

# Report on German ISWI Instruments

ISWI Instrument: **GIFDS**

**Global Ionospheric Flare Detection System**

ISWI instrument: **SOFIE**

**Solar Flares detected by Ionospheric Effects**

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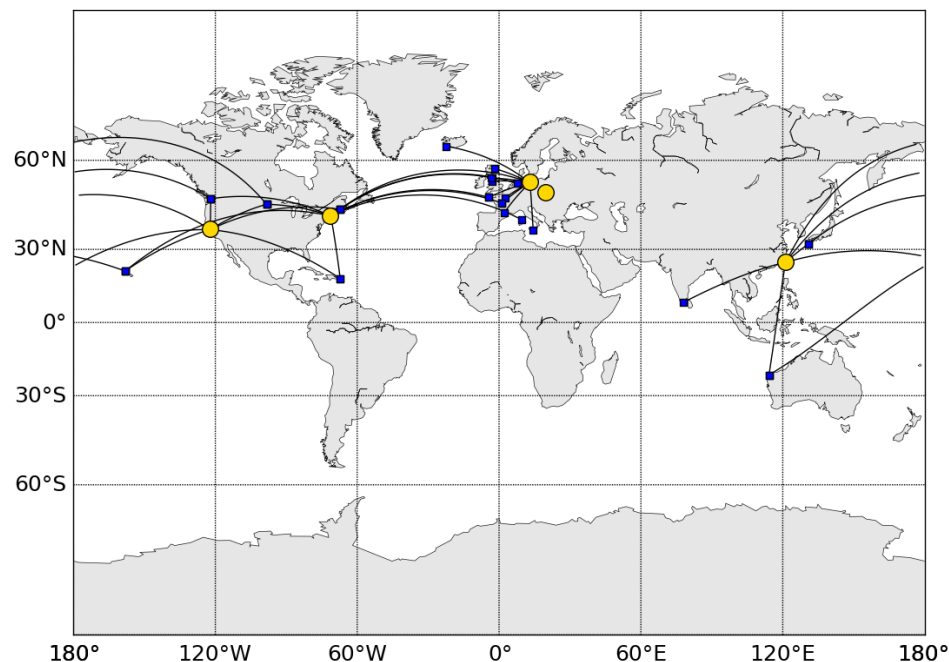
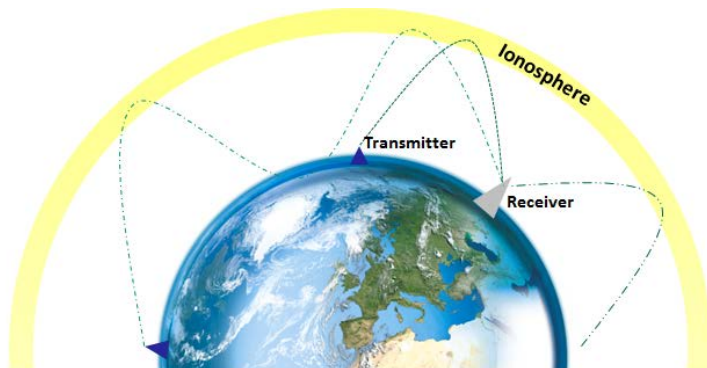


Wissen für Morgen



# GIFDS: Motivation

- Now cast detection of Sudden Ionospheric Disturbances (SIDs) primarily caused by solar flares using a groundbased VLF receiver system.
- Continuous monitoring of the lower dayside ionosphere via a global network of receivers.
- Integration of warnings into services of IMPC in the near future



Ionospheric Monitoring and  
Prediction Center

[impc.dlr.de](http://impc.dlr.de)



