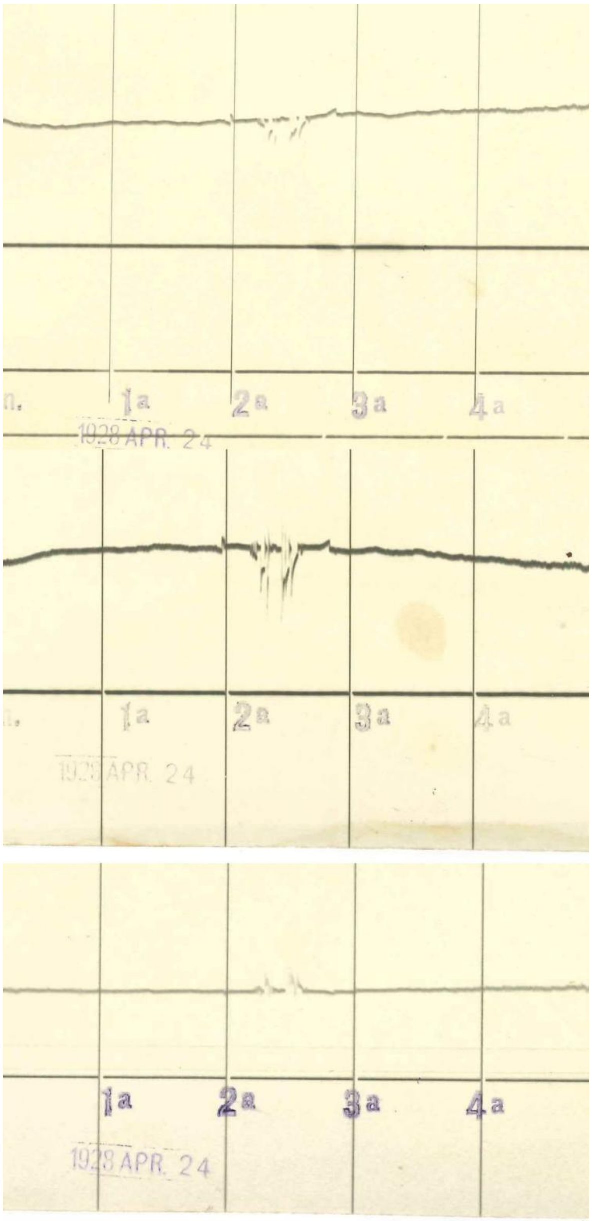

Fig. 8. Potsdam Observatory photographic recordings of the horizontal intensity (top), declination (middle) and vertical intensity (bottom) of the time interval 23 April 1928 12 p.m. till 24 April 1928 5 a.m. (Greenwich civil mean time) showing the disturbing effect of the first electrical train of the Berlin suburban railway. Source: Helmholtz Centre Potsdam – GFZ.

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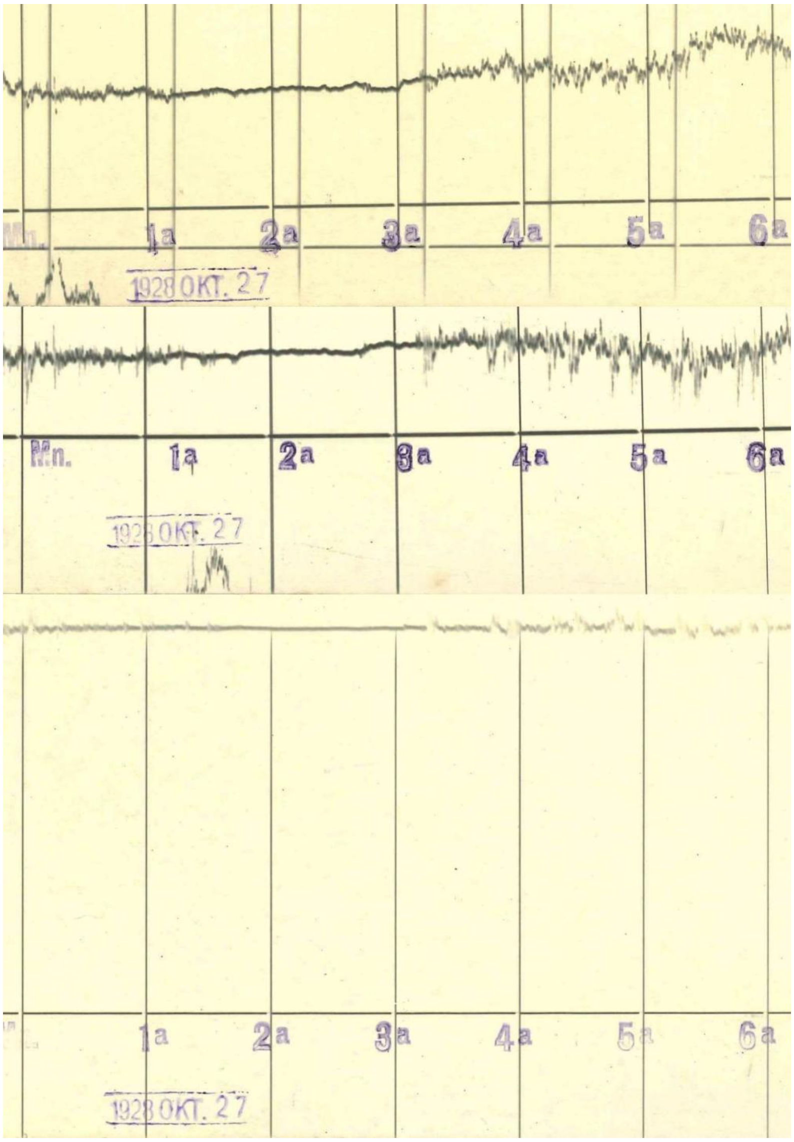

