

Interplanetary Weather Forecasting with the Murchison Widefield Array

Our society is heavily reliant on infrastructure such as power grids and Satellite Navigation Systems. However a major Space Weather event such as those that occurred in the 19th century and the first half of the 20th century could place these technologies at risk. In fact it has been estimated that the cost of a Carrington-like event could be 1 trillion USD. Consequently, predicting the severity of such events in advance is a hugely important topic.

Just as stars twinkle in the night sky, compact radio sources twinkle due to turbulence in the solar wind, a phenomenon known as interplanetary scintillation (IPS). This technique is useful both for studying compact radio sources, and for making measurements of the solar wind. The latter will be the focus for this project, with a particular focus on using MWA IPS observations to detect Coronal Mass Ejections (CMEs).

We have a quarter of a Petabyte(!) of observational data consisting of ~1000 observations taken in the first half of 2016 when the Sun was relatively active. We believe that there should be 185 Coronal Mass Ejections detectable within this data.

The initial phase of the project will be to reduce this huge amount of data (or a large subset of it), and determine what major events are detected within it. The next phase will to connect as many events as possible to Coronal Mass Ejections detected by other instruments (primarily LASCO), and also detected via in-situ measurements in Earth Orbit and elsewhere. The expectation is that not all MWA events will have been detected previously, and that the MWA measurements will be able to significantly refine our understanding of how the ejections evolved as they moved away from the Sun.

As well as working with the huge archive of existing data there will also be the opportunity to make new observations with the MWA, and developing creative ways to use the instrument to detect and track space weather.

You will also have the opportunity to work with an international network of collaborators across East Asia, India, the US and Europe, as well as more locally with CSIRO.

Research Field

Radio Astronomy

Project Suitability

PhD/Masters

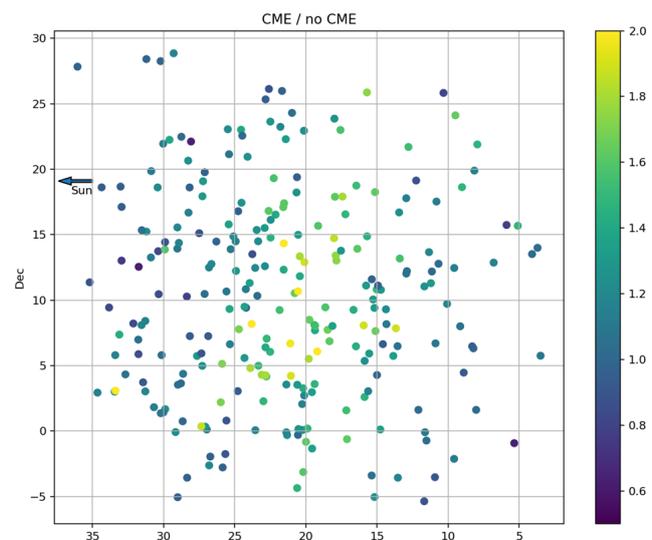
Honours

Project Supervisor

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Co-Supervisors



1 A CME detected by the MWA. Each point is a scintillating source and stronger scintillation indicates denser solar wind. The CME can be seen as an increase in scintillation equidistant from the Sun.