THE CME GEO-EFFECTIVENESS FORECAST TOOL

1st SOLARNET Springschool, Wroclaw 2014

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13th Hvar Colloquium
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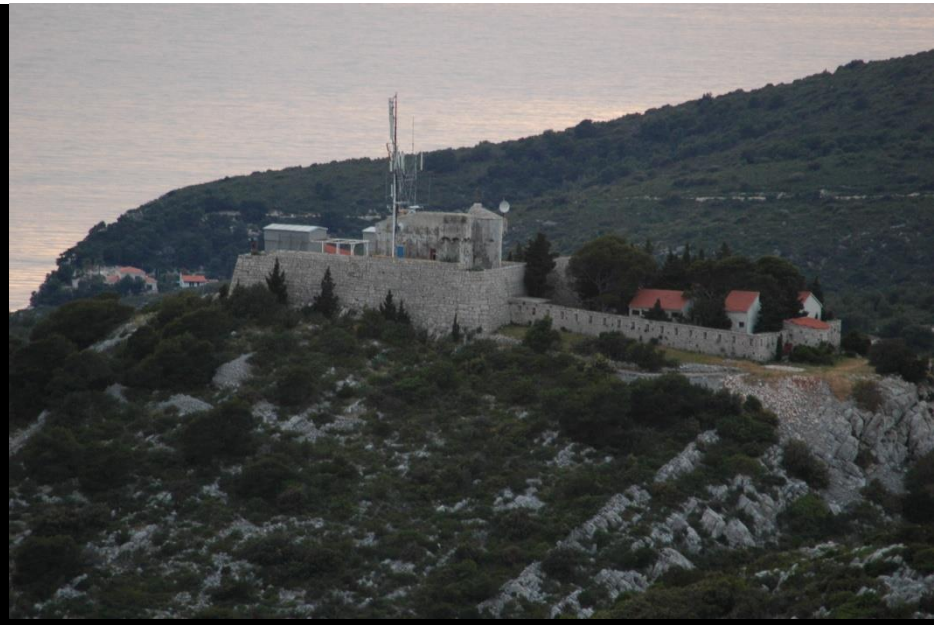
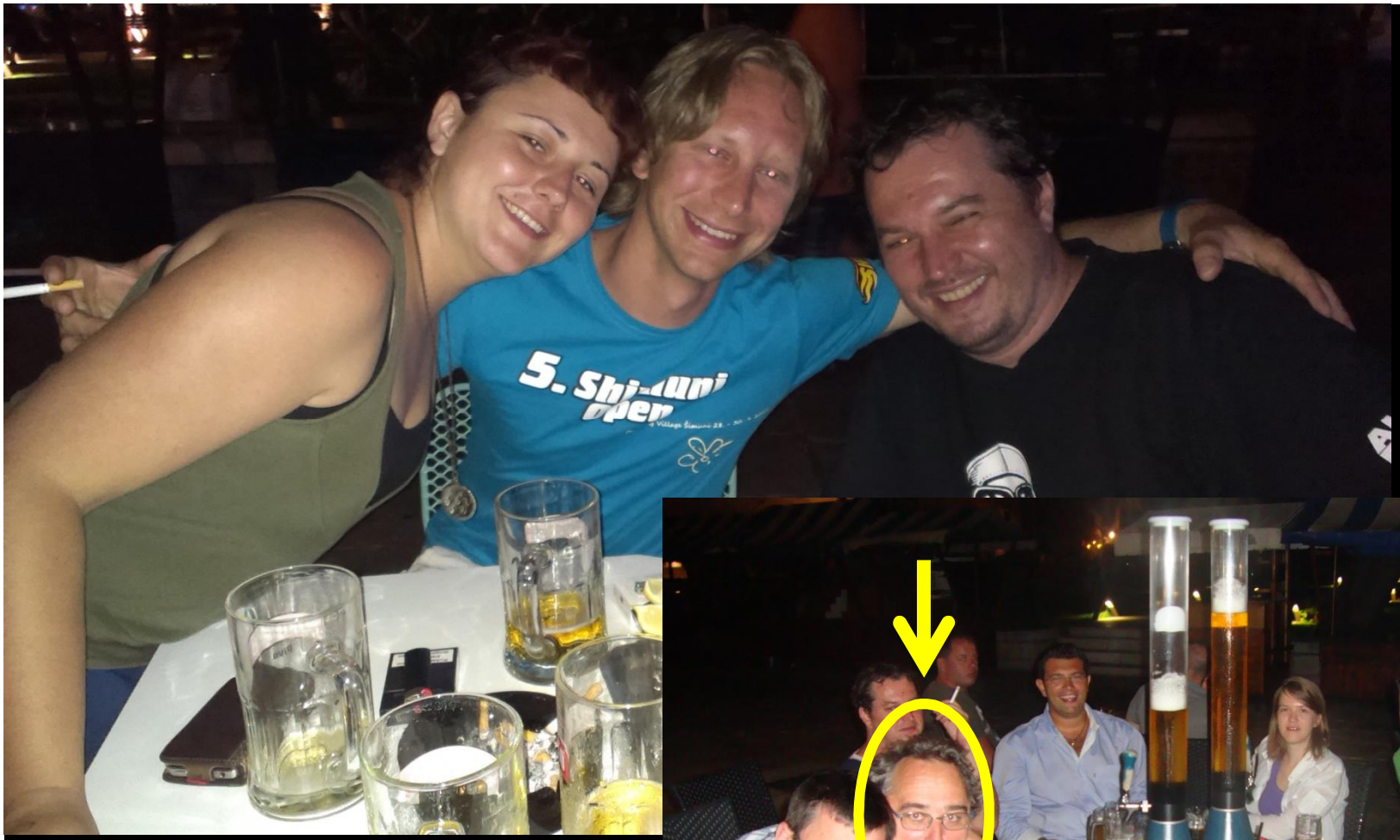
http://oh.geof.unizg.hr/





