Interactive
Comment

Interactive comment on "Enhanced timing accuracy for Cluster data" *by* K. H. Yearby et al.

Anonymous Referee #2

Received and published: 23 August 2013

Report on the discussion paper No.: gi-2013-18 "Enhanced timing accuracy for Cluster data" by K.H. Yearby et al.

General comments:

For the Cluster mission comprising 4 spacecraft housing identical experiments, it is necessary for the waveform data to accurately time calibrate them, in order to have a good phase precision at all available frequencies, when comparing data at the different points of measurements, in the present case up to 180 Hz.

The time accuracy given by ESA was not sufficient, as claimed since the beginning of the project. Efforts have been done to improve this, and authors explain how they have proceeded to improve the time accuracy from 2 ms up to about 20 microïĂă seconds. They process and analyse combined data sets of correction values and provide a ver-

ified time correction data set, as far as they can (∼90% of the time). Some special spacecraft operations may prevent from a precise time correction. They use a correction data set acquired by ESOC when real time data are dumped to ground (with a precision of 11 ïA■ seconds), a similar correction done by the Cluster WBD experiment, using DSN telemetry. The authors look at the discrepancies between the 2 data sets; they describe the different possible errors, depending on acquisition antennas and on spacecraft telemetry mode. Then the authors propose a final time correction using the onboard clock of the Digital Wave Processor (DWP) experiment and the Cluster Sun Reference Pulse. At the end they explain how users of Cluster wave form data can access to the resulting TCOR files. It is also explained that for Cluster data, there are 2 different periods in what concerns time accuracy, before November 2007 and after this date. After November 2007, ESOC has changed its procedure and corrected the time at each real time data acquisition, having then a corrected time about once every 3 days instead of once every month as was done previously (to stay within +/- 2ms of precision); since November 2007 the raw data precision is of 50 micro seconds.

Lessons from this could be taken for future multi spacecraft missions, in order to give to the users the adequate time accuracy straight forward and not some months or years after data acquisition.

The subject of this time calibration seems to perfectly fit the objective of the review and of its special issue. To my opinion, as a referee, the present manuscript is quite worth being published.

Specific comments/technical corrections:

It is not clear from the text whether the WBD experiment team uses the correction file TCOR for its own needs. It would be interesting to precise this point.

In the text and in figures there are both DSN diff and WBD diff. It is called DSN at the beginning, later it becomes WBD Diff. Can you precise the difference if any, and also in particular for Figure 1 there is WBD on the axis and DSN in the figure caption.

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 3, 515, 2013.