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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "A new high-precision and low-power GNSS receiver for long-term installations in remote areas" *by* D. H. Jones et al.

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The authors present a very useful and timely development of a GPS unit for harsh environmental conditions. It is true that currently available off-the-shelf GPS receivers are not very well suited to the purposes of continuous monitoring in remote locations for a number of reasons (mentioned in the paper), and the proposed UBI unit solves at least some of them. Presented material generally is of high quality, however there are some improvements that can be made.

The word "receiver" can mean both the measurement device, consisting of the antenna, signal tracking and control circuits, power supply, communication devices, and an enclosure, but also just the signal tracking circuitry. The authors used a ready Ashtech

MB100 receiver board, and I would suggest changing "receiver" into "receiver unit" at least in some places in the text to avoid confusing potential readers who are mostly interested in the signal tracking rather than collecting geophysical data.

It is mentioned that the Ubi software is open-source, but the precise license (e.g. Public Domain, BSD or GPL) is not specified. Is the hardware design open as well? If so, can the reader get the technical documentation? It would also be helpful to give an example of a typical installation and maintenance instruction sheets for unqualified field personnel to demonstrate how straightforward Ubi's operation is. An estimate of current cost of a single Ubi unit would be also useful.

GIPSY/Oasis software (p. 9, l. 4-11) does not use double differences, it works with undifferenced observations.

The fact that carrier pahse residuals are generally lower for Ubi than for another receiver does not necessarily mean that it is "the more precise receiver" (p. 9, l. 12-18). With the data volumes typically processed random noise could be averaged out very efficiently. Other properties of the residuals, such as their time correlation (which may also depend on the particular settings of the receiver), are more important and can lead to deterioration of results. It is easy to misinterpret the statistics of the residuals. By default many of GNSS processing software use decimated data in parameter estimation step. For GIPSY/Oasis the default rate of data used is 1 per 300 seconds, irrespective of the original data sampling rate. GIPSY/Oasis also may produce the kinematic time series with temporal smoothing (as a result of Kalman filter application). When analysing the quality of the coordinate time series, all these factors should be reported and taken into account. Time series analysis is not the main topic of the paper, so I would suggest to avoid claims like "Ubi is better" in farour of stating that "Ubi is good".

Minor notes:

p. 3, l. 2: turbines or -> turbines are

p. 3, l. 4: Abbreviate "British Antarctic Survey" here (currently abbreviated on p. 4 l. 15).

p. 5, l. 5: "in Figs. 3 and 4 shows" -> "in Fig. 3, and Fig. 4 shows"

p. 5, l. 13: "and low cost" -> "and lower cost"

p. 5, l. 15: Give a reference to Micro-robotics VM2 controller specs

p. 5, l. 19: Give a reference to Iridium 9602 modem specs. What is its power consumtion during sleep and active modes?

p. 6, l. 11: "GNSS data is" -> "GNSS data are"

p. 7, l. 1: Ashtec -> Ashtech

p. 7, section 3.1: Active GNSS antenna is also a consumer of electric power. Can you comment if this consumption is significant (probably not)?

p. 8, l. 4: "GNSS data was" -> "GNSS data were"

p. 9, l. 25: "the mail functioning" -> "malfunction"

p. 9-10, section 3.4: Some success stories of realistic Ubi deployment are presented, but could you also comment if Ubis performed generally better than the COTS receivers in similar conditions and over similar time intervals?

p. 10, l. 15: "distortion" -> "deformation"

p. 11, l. 1: "aircrafts" -> "aircraft"

p. 11, l. 5: "a single flight from a Twin Otter aircraft" -> "a single Twin Otter aircraft flight"

p. 11, l. 24: "The status of the Ubi receiver is broadcast" -> "The status of the Ubi receiver can be retrieved" (if I understood correctly)

p. 12, l. 4: "as accurate as commercial" -> "as accurate as some commercial", as only

one comparison was done

Table 1: Adding urls to the data sheets would be helpful

Figures 4, 6: would benefit from labelling the parts of the receiver (SD card, connectors) and an indication of scale.

Figure 7: Present the coordinates in a local coordinate system, not geocentric. "Kinetic tracking" -> "Kinematic tracking"

Section 3.2, Figures 8 and 9: Conditions at apparently similar antenna locations may be very different due to very slight changes in multipath geometry. More reliable test would include connecting different receivers to the same antennas (without moving them) in turn. The widths of the PDF curves (Fig. 9) are actually very close to make a conclusion.

Figure 11: Use more contrasting colours.

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