caffe bar Sidro

CME geo-effectiveness forecast tool (CGeFT)

Model input | Documentation

CME speed **v** (in km/s): not available

CME/flare source position radius R_s (in solar radii): not available

CME apparent width **w**: not available

Solar flare x-ray class **f**: not available

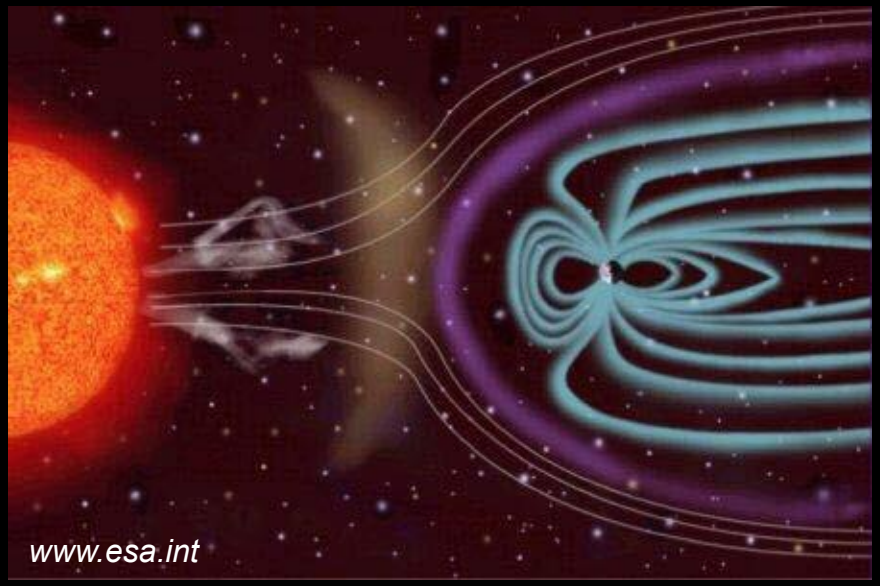
CME-CME interaction level **i**: not available

Calculate | Reset!

CME geo-effectiveness forecast tool has performed **65** successful calculations (since 10.3.2014).

