

We describe a CubeSat mission to predict and diagnose space weather events at Earth by tracking the interplanetary disturbances that cause those effects. Our demonstration mission, the CubeSat Heliospheric Imaging Experiment (CHIME), is a wide-field sky camera that can image large, tenuous clouds of material as they cross the inner solar system en-route to Earth. These clouds, such as interplanetary coronal mass ejections (ICMEs), are produced by magnetic activity on the surface of the Sun, and consist of billions of tons of magnetized plasma that streak across the solar system at up to 8 million km/hour. Impact of ICMEs on the Earth's magnetosphere is the main cause of magnetic storms, aurora, ionospheric radio interference, intermittent satellite radiation exposure, and related space weather activity at Earth. ICME tracking requires modest resolution and data rates, and is well suited to the CubeSat platform. CHIME will enable ongoing developmental space weather prediction, demonstrate the heliospheric imaging concept on the CubeSat platform, and advance the state of CubeSat readiness for many applications. Further, CHIME is a stepping stone to an agile, operational space weather imaging system, using moderate numbers of extremely inexpensive, redundant spacecraft to achieve robust operational reliability from commercial grade parts.