GeoMagPy and MARTAS in operational use at SGO

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The GeoMagPy and MARTAS softwares have been tested and adopted to the operational use in the Sodankylä Geophysical Observatory. Today the GeoMagPy software package is used for data quality checks, the definitive data processes of SOD as well as INTERMAGNET data checking work. MARTAS software has been tested since June 2022 for the new variometer stations with a Raspberry Pi single board computer.

After GeoMagPy was introduced to the geomagnetic community it has been tested for the different geomagnetic data processing work at the Sodankylä Geophysical Observatory, University of Oulu, which operates the SOD geomagnetic observatory. Especially, the ready written tools for filtering and format exports to fulfill defined format standards have found to be efficient and easy to use for institutes running a single geomagnetic observatory. Earlier MATLAB-based "home made" processes have been replaced stepwise by GeoMagPy. The wider user community of open source software decreases the risk of erroneous data processing.
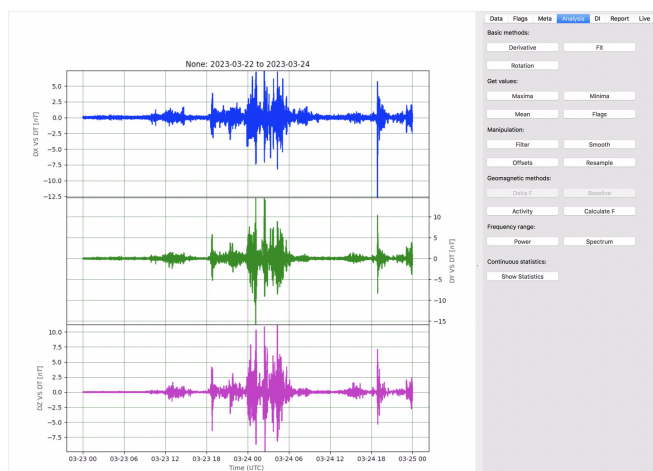

Figure 1: 1 second derivatives recorded on 23-24 Mar 2023 at SGO test site using MARTAS software package. The gradients reached 10 nT/s recorded by LEMI-025.

GeoMagpy has been used for filtering 1 min definitive data according to INTERMAGNET standard since 2017 and merging and calculation of G value to INTERMAGNET IAF binary files. The capability to read SGO's internal binary format was added to GeoMagPy package for internal use. In addition, the automatic definitive data verification tool package has been used in parallel with older checking procedures.

SGO has used its own data sampling system since 1995. Over the years some observatory data has been collected with the Maglin software in MAGREC-4 dataloggers. It has some operational disadvantages, and the software package is locked in certain hardware. Three LEMI-025 magnetometers were delivered in 2022 to SGO. The MARTAS software was selected to be data acquisition software for the digital output of LEMI025 magnetometers. The packages were first installed on Raspberry Pi 4 Model B Rev1.4 running Debian GNU/Linux 11 ("bullseye"). The remote station has small UPS and it has been running since August 2022 8 months with 99.96% data coverage without any site visit. The system is shown to be stable to store 10 Hz binaries from LEMI025. Also, MQTT transmission for real time monitoring is tested. The system monitoring is done parallel with Munin (muninproject.org).
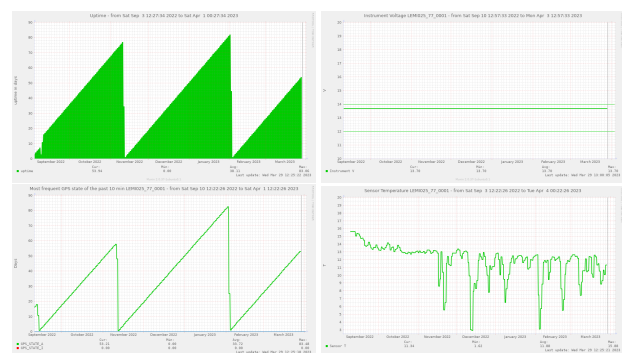

Figure 2: Munin monitoring plots of LEMI-025 magnetometer over MARTAS on Raspberry Pi 4B. Voltage, GPS status, uptime and temperatures are monitored.

Later on, the MARTAS package has been installed in four IPC-401 Fanless PC running Linux (Ubuntu 20.04) to have more solid hardware solution for long term operations and for the harmonisation of the observatory dataloggers. The new magnetometer array will be operated using MARTAS.

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