Geomagnetic storms

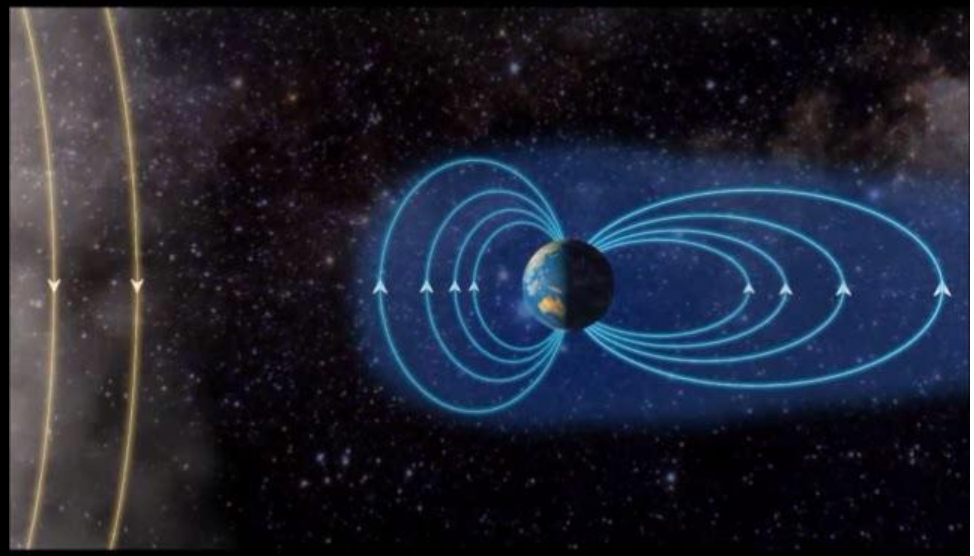
= disturbances in the geomagnetic field



⬅ geomagnetic field

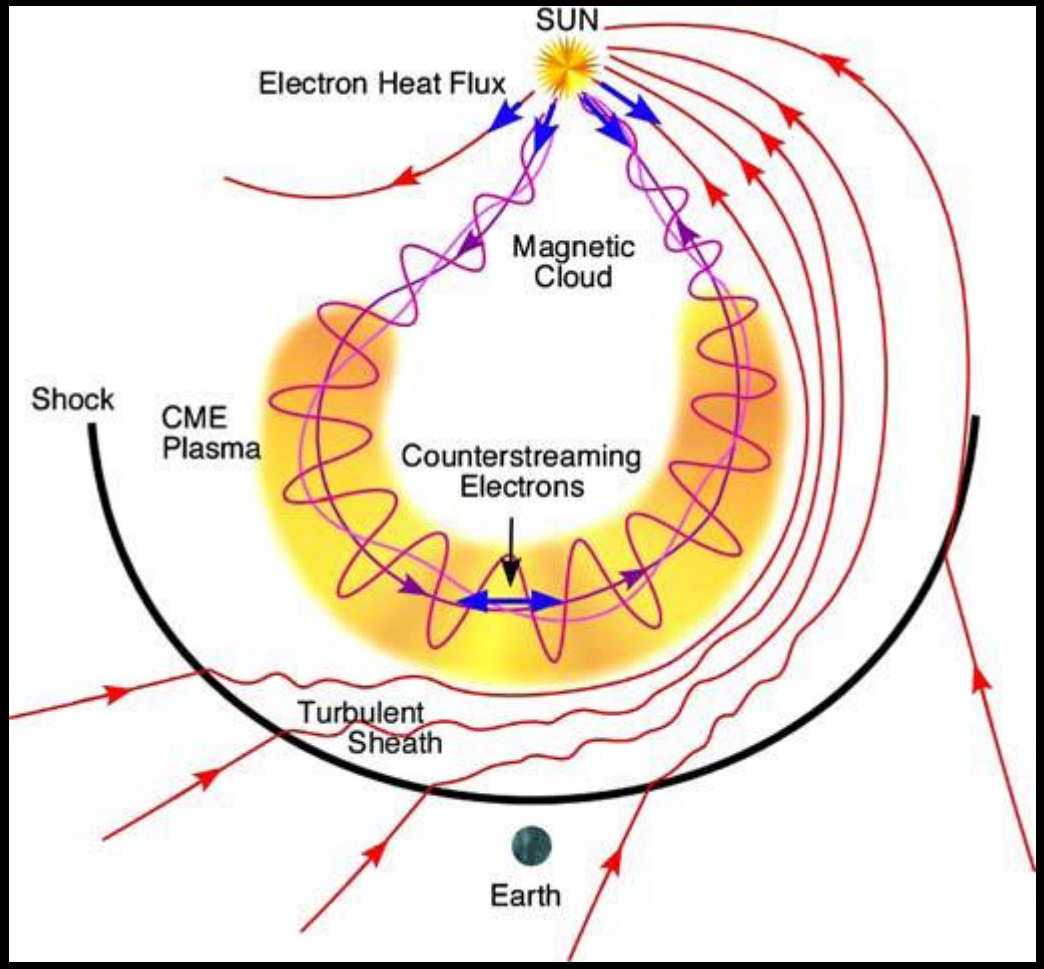
é caused by:

