CME parametrization for L1 Forecast updates

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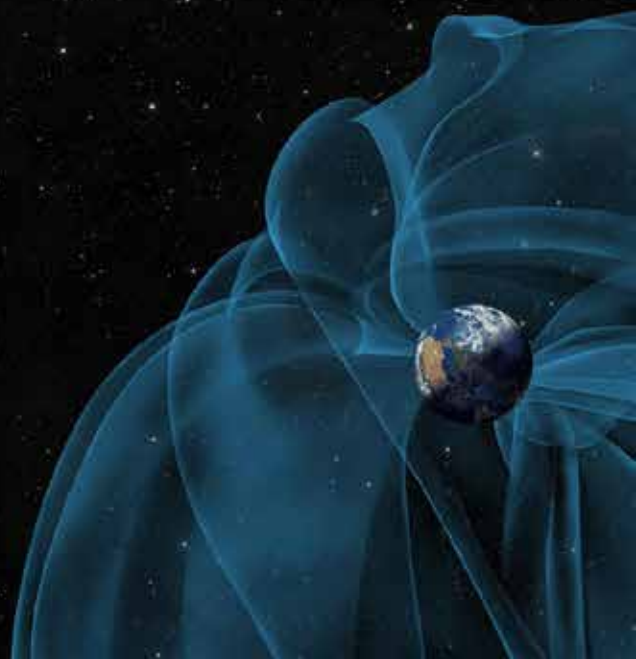


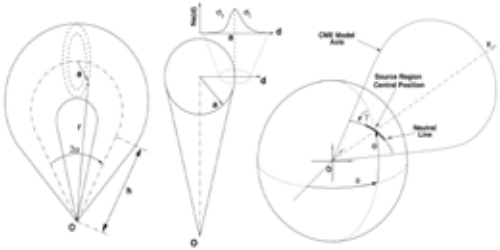
ESWW 10 / Nov. 2013 / Antwerpen, Belgium

Computer system for analysis

Linux 32/64bit or Mac
IDL[1] (tested on 6.3 and 8.2)
SolarSoft [2] (SSW, SSWDB) with packages:

GCS [3] flux-tube with croissant like shape
SECCHI, rtsccguicloud
SECCHI background cal files

CAT [4] ice cream cone model
SWPC_CAT,
swpc_cat_(getdata)



STEREO/COR2
STEREO/EUVI
SOHO/C2 C3
(science and) beacon data[5]

