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Heliospheric Space Weather Centre tools for space weather monitoring

The Heliospheric Space Weather Centre (HSWC) is an ALTEC, INAF –OATo, and UniGe joint project aimed at providing and supporting services related to the heliosphere. It currently hosts two tools developed by ALTEC and INAF: the Geo Magnetic Effectiveness (H103d) and the CME propagation prediction (H103e). The tools are part of the SWESNET project, within the ESA Space Weather programme. The algorithms, developed by INAF, are integrated into ALTEC's infrastructure, which handles data retrieval, scientific product generation, storage, and web interface.

The H103d tool uses data from the DSCOVR instrument to compute magnetic helicity, used to identify geo-effective events. It analyzes near real-time measurements and generates 7-day plots of magnetic field, solar wind speed, proton density, proton temperature, DST index, magnetic helicity spectrogram, and integrated magnetic helicity.

The H103e tool employs data from DSCOVR/FC and LASCO/C2-C3. Its algorithms detect halo CMEs, identify CME features, model solar wind, and model CME propagation. The pipeline computes 48 solar wind and proton density maps daily from DSCOVR/FC data over the previous 28 days, and identifies earthward CMEs, calculates their parameters and arrival time.

ALTEC infrastructure is being upgraded to host AI support tools. In the next future, AI-based modules will be added to both the H103d, in the context of Alxtreme-I project, and H103e tools; a third tool dedicated to predict the occurrence of intense solar flares within next 24 hours is currently in the integration phase.

The presentation will cover the pipelines, components, and working mechanisms of current and future tools.

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