**LOFAR observations of the solar corona during Parker Solar Probe perihelion passages**

LOFAR's (LOw-Frequency ARray) capability of observing the solar corona, the highest layer of solar atmosphere, and studying the heliosphere ideally complement NASA's Parker Solar Probe's in-situ and remote data from the inner heliosphere. Simultaneous observations of the Sun and inner heliosphere with LOFAR and Parker Solar Probe will give us a unique opportunity to study processes in the solar corona and near-Sun interplanetary space, observing both the formation of space-weather events, and their subsequent propagation.

The LOFAR is a large radio interferometer, operating in the frequency range 10-240 MHz, that consists of an array of stations. The total number of LOFAR stations is 51, 38 of which are in the Netherlands and 13 international stations are located in Germany (6 stations), Poland (3 stations), and one station each in France, Ireland, Sweden, and UK. All this LOFAR stations working together, using interferometric techniques, like one big radio telescope with diameter around 2000 km like most European countries.

The NASA's Parker Solar Probe (launched on 18 August 2018) mission is designed to observe the solar corona and near-Sun interplanetary space. The spacecraft is equipped with different instruments for study the structure and dynamics of the Sun's coronal plasma and magnetic field, the energy flow that heats the solar corona and impels the solar wind, and the mechanisms that accelerate energetic particles.

The LOFAR Key Science Project "Solar Physics and Space Weather with LOFAR", of which the applicants of this proposal are members, has been awarded a total of 1064 hours of observing time during the Parker Solar Probe perihelion passes in the next two years. This proposal aims at evaluating these joint observations, with science cases covering a wide range of solar and heliospheric topics:

1. Type II and III radio bursts, the radio signatures of shocks travelling through the corona and the radio signatures of flare-generated electrons propagating along magnetic field lines, respectively.

2. Quiet Sun observations, devoted to solar research during approaching solar minimum.

3. Solar wind and inner heliospheric structure research - density fluctuations in the solar wind lead to scintillation of flux of distant radio sources.

4. Interplanetary magnetic field research - the impact of space weather events on the Earth's space environment is heavily dependent on the strength and direction of the interplanetary magnetic field when it encounters the Earth's magnetosphere.

The project will result in better understanding of the solar corona and heliosphere.

The sensitivity and angular resolution of the LOFAR telescope is much higher than other instruments observing on meter waves. Also, a new data from NASA's Parker Solar Probe mission will bring a new results. We expect a lot of interesting results on the solar corona and heliosphere. These observations can be used in conjunction with other wavelengths to determine various events occurring on the solar corona and heliosphere.

The implementation of the grant will enable the creation of a research group dealing with the conduct and use of observations from the LOFAR telescope. Thanks to this, it will be possible to fully use the possibilities of this instrument and making it a unique research tool.