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Embedded multiparametric system for volcano monitoring

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A low cost and low power consumption multiparametric system designed for volcano monitoring is presented. Once tested with various sensors, at present it is installed in two locations in Tenerife, Canary Islands, acquiring and transmitting data in real time.

The system is based on a commercial board (Raspberry Pi®, RPi®) that uses an embedded ARM^{TM} processor with a Debian (Wheezy-Raspbian) Linux Operating System. This configuration permits different standard communication systems between devices as USB and ETHERNET, and also communication with integrated circuits is possible. The whole system includes this platform and self-developed hardware and software.

Analog signals are acquired at an expansion board with an ADC converter with three 16 bits channels. This board, which is powered directly from the RPi®, provides timing to the sampling data using a Real Time Clock (RTC). Two serial protocols (I_2C and SPI) are responsible for communications.

Due to the influence of atmospheric phenomena on the volcano monitoring data, the system is complemented by a self-developed meteorological station based on Arduino^{CC} and low cost commercial sensors (atmospheric pressure, humidity and rainfall). It is powered with the RPi® and it uses a serial protocol for communications.

Self-developed software run under Linux OS and handles configuration, signal acquisition, data storage (USB storage or SD card) and data transmission (FTP, web server). Remote configuration, data plotting and downloading is available through a web interface tool.

Nowadays, the system is used for gravimetric and oceanic tides data acquisition in Tenerife and soon it will be applied for clinometric data.