

## Reviewer comments to gi-2017-22-manuscript-version v1

The considered submission presents the results of initial tests of automated instruments capable of determining the magnetic vector in the geographic reference frame. Traditionally, these measurements have been made manually by skilled observers; however this requirement provides a limitation on the location and/or accuracy of absolute magnetic observatories. Here, the authors seek a robust and practical solution for the Spanish Antarctic Station on Livingston Island, which operates in a harsh environment and is unmanned through the winter months. The authors' findings provide are clear, well presented, thorough and provide a useful insight to some of the issues and potential resolutions encountered in operating remote, unmanned observatories that will be of interest to the wider geomagnetic observatory community.

The reviewer's recommendation is that the submission is published, on the proviso that the authors consider the following comments:

Page 2 line 7, "Variometric" is not a recognised term in English and either "variation magnetometers" or "variometers" would be preferred, although a GEM Systems proton magnetometer does not fit either of these categories.

Page 2 line 13, the stable reference frame referred to here is the geographic reference frame and should be stated as such.

Page 2 line 16, the authors may wish to expand on what is meant by "baseline evolution" here to underline the problem to be solved i.e. what are the causes of variometer baseline evolution, what are typical signals (period, amplitude & resolution) requiring modelling by the baselines, why is a linear interpolation between occupations inadequate and what are the sampling recommendations of the international community?

Page 2 line 28, reference Rasson et Gonsette, 2016 here for the GyroDIF.

Page 2 line 31, "In-house testing" is ambiguous. Does this refer to testing by the authors or a specification provided by the manufacturer? Also, which instrument does this refer to and is this consistent with the declination uncertainty figures in Section 2?

Page 3 line 9, do the authors have a reference for the assertion that the AutoDIF declination uncertainty is less than 0.3'? Similarly for the GyroDIF value of 3.6' stated later in the paragraph and in Table 1?

Page 4 line 26, it would be helpful to state here something about the driving current for the heating system as it is assumed that this must be safe and have no effect on the magnetometer enclosed within it.

Page 8 line 7,  $\sigma_t$  should read  $\sigma_f$

Suggested grammatical corrections:

Page 1 line 29, "..as it is at our partially manned station.."

Page 2 line 23, "The one with longer history is called AutoDIF ... designed to reproduce its manual measurement sequence", would read better as, "The one with the longest history is the AutoDIF ... designed to reproduce the manual measurement sequence of the DI-flux."

Page 4 line 12, "preserving it in the system batteries in prevention of periods of scarce wind generation", would be better phrased as, "enabling its operation from system batteries during extended periods without wind-generated power."

Further notes:

Page 5 line 1, "basically" would be better replaced with "mostly". Note: heat loss by air exchange, which is easily estimated, can also be a lesser but significant factor as it is difficult to construct an air-tight enclosure. This may account for some or most of  $P_a$ . Some air exchange may be desirable e.g. to prevent the accumulation of damp.