Changes in the auroral currents and ring current (charged particles injected into the atmosfere)
<= magnetic reconnection with an interplanetary transient

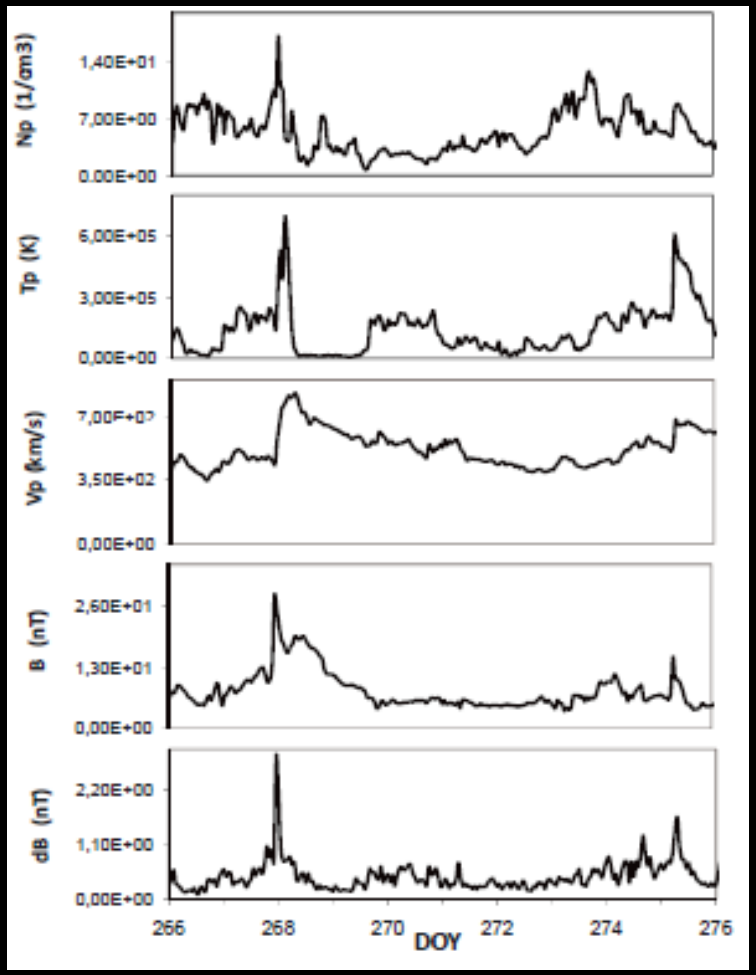


Interplanetary coronal mass ejections (ICMEs)

= interplanetary counterparts of CMEs, identified via *in situ* measurements of plasma parameters (v, T, N) and mag. field measurements

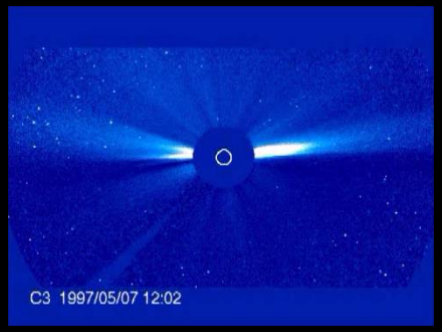


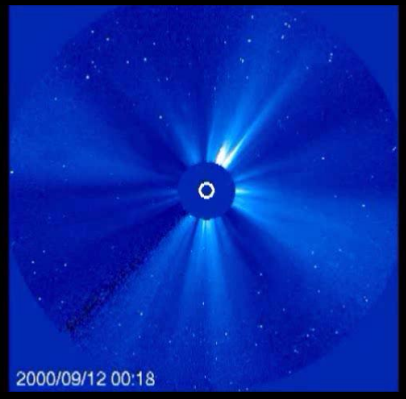
Zurbuchen & Richardson (2006)



Dumbović et al. (2012)

