

Analyzing the early 19th century's Geomagnetic declination in Japan from Tadataka Inoh's Santou-Houi-Ki The 9th report

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The Santou-Houi-Ki is a national treasure of Japan recorded by cartographer Tadataka Inoh in 1800-1816, is 67 volumes survey ledger consist of approximately 200,000 magnetic compass land survey azimuth data accuracy of 5 min, from the coast of eastern Hokkaido to Yakushima Island in western Japan.

We continue the work of analysis that stopped after only one analysis in 1917, which done about the magnetic compass survey azimuth data at known position of the retirement home of Tadataka Inoh at Fukagawa in Edo (Tokyo) in 1802-1803.

From this interdisciplinary simultaneous analysis across geomagnetism, survey science, historical cartography and local history and human sciences, we can increase precise evidence to verify the real azimuth, geomagnetic declination and short description of the reference point where magnetic compass survey was executed or the historical place name of survey target points recorded in The Santou-Houi-Ki, than the traditional way of study separated in each field.

(1) The short description of survey reference point where Tadataka Inoh executed magnetic compass survey, the place name of each survey target points, and magnetic compass survey azimuth in accuracy 5min were recorded in The Santou-Houi-Ki.

(2) Procedure of analysis.

Use the recreation software of scenery and digital map of GSI Japan Denshi Kokudo to know the latitude and the longitude of particular survey target points in accuracy 1 second, and the latitude and longitude at the outline position of survey reference point, to grasp the outline of each real azimuth from the survey reference point to survey target points.

Geomagnetic declination= Real azimuth - Magnetic compass survey azimuth recoded in The Santou-Houi-Ki

Calculate backward the precise position of the survey reference point should be adjusted to the position in accuracy 1 second in latitude and longitude, where all of geomagnetic declination values unit of 1 second, calculate from the magnetic compass survey azimuth to each different targets at the reference point are approximately equal to each other.

Calculate the average value of each geomagnetic declination unit of 1 second, and express it as the geomagnetic declination unit of 1 second on the day Tadataka Inoh's magnetic compass survey was executed. To use the consecutive formula of Excel for speed up and keep accuracy. If it possible to go to the field of the survey reference point, confirm the real scenery at the reference point and use GPS transmitter to confirm the longitude and the latitude, and recalculate the value of geomagnetic declination.

(3) It is able to change Japan as one of the most concentrated area of accurate geomagnetic declination data in the world, in early 19th century, from insufficient area of data, and supply new data to northeast Asia by analysis of The Santou-Houi-Ki. The total number of analyzed points exceeded 183 and the outline of isogonic line in Japan archipelago and the distribution of the declination in every 15 minutes in western Japan coast in those days, began to appear. The analysis is developed from the coast area of Japanese archipelago to the inland area of Honshuu Island.

(4) Compare the isogonic line of declination in those year's Japanese Archipelago by analysis of The Santou Houi Ki, with the Historical Magnetic Declination -Map-by NOAA (1800,1805,1810,1815) is almost similar. The difference is the NOAA's pace of variation west is almost 5 years later than the analysis of The Santou-Houi-Ki.

(5) However, from the analysis of Santou-Houi-Ki, we can recognise the magnetic declination supposed as the local geomagnetic anomaly in southern coast of eastern Hokkaido, some part of Noto Peninsula, Mt.Asama in Ise, Nobeoka city in Kyushuu Island etc, can not draw in Historical Magnetic Declination -Map-by NOAA. . Therefore the analysis of The Santou-Houi-Ki becomes more important.

Keywords: geomagnetic declination, Tadataka Inoh, Santou-Houi-Ki, Survey reference point, Survey Target point, interdisciplinary