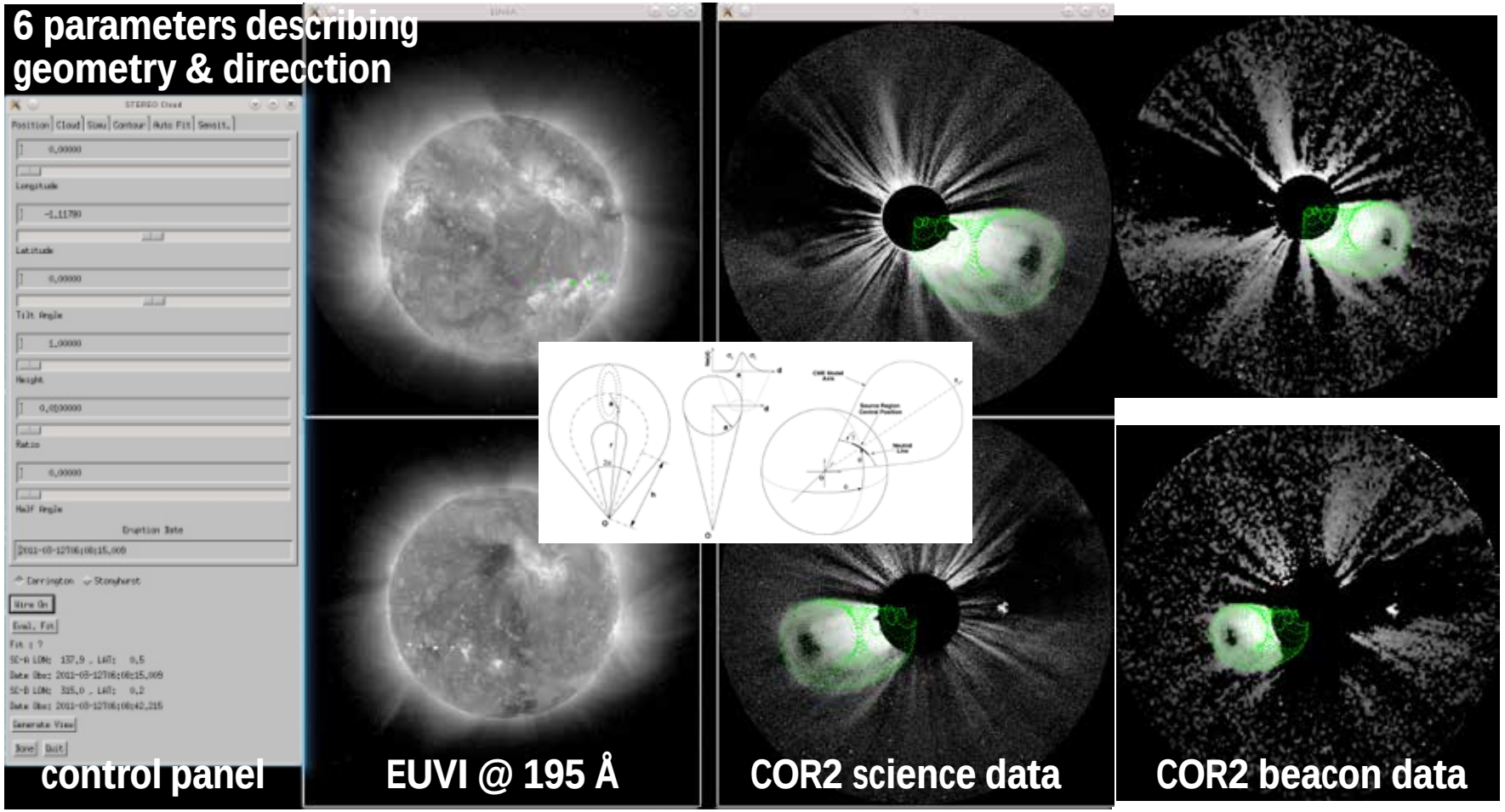
STEREO/COR2
--
SOHO/C2 C3
only beacon data[5]

Image processing with IDL routines[6]

