EGU22-11001
https://doi.org/10.5194/egusphere-egu22-11001
EGU General Assembly 2022

Exploring Weak Impulsive Narrowband Quiet Sun Emissions (WINQSEs): Clues to coronal heating

Divya Oberoi[1], Surajit Mondal[2], Rohit Sharma[3], Ayan Biswas[1], Shabbir Bawaji[4], and Ujjaini Alam[4]
[1]Tata Institute of Fundamental Research, National Centre for Radio Astrophysics, Pune, India (div@ncra.tifr.res.in)
[2]New Jersey Institute of Technology, USA
[3]Fachhochschule Nordwestschweiz, Windisch, Switzerland
[4]e4r, ThoughtWorks India

The confluence of the data from the Murchison Widefield Array (MWA) and an imaging pipeline tailored for spectroscopic snapshot images of the Sun at low radio frequencies have led to enormous improvements in the imaging quality of the Sun. Among other science advances, these developments have lowered the detection threshold for weak nonthermal emissions by up to two orders of magnitude as compared to earlier studies, and have enabled our discovery of Weak Impulsive Narrowband Quiet Sun Emissions (WINQSEs). Their typical flux densities lie in the range of a few mSFU (1 SFU = 10,000 Jy) and they are found to occur in large numbers all over the quiet Sun regions. In the solar radio images, they appear as compact sources and our estimate of their median duration is limited by the instrumental resolution of 0.5 s. Their spatial distribution and various other properties are consistent with being the radio signatures of coronal nanoflares hypothesized by Parker (1988) to explain coronal heating in the quiet Sun emissions. As steps towards exploring this tantalising possibility of making progress on the coronal heating problem, we have been pursuing multiple projects to improve our ability to detect and characterise WINQSEs. These include attempts to look for WINQSEs in multiple independent datasets; using different independent detection techniques; attempting to characterise their morphologies in radio maps using Artificial Intelligence/Machine Learning based approaches; looking for their counter parts in EUV wavelengths; estimating the energy associated with groups of WINQSEs; and investigation of the spectro-temporal structure of WINQSEs. Here we present the current status of these projects and summarise our learnings from them.