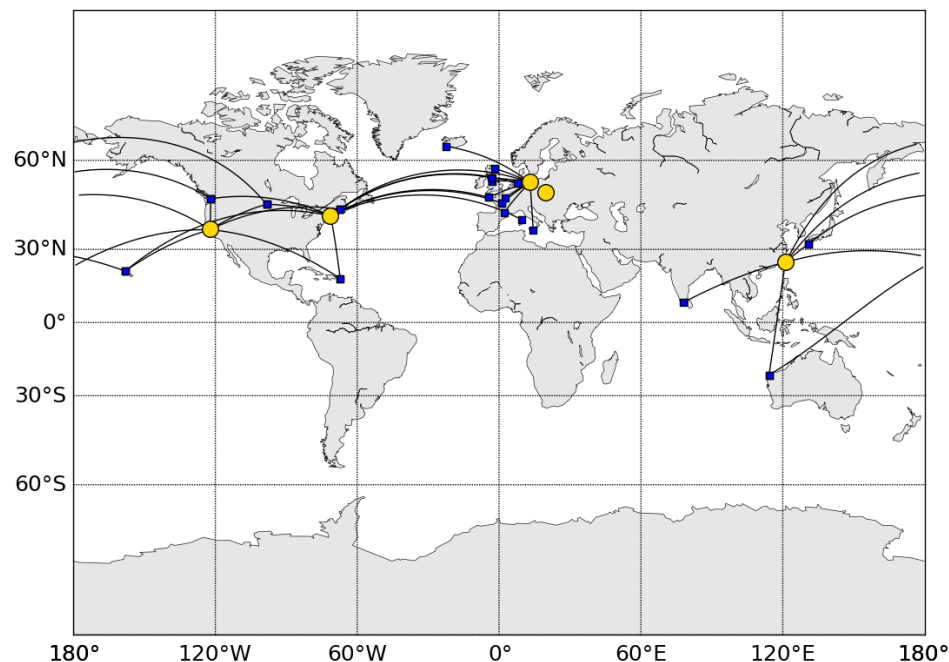
# GIFDS: Setup and instrumentation

## GIFDS receiving sites:

- DLR Neustrelitz
- Boston College
- PAN Krakow
- Stanford University
- NCU Taiwan

## Instrumentation:

- Perseus SDR receiver (modified for external time reference)
- MiniWhip antenna
- Frequency standard (LPFRS, Efratom)
- PC for processing I/Q samples



# GIFDS: Receiving site Neustrelitz

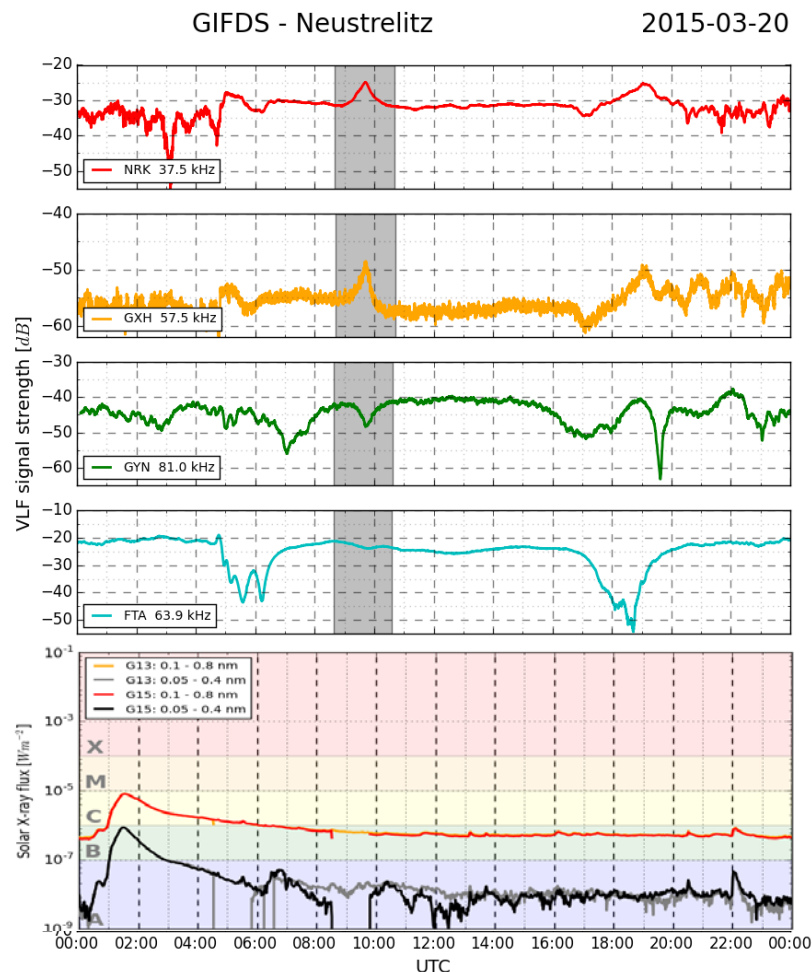
Instrument location: 53.33 °N; 13.07 °E

## Performance:

- Smoothed 1Hz amplitude measurements [dB] of 8 transmitters updated every 15 minutes

## Calibration:

- in frequency: via external frequency standard
- in time: at known reference time signals
- No correction by the sensitivity of the antenna  
→ relative amplitude values



