



## The International Space Weather Initiative (ISWI) instruments in Germany

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The International Space Weather Initiative (ISWI) is an international space weather program inspired by the activities of the International Heliophysical Year (IHY) 2007. It combines space weather issues concerning hardware and data interpretation associated with space-based measurements in order to bring space weather sciences forward. Currently, ISWI encompasses 17 instruments whereof Germany maintains two of them: the educational project named SOFIE (SOlar Flares detected by Ionospheric Effects) and the global, near real time network called GIFDS (Global Ionospheric Flare Detection System). Both instruments deal with the monitoring of the lower ionosphere and utilise VLF measurements in order to provide information on solar flare impacts.

GIFDS consists of a ground-based network of Perseus SDR (Software Defined Radio) receivers which provide concurrent measurements of VLF signal strength and phase at multiple frequency channels ranging from 10 kHz to 100 kHz. One of the main objectives of GIFDS is the immediate and continuous detection of solar flares affecting the bottomside ionosphere and consequently inducing sudden interferences of VLF signals. In general, these measurements are determined by solar irradiation and geophysical conditions. The influence of diurnal variations on VLF amplitudes can be corrected by applying time series analysis followed by detrending. The VLF data is regularly adjusted by various transformation techniques to ensure a stabilized output. Finally, the results are compared with the X-ray flux obtained from GOES satellites to validate the magnitude and shape of flares recorded by GIFDS. As solar events can only be detected during daytime, DLR has been installing a uniform array of receivers at selected locations around the globe. Measurements carried out at the dayside part of the Earth will be provided 24/7 in the near future.

SOFIE is an educational venture established by the DLR\_Project\_Lab in Neustrelitz, Germany. Its objective is a robust ground-based detection of solar radiation bursts, i.e. solar flares, via measurable changes in the lower ionosphere. In order to accomplish this, continuous signals of powerful VLF Navy transmitters are received and stored. SOFIE offers a professional insight into topics of space weather, the ionosphere and the radio wave propagation. During the project interested students may construct the antenna on their own. Moreover, they are given the opportunity to assemble and operate the receiver following the provided construction kit and the included installation manual. DLR offers the students professional support and guidance. The recorded VLF data is directly transferred from the schools to a server in the DLR\_Project\_Lab.

In compliance with ISWI's open data policy, the access to data products is free. After all, the data management and its dissemination form the basis for a good cooperation among all ISWI participants. This presentation will give an overview on the ISWI organization and participating instruments, with a particular focus on German activities.