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Poster
At NOAA's Space Weather Prediction Center (SWPC), one of the key tools for space weather forecasting is the WSA-Enlil model—a time-dependent, three-dimensional Magnetohydrodynamic (MHD) model of the heliosphere. Running operationally on National Weather Service (NWS) supercomputers since 2011, WSA-Enlil provides five-day forecasts of solar wind conditions at Earth. A crucial aspect of this forecasting is estimating the likelihood and timing of Coronal Mass Ejections (CMEs) impacting Earth, as these events are the primary drivers of significant geomagnetic storms.

A vital component of the WSA-Enlil system is the estimation of CME parameters, including their size, propagation direction, and speed. To support this, an R2O project at SWPC in 2010–2011 led to the development of the CME Analysis Tool (CAT), an IDL-based system that derives these parameters using concurrent coronagraph images from SOHO and STEREO. Over the years, CAT has become an essential part of the WSA-Enlil workflow, playing a key role in daily space weather forecasts.

With the emergence of a new generation of coronal observatories—including the operational CCOR-1 and CCOR-2 coronagraphs on NOAA's GOES-19 and the upcoming SWFO-L1 satellite—there is now a need to modernize CAT. This modernization will enable the integration of these new data sources while also leveraging cutting-edge web-based technologies.

To meet this need, SWPC and the UK Met Office are developing PyCAT, a next-generation CME analysis tool. PyCAT features an interactive JavaScript-based browser front end and a Python-powered back end, all containerized using Docker for flexibility and scalability. In addition to supporting SOHO and STEREO-A coronagraph imagery, PyCAT will incorporate data from CCOR-1, CCOR-2, and future coronagraphs on the PUNCH mission, as well as CCOR-3, which will be deployed at the L5 point aboard the VIGIL satellite.

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