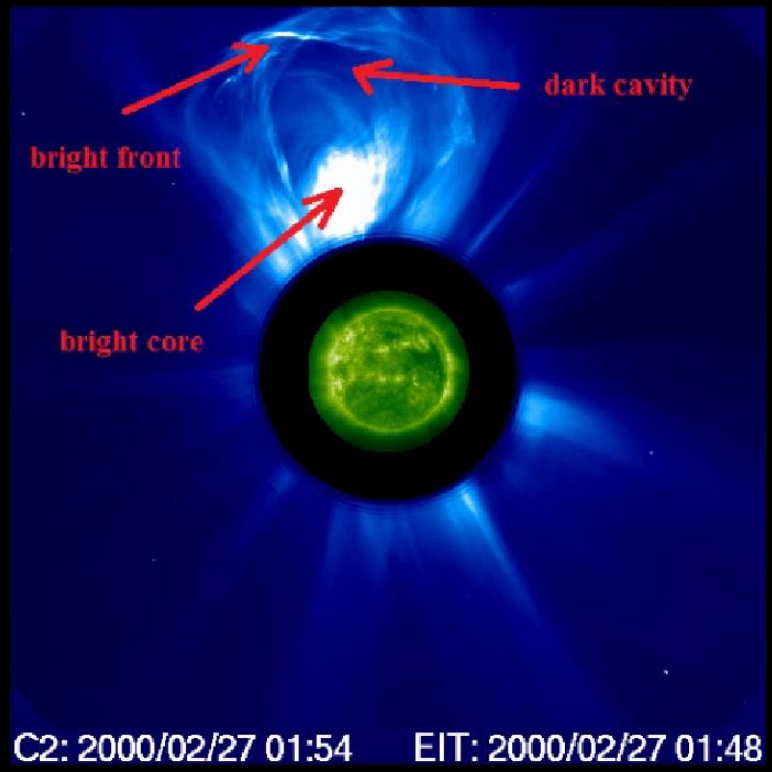
coronal mass ejections (CMEs)





LASCO - SOHO

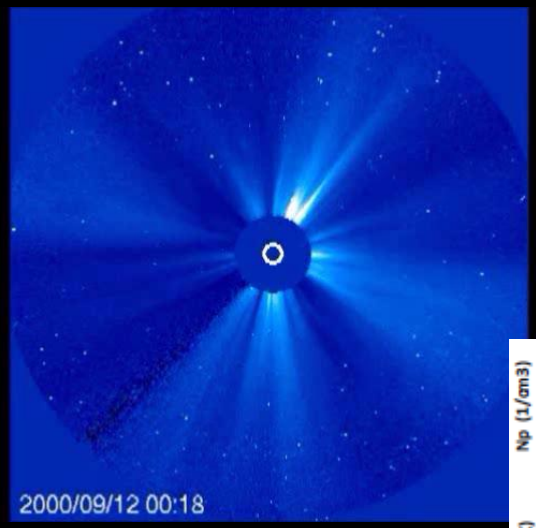
CORONAGRAPHIC OBSERVATION
Bright feature moving away from the Sun



Three-part structure (sourounding material, flux rope, prominence material)

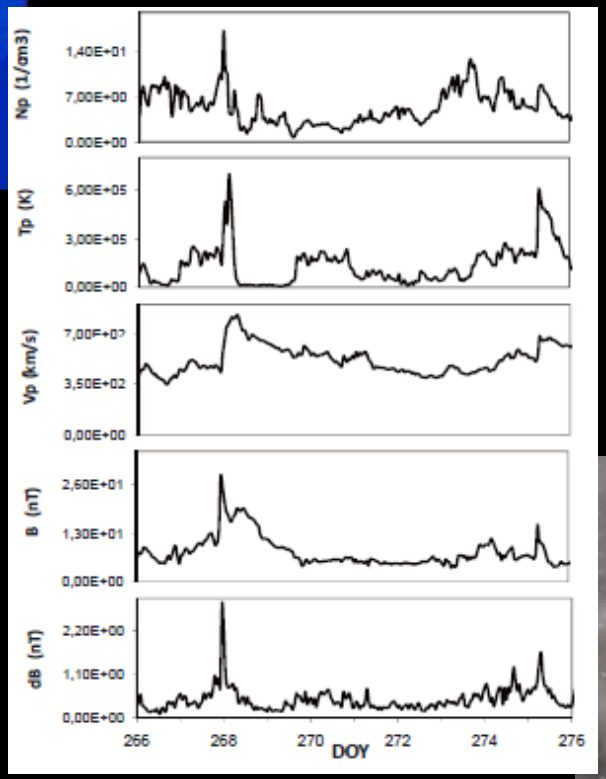
Overview: e.g. Hudson et al. (2006)

