

# RALMAG 3-Axis Fluxgate Magnetometer



3-axis fluxgate sensor module that measures the magnetic field in the 3 orthogonal directions X, Y and Z and the temperature of the sensors.



Remote control unit complete with 230 V / 50-60 Hz power supply and USB serial interface for connection to the station computer.



Software for acquiring, displaying and recording measurements.

The RALMAG magnetometer uses 3 orthogonal fluxgate sensors (X,Y,Z) to vectorially measure the intensity and variations of the Earth's magnetic field.

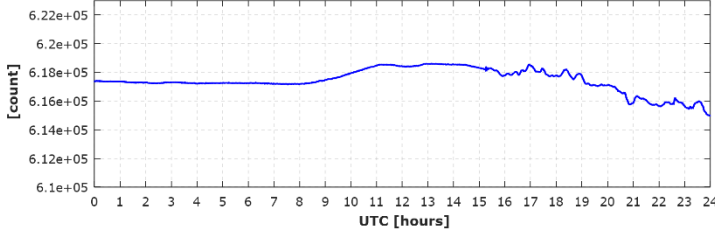
The operation of a fluxgate sensor is based on the non-linearity of a core of ferromagnetic material. Two coils (excitation and detection) are wound on a highly permeable core: the excitation winding is powered by an alternating current that makes the core work close to saturation. Under normal conditions the effects of the non-linearities are symmetrical, while if an external magnetic field is superimposed the circuit is closer to saturation in one half-period of the excitation current than in the other. The signal induced in the detection winding includes harmonic components of the excitation signal that are more intense the closer the core is to saturation. Since the percentage of saturation is proportional to the external magnetic field, the intensity of the higher harmonics is measured to obtain a measurement of the external magnetic field.

**The RALMAG magnetometer has many applications in the scientific and industrial fields. Particularly interesting is the monitoring of geomagnetic field perturbations induced by solar activity, the main cause of disturbance of the Earth's magnetosphere.**

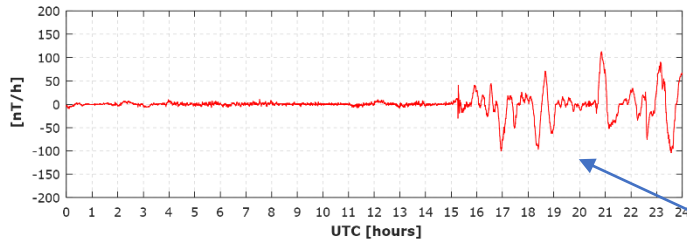
A 30-meter long cable (supplied with the instrument) allows the sensor module (preferably protected from temperature changes) to be installed far from the acquisition circuit in order to optimize its positioning and orientation: it is important to install the sensitive element far from potential artificial sources of disturbance such as transformers and electricity distribution lines, vehicles, industrial structures and residential homes, since frequent current variations due to the operation of household appliances disturb the local magnetic field.

## RALMAG 3-Axis Fluxgate Magnetometer

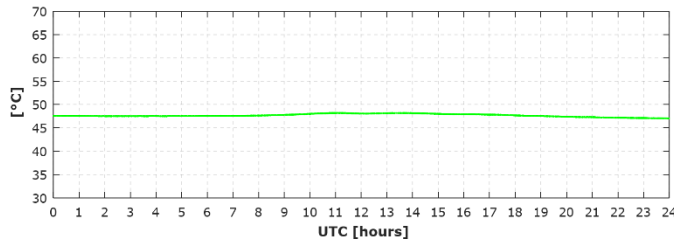
RALMAG: Y-Component Geomagnetic Field - RadioAstroLab (10/10/2024)



RALMAG: dY/dt-Component Geomagnetic Field - RadioAstroLab (10/10/2024)



RALMAG: Fluxgate Sensor Temperature - RadioAstroLab (10/10/2024)



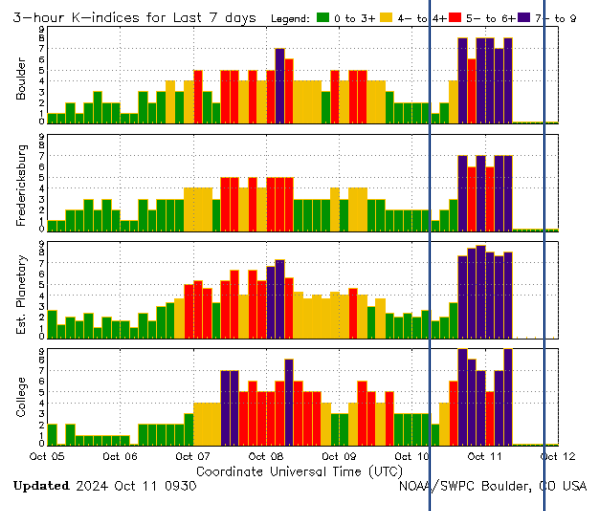
### APPLICATION EXAMPLE:

**monitoring of geomagnetic field disturbances caused by solar activity: recording of the strong geomagnetic storm on 10-11 October 2024.**

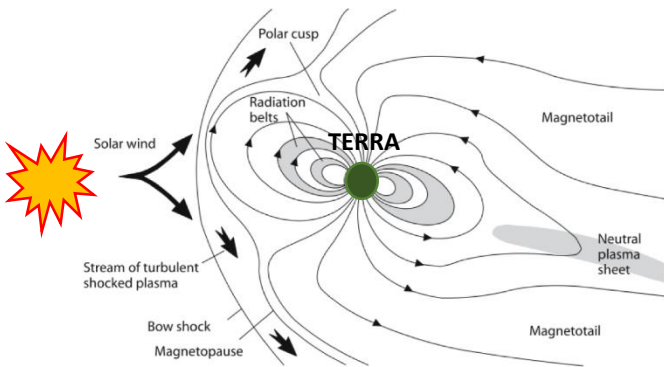
The top graph (blue trace) shows the daily trend of the field intensity of the horizontal component Y (East-West) in arbitrary uncalibrated units; the graph in the center (red trace) shows the field variations of the same component expressed in [nT/h]; the graph at the bottom shows the daily thermal excursion of the sensor module (the component was buried at 1 meter depth).

The intense disturbances of the field compared to the regular background trend are evident.

### Reference observatories:



Variations of the planetary index  $K_p$  (NOAA archive): when the value exceeds 5, a geomagnetic storm due to solar activity is underway.



Earth's magnetosphere disturbed by solar activity.

Learn more by visiting the blog:

<https://blog.radioastrolab.com/sole-e-geomagnetismo/>

We are available for further information and clarifications on our products.