APIA’S UPGRADED OBSERVATORY

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Abstract

Apia observatory was established in 1902 through an expedition by the Germans. This makes it one of the longest running magnetic monitoring stations in the world and strategically important because of its remote location in the Pacific. Instrumentation for Absolute Measurements was upgraded in 2011 and performance was monitored and compared to those seen on Ascension Island. The two instruments that were installed in 2011 were Gemsys GSM-9051 Overhauser Magnetometer and a DMI FGM FGE Suspended Variometer. These two are 4meters apart and located South of the absolute hut. Since installation, we are now able to monitor the errors from magnetic field measured by the Overhauser and that by the Variometer. We will also look into other factors that may cause variation in measurements, the temperature in the fibreglass for example. Our report will focus mainly on current location of Apia Observatory and its vulnerability to many factors that contribute largely to measurement variation.
Presentation Outline

- Overview of Apia Observatory
- 2011 installation and upgrade
- Maintenance and upgrade
- Problems affecting current operations
- Conclusion
Overview of Apia Observatory

- The Apia Geomagnetic Observatory in Samoa is one of the oldest observatories in the South Pacific.
- The first geomagnetic measurements to be made there were in 1902 but the Gauss Haus and absolute house were built in 1912, thus making the Magnetic Observatory in Apia one of the longest periods of recordings in the world (>100 yrs).
- The magnetic variometers were Eschenhagen for measuring D and H, various magnetometers were used including CIW instruments No 5 (before 1921), Tesdorpf (1921-1936) and No 9 (1936-1966)
- It provides the only geomagnetic data for this region of the earth therefore it is very significant.
Overview of Apia Observatory

- The Eschenhagen variometers were replaced by Le Four instruments in 1956. An Askania declinometer was installed in 1966 and a proton magnetometer in 1968.
Location of Apia Observatory (API)
2011 Upgrade

- It was upgraded to modern instrumentation, having a Gemsys GSM-90F1 Overhauser magnetometer and DMI FGM-FGE triaxial suspended fluxgate variometer installed.

- This upgrade was made possible through the endless support from Andy Jackson of ETH Zurich, GNS New Zealand, USGS and Alan Berarducci of Compass Rose Surveying.
Problems affecting current operations

- Problems due to Meteorological conditions
- Problems due to artificial interference
Significant Events in Apia 2014-2016 Operations

- February 2014 - first visit by Prof A. Jackson to Samoa to check on observatory operations and organise remedial works.

- March 2014 - Daniel Whittaker GNS visited to repair faulty fluxgate thermal control.

- May 2014 visit by Alan Berarducci to:
  - organise and oversee repair of Absolute Hut
  - Absolute observations training for local staff
  - re-measure Total Field site difference between the continuous proton and the D/I observing position
  - check the continuous proton stability
  - install drying agent in the DMI fluxgate sensor
  - check the DMI fluxgate sensor temperature coefficient
Significant Events in Apia 2014-2016 Operations

- August 2015- Installation of new antenna for electronics shelter and computer
- March 2016- Daniel Whittaker of GNS New Zealand maintained the overhauser
Problems due to Meteorological Conditions

Following a tropical cyclone in 12\(^{th}\) December 2012 several large palm trees fell on the Absolute Hut damaging the roof. Following this rain shorted out all the hut electronics preventing any absolute obs being made.

To prevent a repeat of these problems all trees in the vicinity of the Absolute Hut have now been cut down to avoid future damage.
Minimising the vulnerability to meteorological effects and artificial interference

Removal of trees around

Installation of Signs
Baseline Plot of Apia 2015
Conclusion

Everything at Apia seems to be working well:

- All trees potentially causing damage to buildings - removed
- No daily 1 nT steps
- No long term drifts
Future of Apia Observatory

- Improve capacity of local staff to analyze and apply magnetic data to other geological and geophysical activities such as climate change modelling.

- Exposure to international observatories, trainings and work attachments to further the capacity on this particular area of science.
Thank you for your time