Responds to the comments 1

The author sincerely appreciates the reviewers' meticulous evaluation. In response to the constructive suggestions provided by the reviewers, we have made revisions in the revised manuscript. Regarding errors in textual expression, we have carefully corrected them. All modified content has been highlighted in red font in the revised manuscript. Below are the specific responses to the reviewers' comments.

Comments

The subject of geomagnetic absolute instrument comparisons across national and international observatory networks is an important issue worthy of the exploration presented in this paper. The paper presents useful introductory information and explanation on the theory and methods used for the analysis together with specific details on the observatories and instrumentation from the Chinese network used in the study. Methods of calculation and statistical analysis of results from the multi-year data set are presented effectively in diagrams and discussion.

Line 92 ; The meaning of the word "integration" in this context is not clear to me.

Responds： The term "integration" here is intended to convey the meaning of "joint use". It has been modified to “By using the geomagnetic declination (D), inclination (I), and the total magnetic intensity (F) measured by the proton magnetometer, all the absolute components of the Earth's magnetic field can be calculated. This will facilitate the subsequent baseline calculations of variometer for all components (such as east, north, and vertical directions).”

A map of the observatory locations would be interesting, but obviously not necessary for the arguments presented in the paper.

Response: Following this suggestion, a map of the observatory locations has been added in the revised draft.

I suggest a more precise description of the instruments would be useful in Table 2, including both the theodolite make/model and also the fluxgate make/model.

Response: Thank you for your suggestion. We have added an introduction regarding theodolites and fluxgate sensors in the revised manuscript. More detailed information about these instruments has been added in Table 2, including models, resolution, maximum, etc. Information about the observers has also been added to Table 1.

Line 175: A reference would be helpful for Type B (line 175) and Type A (line 190) uncertainties

Response: The true value can usually be represented by the arithmetic mean of sufficiently repeated measurements, while the uncertainty includes Type A and Type B standard uncertainty (ISO/IEC ,2008).

International Organization for Standardization and International Electrotechnical Commission: Uncertainty of measurement, Part 3: Guide to the expression of uncertainty in measurement (GUM:1995), ISO/IEC GUIDE 98-3:2008, https://www.iso.org/resources/publicly-available-resources.html (last access: 2 September 2025), 2008.

Line 180: Table 3: Is it possible to relate the "Class" column in Table 3 to instrument types listed in Table 2?

Response: This is an excellent suggestion. We have added a column for instrument type in Table 3 (it is table 2 in the revised draft).

Corrections:

Include the word "of" in the title "... from 12 years of DI magnetometer..."

Line 69: replace "..A of the marker given," with "... of the marker is known,..."

Line 70: "(with the vertical circle maintained at ...")

Line 75: "Inclination measurements follows analogous procedures in the vertical plane, omitting azimuth mark referencing and using the magnetic meridian derived from the preceding declination measurements"

Line 80: "The declination measurement protocol is preceded and followed by sensor up and down azimuth mark readings and then involves four configurations...."

Line 83 : "D'=(Dz + D2 + D3 + D4)/4 and substituting the value D' into equation (1)

Line 96: "...systematic verification of inter-instrument differences across..."

Line 107: "Where, W0(i:j) ,,,,"

Line 110: "... of inter-pillar differences..."

Line 122: Table 1:

Line 125: Table 2: Correct the spelling of "Instrument" in table header

Line 152: "susceptible to operator error compared to ...."

Another significant source of possible error in declination readings, which is not present in inclination readings, is the accuracy of setting (90/270) on the vertical circle.

Line 158: remove "its" ..."necessary to analyses long term stability ...."

Line 163: "... 12 years of intercomparison ..."

Line 166: "...using multi-year..."

Line 167: "...integrating multi-year..."

Line 169: "... and multi-source uncertainty..."

Line 193: "analyzing inter-station variances"

Line 226: "The multi-year mean..."

Line 240: "However, mean differences for both D and ..."

Line 258: "...azimuth mark alignment step, and the accuracy the vertical circle setting (90/270), required for declination measurements

Line 277: "Furthermore, multi-year data analysis revealed the mean differences and inter-annual...."

Line 293: the use of the phrase "... and so on" seems inappropriate

The words "discrepancy" (lines 96, 114, 100) "difference" (line 116), "deviation" (figure 2), are used in different places throughout the text. I suggest consistent use of "difference" would be better.

Response: The author fully accepts the upper suggestions (the title, L69, L70, L75, L80, L83, L96, L107, L110, L122, L125, L152, L158, L163, L166, L167, L169, L193, L226, L240, L258, L277, L293 in the original manuscript) and has made corresponding modifications at the relevant positions. The word “discrepancy” and “deviation” in the entire text have also been replaced with “difference”.