



# HELcats:

## Heliospheric Cataloguing, Analysis and Techniques Service

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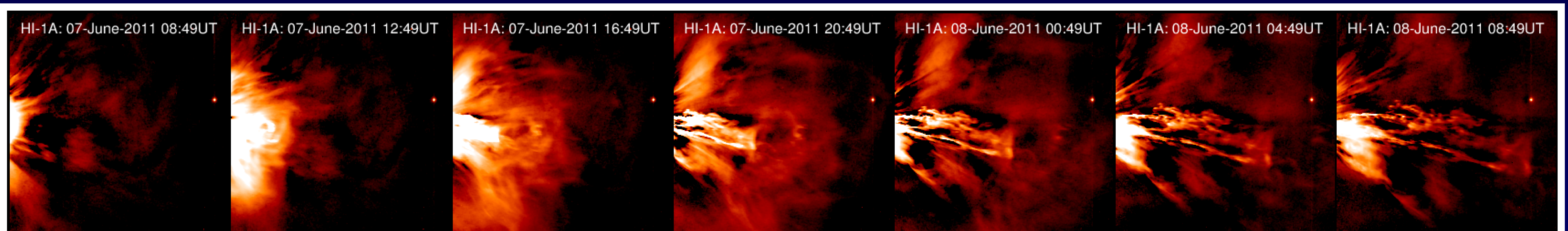
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The FP7 Heliospheric Cataloguing, Analysis and Technique Service (HELcats) project (start date 1st May 2014; duration 3 years) capitalises on European expertise in heliospheric imaging built up over the last decade, particularly by lead involvement in NASA's STEREO mission, whilst also exploiting the vast wealth of long-established European expertise in such areas as solar and coronal imaging, as well as the interpretation of in-situ and radio measurements of solar wind phenomena.

The general aims of HELcats are:

- to catalogue both transient (CMEs) and background (SIRs/CIRs) solar wind structures imaged by the UK-led STEREO/Heliospheric Imager (HI) instruments, including estimates of their kinematic properties based on a variety of established modelling techniques and the prototyping of other, more speculative, approaches;
- to verify these kinematic properties, and thereby assess the validity of these techniques, through comparison both with solar source observations and in-situ measurements at multiple points throughout the heliosphere;
- to assess the potential for initialising advanced numerical models based on the derived kinematic properties of the transient and background solar wind structures;
- to assess the complementarity of using radio observations to detect structures and diagnose processes in the heliosphere (in particular Type II radio bursts and interplanetary scintillation) in combination with heliospheric imaging observations.

The dissemination of the HELcats results, not only through publications emanating from the consortium but also through providing the broader scientific community with easy access to the HELcats catalogues and methodologies, will enable a much wider exploitation and understanding of heliospheric imaging observations.



**WP1 Management:** The HELcats consortium includes 8 European groups from 7 EU countries, and collaborators from further afield. WP1 covers the formal management tasks, including administration, maintaining project infrastructure, coordination of inputs, and reporting as required.

**WP2 Producing a definitive catalogue of CMEs imaged by STEREO/HI:** WP2 provides the foundation for this project, namely the production of a catalogue of CMEs in the heliosphere. The catalogue will be produced from manual inspection of STEREO/HI imagery but use of automated techniques will be investigated. Comparisons with coronal CME catalogues will be made.

**WP3 Deriving/cataloguing the kinematic properties of STEREO/HI CMEs based on geometrical and forward modelling:** Here we apply recently-established geometrical, forward and (prototype) inverse modelling methods to derive CME parameters for the catalogue (including back- and forward-projections to estimate CME launch and arrival at various solar system locations). Comparisons will be made between results from different models.

**WP4 Verifying the kinematic properties of STEREO/HI CMEs against in-situ CME observations and coronal sources:** This WP catalogues in-situ CME information (at Earth and elsewhere) for comparison to the projected data from WP3 in order to assess the performance of the aforementioned models. Similarly, comparisons are made with solar 'surface' phenomena. These allow thorough model validation.

**WP5 Producing a definitive catalogue of CIRs imaged by STEREO/HI that includes verified model-derived kinematic properties:** In parallel with the CME cataloguing, modelling and model assessment in WP2-4, this WP performs an analogous activity for CIRs, again with cataloguing, geometrical modelling and the validation of results through comparisons to in-situ/solar data.

**WP6 Initialising advanced numerical models based on the kinematic properties of STEREO/HI CMEs and CIRs:** This WP recognises the potential for using HI data as input to numerical MHD models of the heliosphere (in terms of both CME and CIR phenomena) by considering use of HI images to initialise/drive the ENLIL model. Results will be compared to traditional methods for running such models, based on coronal/photospheric inputs.

**WP7 Assessing the complementary nature of radio measurements of solar wind transients:** WP7 explores the value of incorporating radio observations, to augment the HI data. It assesses the value of using interplanetary scintillation (IPS) observations and Type II radio burst data in conjunction with HI data, both of which can provide additional information.

**WP8 Dissemination:** WP8 brings the results to the community through (1) publication of results in the open, refereed literature, (2) running of annual open meetings, (3) installation of all relevant documentation, catalogues and reports on a website and (4) dissemination of information to the public/policy makers. This includes ingestion of products into the AMDA data-mining tool, the IRAP propagation tool, and integration with projects such as HELIO. WP8 coordinates exploitation of project outputs, so they feed into research and future space weather applications.