Geomagnetic storm predictions

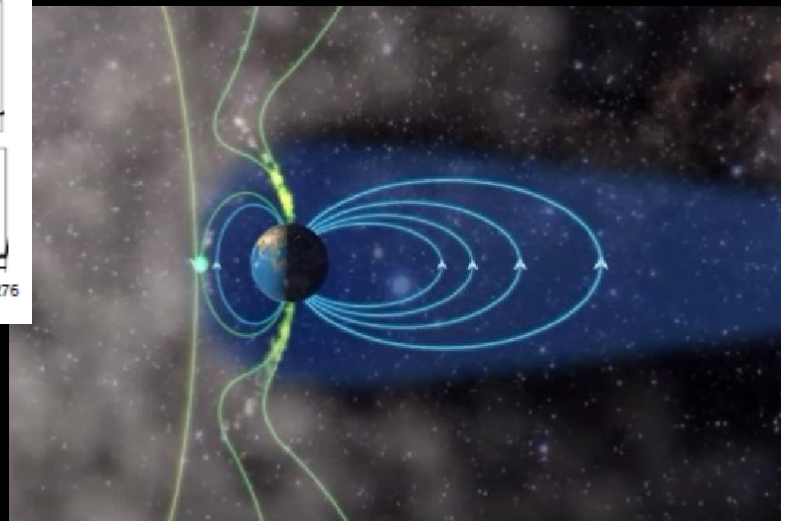


Propagation/evolution model

~ 1 day

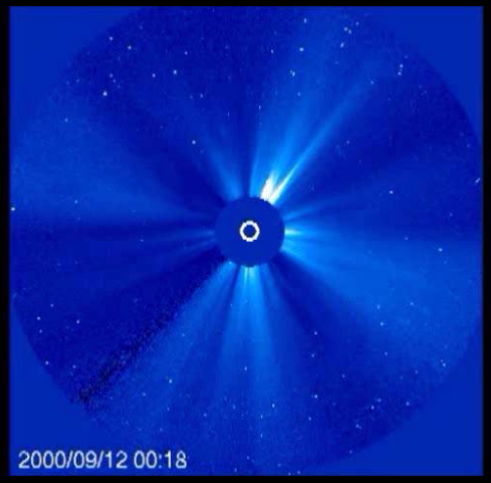


Solar wind-geomagnetic field coupling



~ 1 h

Many, many, many problems…



CME observational problems:

2D projection

Optically thin (relatively transparent) medium

Is this CME comming from the visible hemisphere?!

What is the ñrealòradial speed of the CME?

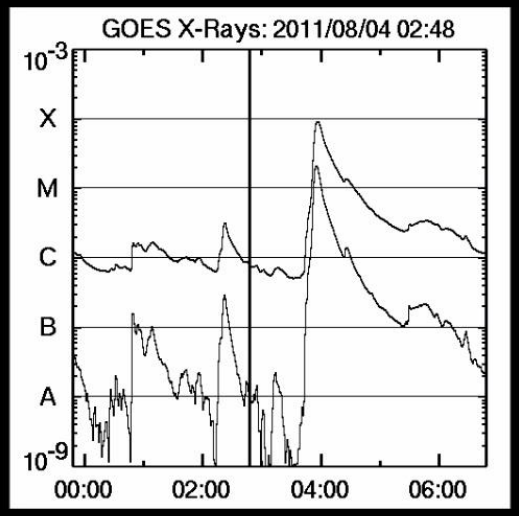
What is the ñrealòwidth of the CME?

What is the ñrealòdirection of the CME?

Will it reach Earth?

What will magnetic field look like when it reaches Earth?

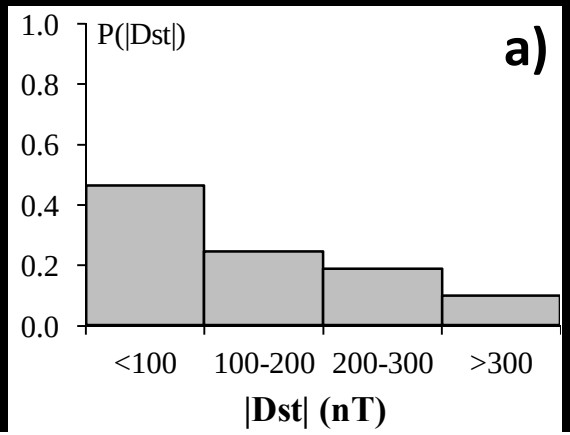
Long story short:

