

## Automatic solar flare detection from narrowband VLF signals received at Marion Island

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VLF transmissions are used to communicate over vast distances and are mostly used for military purposes. Wave propagation between the Earth and the bottom side of the ionosphere enables these over-the-horizon transmissions. The UltraMSK (UMSK) system on the island is used to record transmissions from specific transmitters. Because the carrier phase of the signal remains constant we can interpret changes in phase and amplitude as changes to ionospheric conditions driven by solar activity. One of these activities are solar flares - eruptions of relativistic particles from the Sun that can cause major damage to satellites and disable high frequency communications.

A method was developed to analyse the changes in phase of a pair of transmissions received from transmitters in Europe to automatically detect solar flares in near-real time. This code is still in prototype phase, but initial results are promising. This method may be adapted to also work at our station at SANAE IV, Antarctica, forming a pair of automatic detectors.

The automatic detection and characterisation of solar flares from ground-based measurements is an important field of research that is of scientific and practical use. Achieving this

- i. helps us to better understand the coupling between the Sun and the ionosphere; and
- ii. enables a redundant, relatively cheap, detection system that is independent of spacecraft-based observations.