# GIFDS: Measurements and data format

## Measurements:

- Daily ASCII files for 8 transmitters
- 15-min updates
- Sampling rate of 1 Hz

## Data format:

- Header shows receiving site (NTZ / Neustrelitz) and transmitter frequency (fc = 24 kHz / NAA Cutler)
- Data field with timestamp of UTC date (yyyy-mm-dd) and UTC time (HH:MM:SS.ssssss) followed by the signal strength [dB]

Example file of NAA received in NTZ

```
# Station = NTZ
# Computer = Latitude E6430 : N-Series
Base
# fc[Hz] = 24000.00000000
# fm[Hz] = 200.000
# Time_UTC  Amplitude[dB]
2016-06-02 00:00:00.145006 -46.82
2016-06-02 00:00:01.145067 -46.94
2016-06-02 00:00:02.145095 -46.65
2016-06-02 00:00:03.144931 -46.88
...
...
...
2016-06-02 23:59:58.898427 -45.61
2016-06-02 23:59:59.898485 -45.74
```

## Long-term data storage:

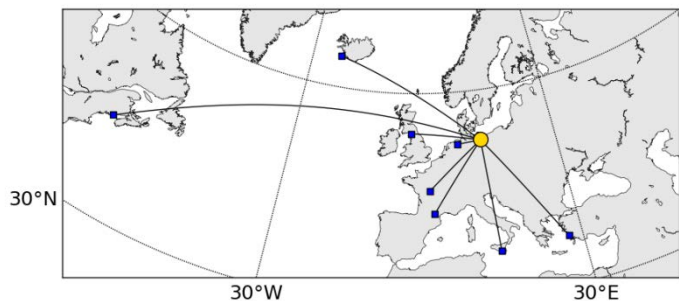
- IMPC server at DLR Neustrelitz



# GIFDS: Data Policy

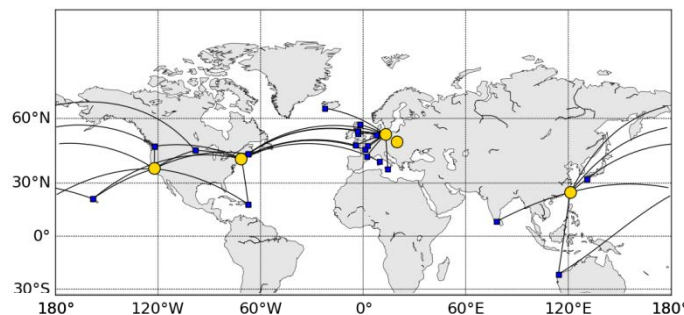
## ISWI:

- 1 receiving site
- Daily ASCII files for 8 transmitters
- 15-min updates
- 1 Hz amplitude data



## IMPC:

- 5 receiving sites
- Daily ASCII files for each transmitter
- 5-min updates
- 1 Hz amplitude and phase data
- Higher-level data products, e.g. flare alerts



Both data distribution concepts are currently under construction and will be available in the near future via [impc.dlr.de](http://impc.dlr.de)



# SOFIE: Motivation/History

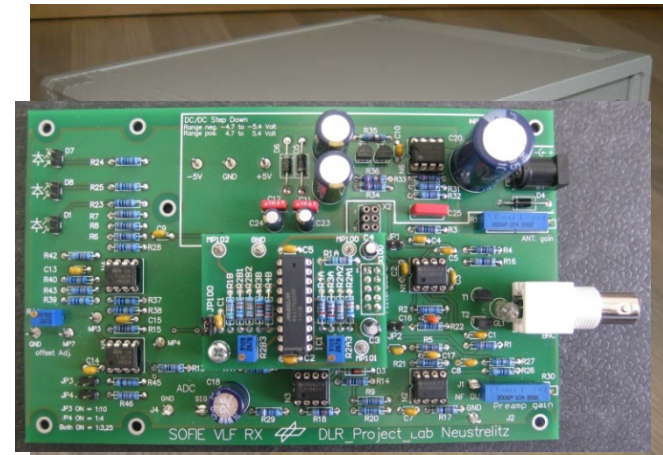
- In the framework of the United Nation's worldwide International Heliophysical Year (IHY) an international campaign for monitoring solar flares by VLF signal strength changes was initiated by the Stanford University.
- Establishment of the project 'Sun & Ionosphere MONitoring NETwork' (SIMONE) in April 2007 with the University Göttingen, based on SID monitor records.
- Establishment of the students project 'SOLar Flare detected by Ionospheric Effects' (SOFIE) in 2012 that uses a new receiver type developed by DLR.