CME Modeling with GCS

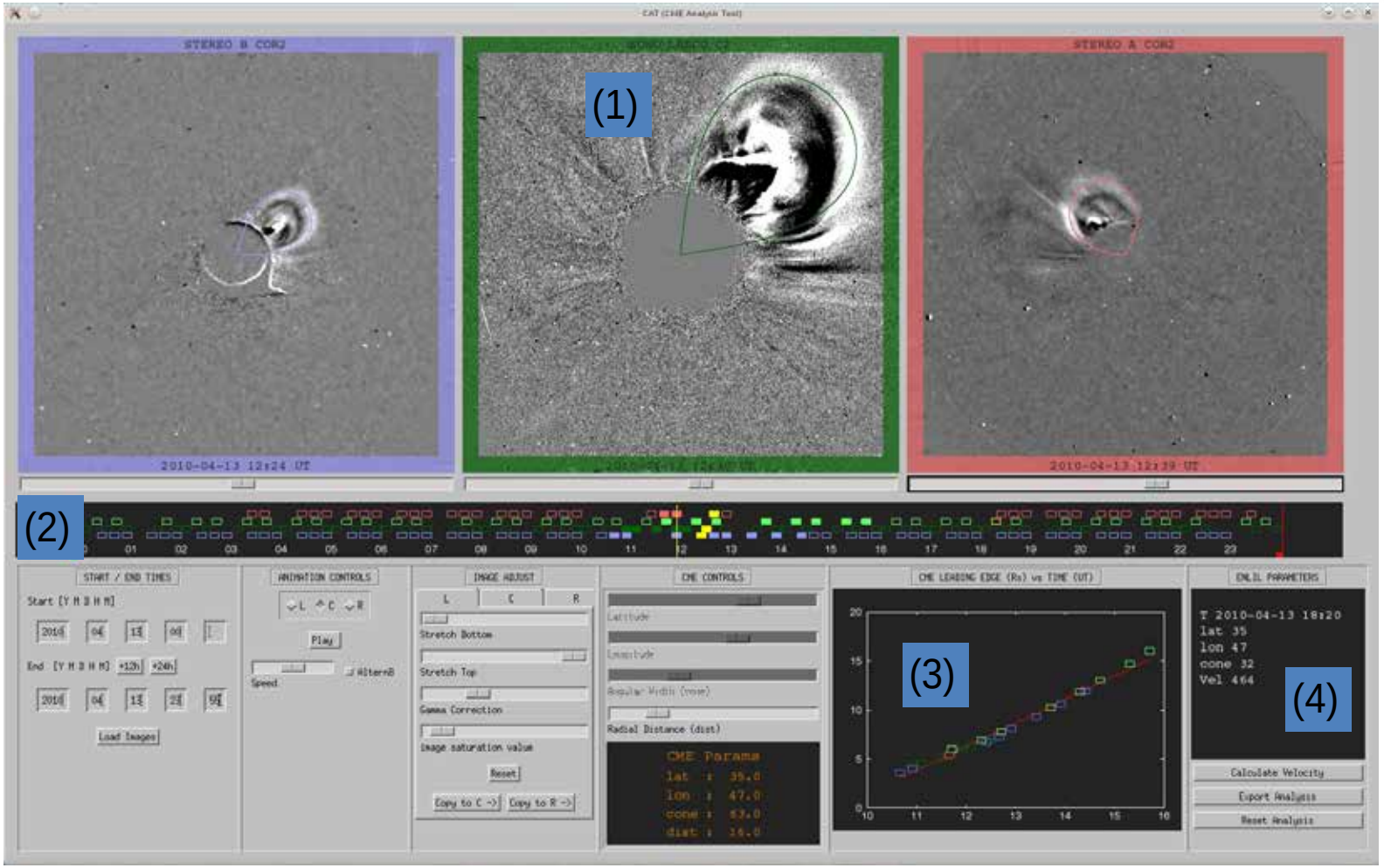
Data set:

- § total CME List (2007 - 2011): 1071 CMEs detected with STEREO/SECCHI/COR2. [7]
- § „Best-of“ CME List: 241 CMEs analyzed with GCS and CAT modeling technique.



GCS developed by NRL, US

CME Analysis Tool



(1) ice cream cone model

(2) multi fit tool with time line

(3) linear velocity determination

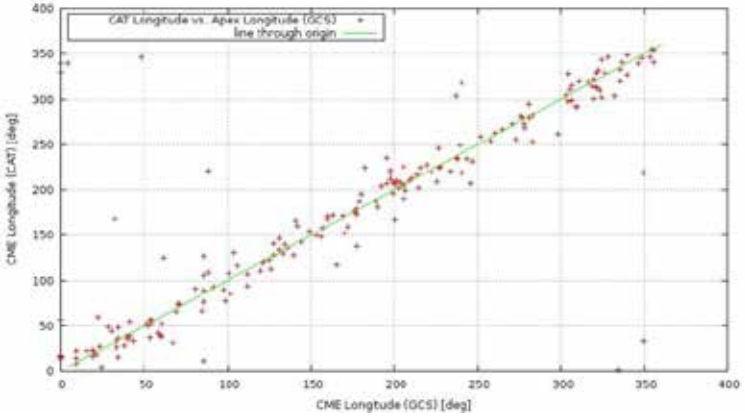
(4) export results (@ 21.5 r_{sun}) for usage with ENLIL

CAT developed by NOAA/SWPC

Results for forecast and more

CME direction:

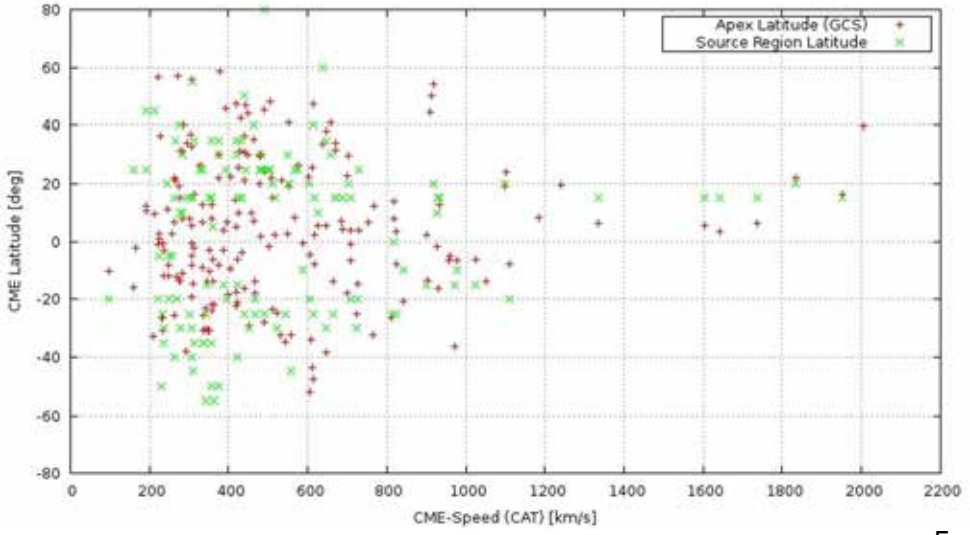
§ Lon. , Lat of GCS and CAT agree very well; deviation in Lat. between both models for 90% of all CMEs < 10°



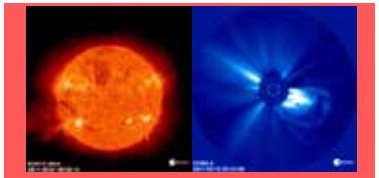
Parameter		Range	For x % of all fits
Latitude [deg]	**GCS**	-40 .. +40	90%
Tilt Angle [deg]		-40 .. +40	80 %
Aspect Ratio [--]		0.2 .. 0.6	85 %
Half Angle [deg]		10 .. 30	71 %
Height [rsun]		10 .. 15	71 %
Latitude [deg]	**CAT**	-40 .. +40	93%
Half Angle, Cone [deg]		16 .. 40	79%
Speed [km/s]		200 .. 1000	90%

CME speed:

§ Faster CMEs (> 1000 km/s) occur mostly at lower Lat. [-20°,+20°]



Overview: data flow



Presto Alert...

CME Detection

SR Detection

STEREO SOHO Data

WWW

AUTO

Linux, IDL SSW, GCS-Tool

Data Processing IDL-Script

Beacon

Science

Beacon

GCS-Modeling

CAT-Modeling

Online CME-Database

resulting parameters

Direction Velocity Expansion

CME Forecast ENLIL

CME arrival time pre-diction

Alert at : www.affects-fp7.eu/weather

Thanks for your Attention!

References and further information:

[1] IDL: www.exelisvis.com

[2] SSW: www.lmsal.com/solarsoft/ssw_install_howto.html

[3] Thernisien,et al: Forward Modeling of CMEs using STEREO/SECCHI data, *Solar Phys.* (2009), 111-130

[4] Millward, et al: An operational software tool for the analysis of coronagraph images: Determining CME parameters for input into the WSA-Enlil heliospheric model, Space Weather (2013), Vol. 11, 57-68.

[5] SCC: http://stereo-ssc.nascom.nasa.gov/data/ins_data/secchi/L0/a/seq/cor2/

SCC: http://stereo-ssc.nascom.nasa.gov/data/beacon/ahead/secchi/cor2/

NRL: http://sharpp.nrl.navy.mil/cgi-bin/swdbi/secchi_flight/img_short/form

[6] http://secchi.nrl.navy.mil/synomaps/scraytrace/dobo/examples.html#tutrtsccguicloud

[7] Bosman, et al: 3D properties of CMEs from STEREO/SECCHI observations, *Solar Phys.* (2012), Vol. 281, 167-185

For further details, questions and discussion see also:
>> Poster No 12.08 in Session 12 (Space Weather Forecast Verification) <<