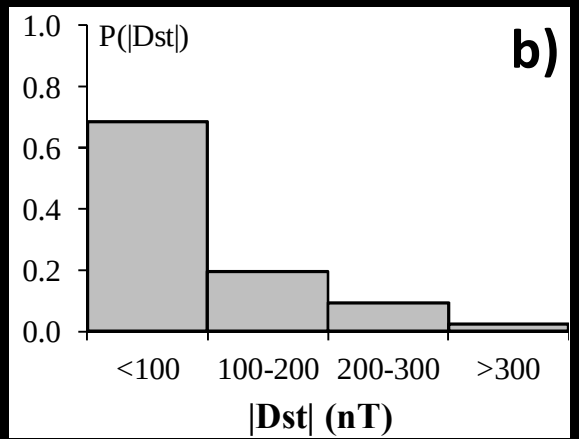


Association of CME & flare ï eruption source region on the solar disc

CME/flare parameters as good (bad) as they areé

a lot of statistics…





Probability distribution for geomagnetic impact (geo-effectiveness)

CME Geo-effectiveness Forecast Tool (CGeFT)

Model input | Documentation

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CME apparent width w: not available

Solar flare x-ray class f: not available

CME-CME interaction level i: not available

Calculate Reset!

CME geo-effectiveness forecast tool has performed 116 successful calculations (since 10.3.2014).

Opservatorij Hvar Hvar Observatory

IGAM

MESEP

SEVENTH FRAMEWORK PROGRAMME

HHEP

HVAR OBSERVATORY WEBSITE: http://oh.geof.unizg.hr/cgeft/cgeft.php

ña lot of statisticsòdescribed

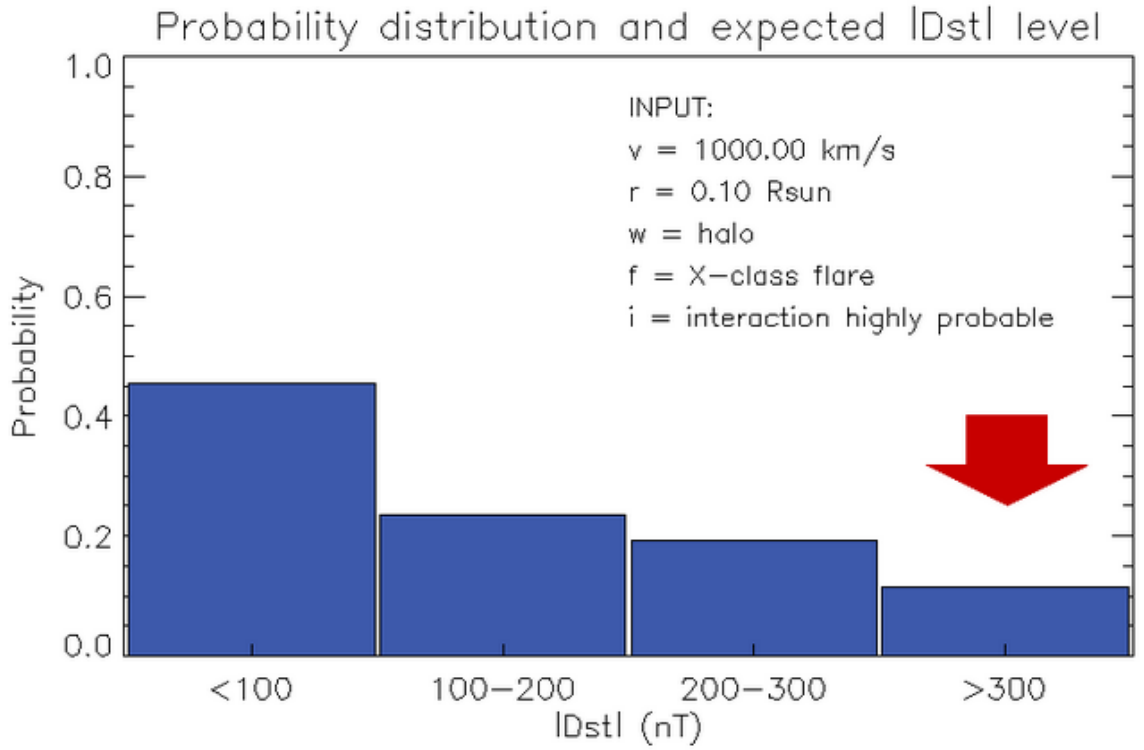
CME Geo effectiveness Forecast Tool (CGeFT)

Results | Documentation

Output:

Based on the probability distribution for a given CME (blue histogram), the expected |Dst| level calculated by the model is |Dst| > 300 nT (marked by arrow).
Combined probability distribution calculated based on P_v,P_r,P_w,P_f,P_i(see table and table description).

