An Overview of STEREO/WAVES Science Results

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The Radio and Plasma Wave (WAVES) Experiment on the Solar Terrestrial Relations Observatory (STEREO) mission has been tracking heliospheric radio signatures of large-scale energy release on the Sun in the form of radio bursts at frequencies below the ionospheric cutoff. In particular, type III bursts caused by beams of electrons propagating along open magnetic field lines and type II bursts caused by electrons accelerated at shocks driven by coronal mass ejections (CMEs). Occasionally one observes type IV bursts, which are thought to be produced by energetic electrons trapped in flare magnetic structures. In addition, STEREO/WAVES observations provide information on radio enhancement associated with colliding CMEs within the coronagraphic field of view. Most of these radio emissions were also observed by the WAVES experiment on board the Wind spacecraft, but the STEREO/WAVES experiment provides additional information because of the stereoscopic observations. This paper summarizes some of the key results obtained using the STEREO/WAVES observations.

The radio enhancement associated with colliding CMEs was first discovered in the Wind/WAVES data. The frequency range of 14-1 MHz is ideally suited for observing phenomena within about 10 solar radii, a spatial domain well observed by STEREO and SOHO coronagraphs. In addition, the STEREO heliospheric Imagers track CMEs for the first time throughout the inner heliosphere, thereby providing information on kilometric type II bursts produced by CME-driven shocks propagating far into the interplanetary medium. The direction finding capability of the STEREO/WAVES experiment has helped locate the radio enhancement with respect to the colliding CMEs. Direction finding techniques have also helped understand large discrepancies in the density of the interplanetary medium obtained from type II burst and white light observations.

Solar Cycle 24 has turned out to be a weak cycle as indicated by the low sunspot number. The number of low-frequency type II radio bursts in Solar Cycle 24 has been also found to be relatively low compared to that in Solar Cycle 23. We combine coronagraphic and STEREO/WAVES observations to understand the change in the physical properties of the heliosphere as a consequence of the weak solar activity.