# SOFIE: instrumentation

- Autonomous receiver systems are developed and manufactured within the Project\_Lab of DLR.
- Project at the International Space Weather Camp (DLR, UA Huntsville, SANSA).
- Data are collected at a server operated by the DLR Project\_Lab/School\_Lab in Neustrelitz on a daily base.
- Participants have direct access to their data and data from other participants via internet.
- Discussion of results by students at project meetings were very enthusiastic focusing on space weather, radiowave propagation and ionosphere.



Receiver board and antenna

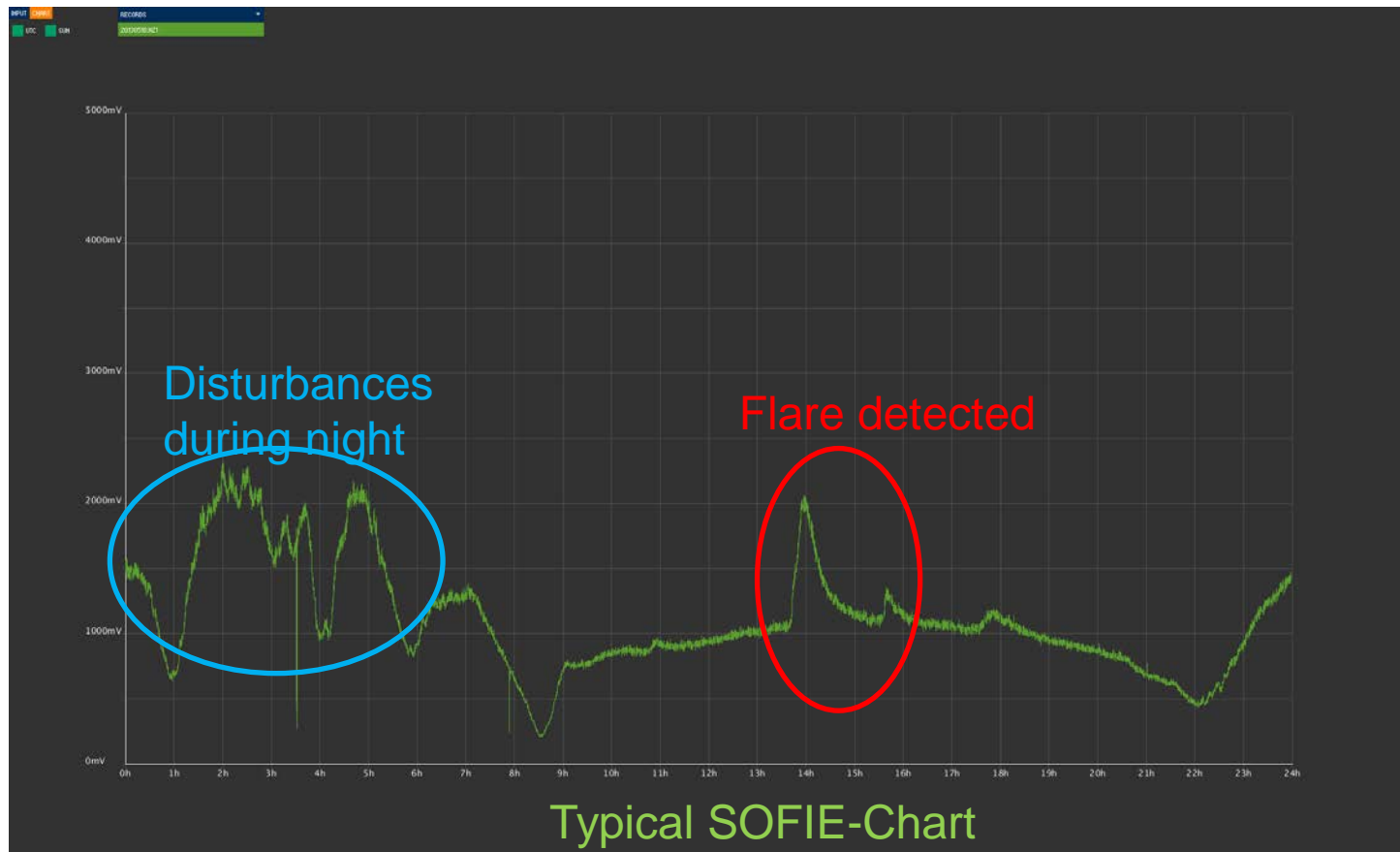






# SOFIE: product sample

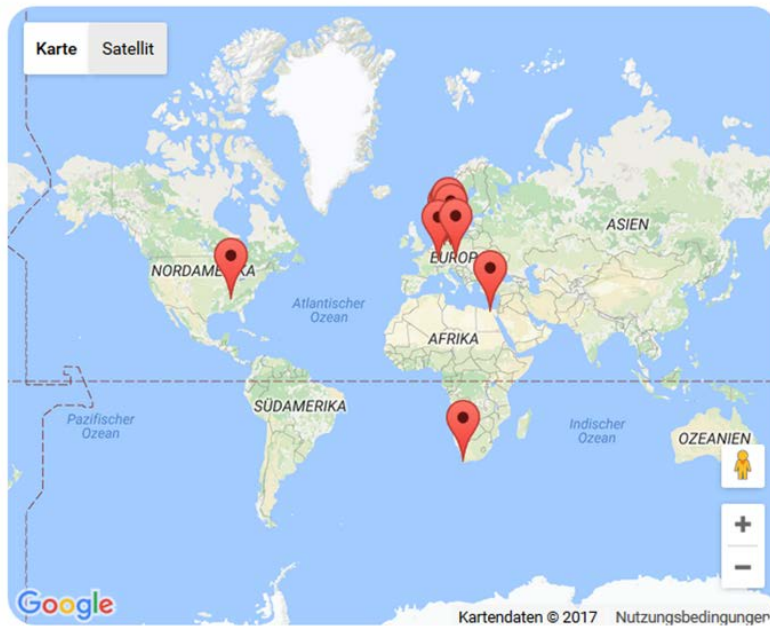
SOFIE participants have recorded numerous flares so far





# SOFIE: Instrumentation Location

SOFIE receivers are installed at schools in Germany and some places abroad