For model calculation details see documentation.



Alert Viewer

Current time: 27-03-2014 07:49

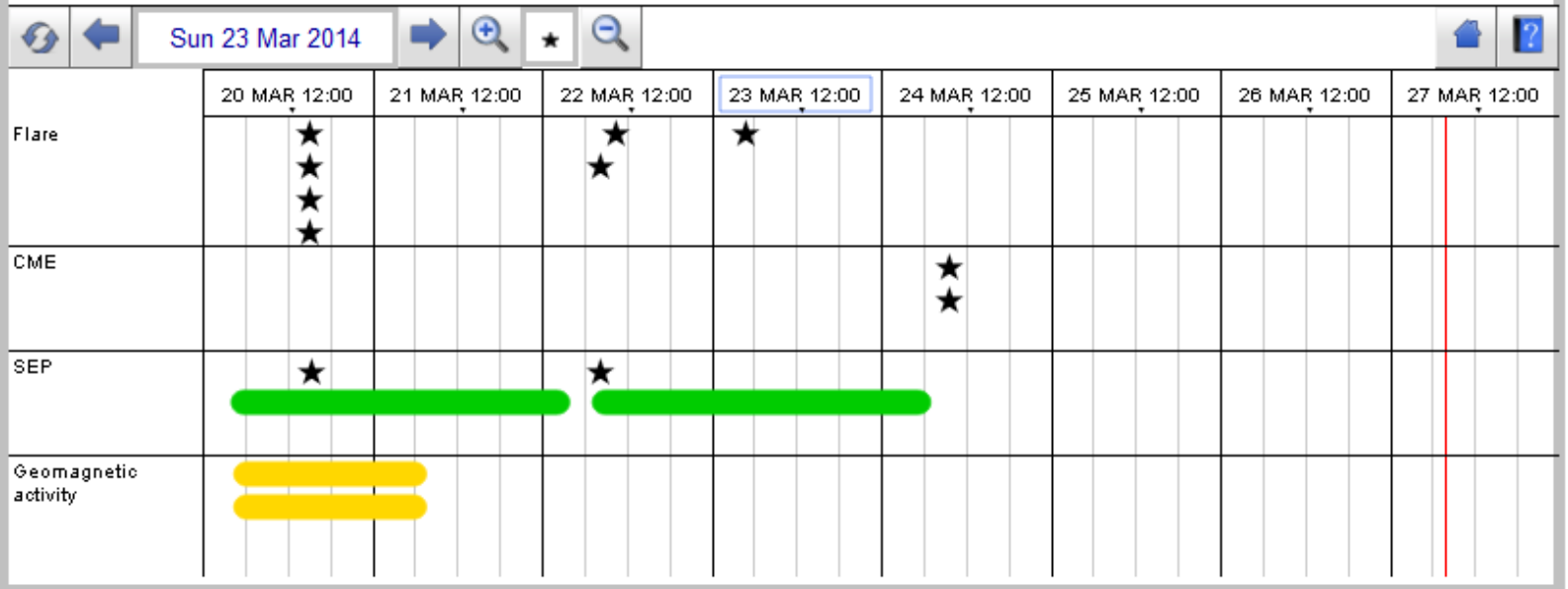
	Latest issued alert	Impact risk
Geomagnetic Storm Alert	No alert since 10 days	Nothing to report
SEP Proton Storm Alert > 10 MeV	No alert since 5 days	Nothing to report
SEP Proton Storm Alert > 60 MeV	No alert since 14 days	Nothing to report

Legend: ★ ... an alert has been issued

...risk impact (timing and level, • low, • medium, • high, • extreme)

Times are in UTC

Click on the icons to see alert details



The "Legend" panel gives some common information about the displayed alerts and impact risks.

Register for COMESEP alerts

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COMESEP alert webpage:
http://comesep.eu/alert/

Thank you for your attention!

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