Fig. 9. Potsdam Observatory photographic recordings of the horizontal intensity (top), declination (middle) and vertical intensity (bottom) of the time interval 26 October 1928 12 p.m. till 27 October 1928 6 a.m. (Greenwich civil mean time) showing the disturbing effect of the Berlin suburban railway service. Source: Helmholtz Centre Potsdam – GFZ.

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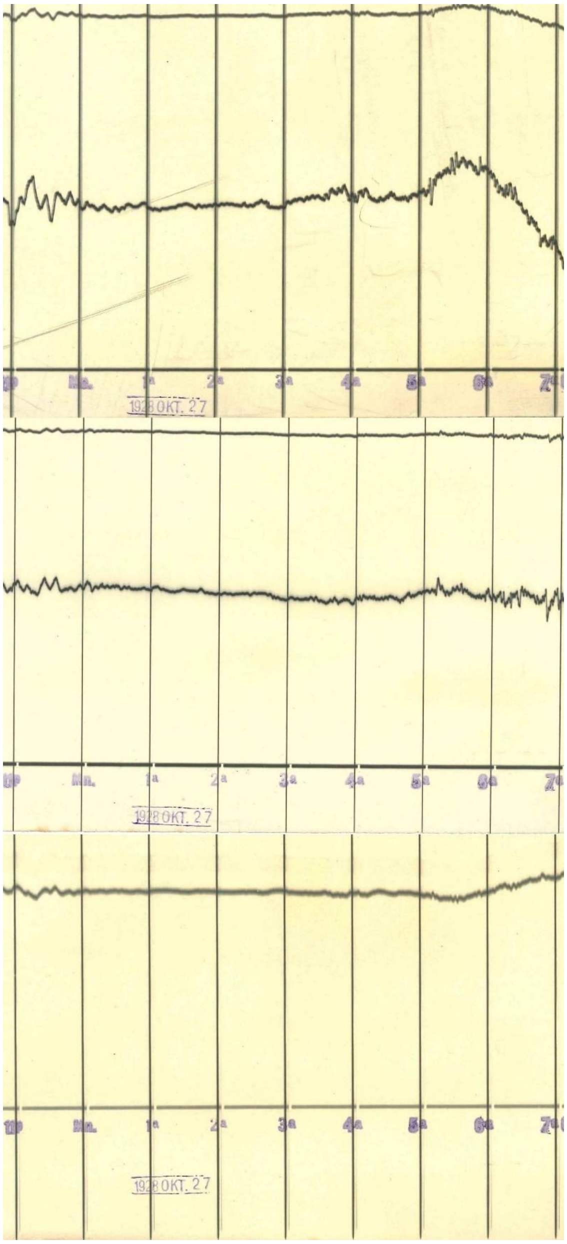

Fig. 10. Seddin Observatory photographic recordings of the North (top), East (middle) and vertical component (bottom) of the time interval 26 October 1928 11 p.m. till 27 October 1928 7 a.m. (Greenwich civil mean time) showing the disturbing effect of the Berlin suburban railway service. Source: Helmholtz Centre Potsdam – GFZ.

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2 Fig. 11. Adolf Schmidt's portrait. Source: Helmholtz Centre Potsdam – GFZ

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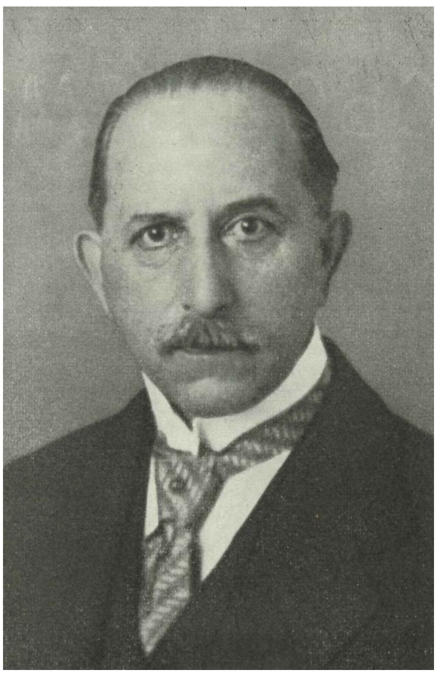
4 

5 Fig. 12. Alfred Nippoldt's portrait. Source: Bock, 1937.