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Sampling the heliosphere through low-frequency observations of pulsars

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Pulsars are highly-magnetized, fast-rotating neutron stars whose radiation is mainly detected at radio frequencies. Their clock-like emission and high degree of linear polarization make them ideal background sources to probe the electron density and magnetic field of the interplanetary medium.

The Soltrack project is a cutting-edge experiment that combines high-quality pulsar observations carried out with LOFAR with the study of the heliosphere and its phenomena. It recently confirmed the first evidence of the Solar cycle's impact on pulsar data, developed a new software to detect pulsar occultations by coronal mass ejections, identified the influence of Solar streamers on pulsar observations and applied pulsar-derived measurements to the validation efforts of the EUHFORIA magneto-hydrodynamic software, that simulate the Solar wind properties for Space weather purposes.

Here I will describe the fundamental concepts at the basis of the Soltrack experiments, and describe the results reached while paving the road for the application of pulsar data to heliospheric analyses.