Geoscientific
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Discussions

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Interactive comment

Interactive comment on "Time-stamp correction of magnetic observatory data acquired during unavailability of time-synchronization services" *by* Pierdavide Coïsson et al.

Anonymous Referee #1

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GENERAL COMMENTS:

The subject presented in this paper could be very informative and interesting for people who conduct observations in geomagnetic observatories. In this study the authors propose a new scheme for time-stamp correction of magnetic observatory data during unavailability of time-synchronization services. They showed that a precise time-stamp correction of the main variometer system can be obtained by comparison with data from the supplement system with accurate time-stamps. The authors clearly demonstrated how to obtain a reliable time-stamp correction by taking advantage of spikes and local noise, and applying the cross correlation analysis on the time series from co-located instruments. Thanks to the clear description and computational simplicity, the method

can be easily applied in other word-wide observatories that have experienced similar problems.

Further, it is showed and illustrated that it is possible to detect a time lag in LZH data through comparison with the data from surrounding observatories. However, in LZH case the separation from nearby observatories is quite big and it is not possible to obtain the time-stamp correction with sufficient precision, i.e. scattering of the time lags in Fig. 3 (and supplement figures) is too big. Nevertheless, maybe their method could be successfully applied in a case when we have smaller separations between observatories (e.q. Europe). This could be particularly useful in cases where observatories do not have two acquisition systems controlled by independent PPS.

The article is well written, understandable and appropriately referenced. In my opinion the article is suitable for publication in GI and I recommend that the article can be published after minor corrections and clarifications of doubts.

SPECIFIC COMMENTS:

1) In Fig. 1 and 2, (06.07.2014) we have negative values of the time lags, i.e. LZH time-series precede the others by nearly three minutes. This means the time lag has negative sign and this is correctly labelled on legends in Fig 2. On the other hand in Figs. 3 and 4 in the same period, July 2014, the time lag has positive sign. You should check sings on these figures. According to Fig. 1 and 2 I would expect reverse signs on y-axis in Figs. 3 and 4. If you change signs on Figs. 3 and 4 pay attention to do this also in Discussion and Conclusion section.

2) To clearly show dependence between the clock drift and the temperature difference (between the ambient and data logger temperature) I recommend changes on Fig. 5. Instead the sensor temperature (which is irrelevant for discussion) to plot the difference between the battery temperature and data logger temperature. The y scaling for this curve can be placed on the right side of the plot.

3) Did you note any problems in absolute measurements, i.e. with base values during the drift period? At least for the period Apr-Aug 2014 when time lags were higher I would expect more scattered observations, especially in the H component. I presume if you use variometer data with a few minutes time lag, to derive base values, this could introduce a few nT errors. Of course this also depends on the local geomagnetic activity during observational times, but in general I would expect systematic increase in scattering of the base values parallel with an increase of a time lag in recordings. If this was the case, maybe this fact should be mentioned in the text.

TECHNICAL CORRECTIONS:

Page 1, line 18: ensure -> ensures, is part -> is a part, line 20: (IAGA) -> (IAGA)

Page 4, line 6: Tukey windows -> Tukey window

Page 5, Line 5: "...the precision is not sufficient precision for the purpose..." -> "...the precision is not sufficient for the purpose ...", line 19: few -> a few

Page 7, Figure 4: subplot left-top: "Y 2013..." -> "X 2013...", Lines 12-13: "Only when the temperature was exceeding more than 5°C the one at the time when F_counter was last estimated, the clock drifted at a higher pace." -> "Only when the temperature difference was exceeding more than 5°C at the time when F_counter was last estimated, the clock drifted at a higher pace."

Page 9, line 9: the most affected -> most affected

Mostly you use "data logger", for consistency you should correct:

Abstract, line 5 "data-logger", page 2, line15 "datalogger", also page 3, line 20, line 24, page 5, line 14, page 7, line 5.

Also use "cross correlation" or "cross-correlation" everywhere in the text.

Page 7, line 7: -27 -> -28 (everywhere else in the paper you are talking about lagging of 28 s)

In my opinion the term "acquisition chain" could be replaced with "acquisition system".