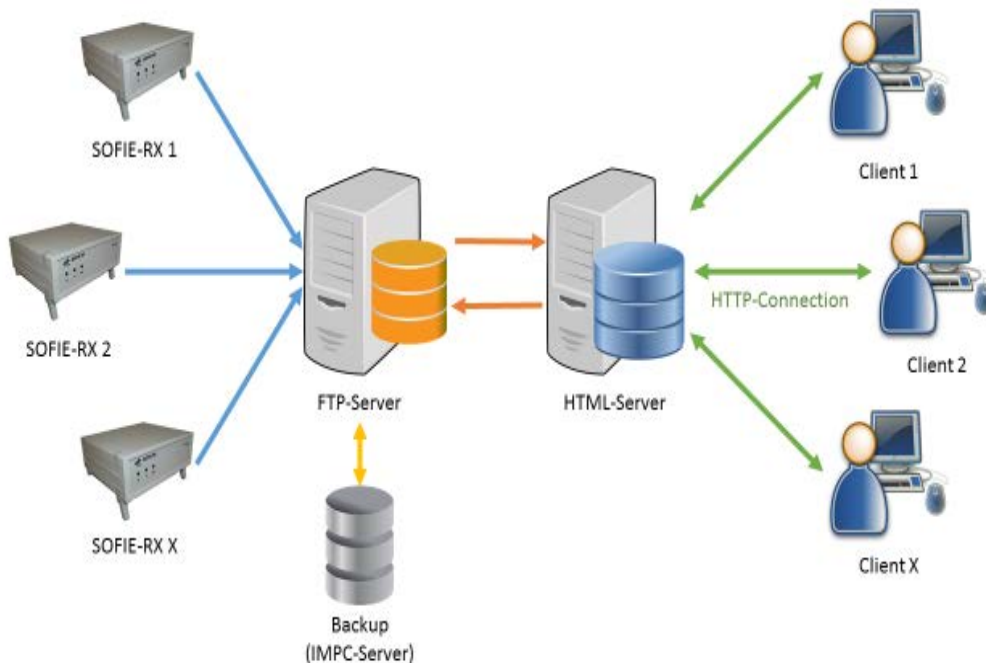


Further Information at:  
[www.projectlab-neustrelitz.de](http://www.projectlab-neustrelitz.de)





# SOFIE: Participation / Data Policy



Fixed VLF frequency according to the receivable transmitter  
5 s data of signal strength in mV  
Daily files uploaded to the FTP server operated by DLR Projectlab  
Data and plots of records available via SOFIE Website  
Software for registered users is also available there  
<http://www.projectlab-neustrelitz.de/sofie/eng/daten.php>

ISWI instrument teams and users of ISWI instrument data agree to abide by the ISWI open data policy. Teams also agree to maintain their data management plans to ensure their accuracy and completeness.



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