



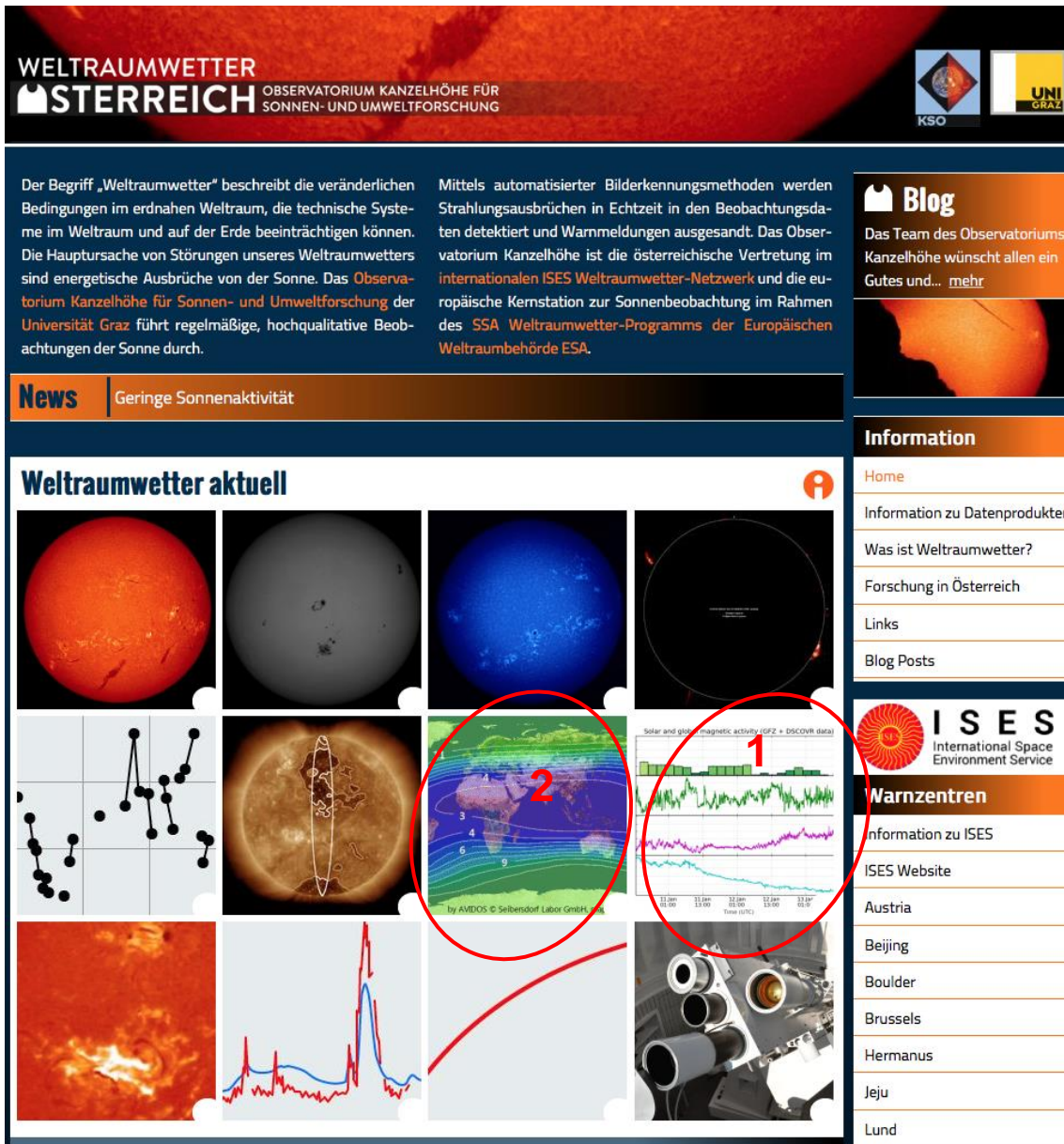
Recent and future actions about Space Weather in Austria

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Institute of Physics, University of Graz, Austria



Kanzelhöhe (UNI Graz) – ISES Network Regional Warning Center Austria



WELTRAUMWETTER ÖSTERREICH OBSERVATORIUM KANZELHÖHE FÜR SONNEN- UND UMWELTFORSCHUNG

Der Begriff „Weltraumwetter“ beschreibt die veränderlichen Bedingungen im erdnahen Weltraum, die technische Systeme im Weltraum und auf der Erde beeinträchtigen können. Die Hauptursache von Störungen unseres Weltraumwetters sind energetische Ausbrüche von der Sonne. Das Observatorium Kanzelhöhe für Sonnen- und Umweltforschung der Universität Graz führt regelmäßige, hochqualitative Beobachtungen der Sonne durch.

Mittels automatisierter Bilderkennungsverfahren werden Strahlungsausbrüchen in Echtzeit in den Beobachtungsdaten detektiert und Warnmeldungen ausgesandt. Das Observatorium Kanzelhöhe ist die österreichische Vertretung im internationalen ISES Weltraumwetter-Netzwerk und die europäische Kernstation zur Sonnenbeobachtung im Rahmen des SSA Weltraumwetter-Programms der Europäischen Weltraumbehörde ESA.

Blog
Das Team des Observatoriums Kanzelhöhe wünscht allen ein Gutes und... [mehr](#)

News | Geringe Sonnenaktivität

Weltraumwetter aktuell

Information
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Was ist Weltraumwetter?
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ISES
International Space Environment Service

Warnzentren
Information zu ISES
ISES Website
Austria
Beijing
Boulder
Brussels
Hermanus
Jeju
Lund

spaceweather.at updated to cover activities

- University of Graz
- Conrad Observatory **1**
- Seibersdorf Laboratories **2**
- (IWF will follow soon)

(ESA requested to use the text from spaceweather.at describing „Was ist Weltraumwetter“ .)

Conrad Observatory – Space Weather Activities

Geomagnetically induced currents in Austria

GICs are **result of solar wind interaction** with Earth's magnetosphere

Can **cause damage to power grids**, e.g. March 1989 power outage (9h) in Quebec

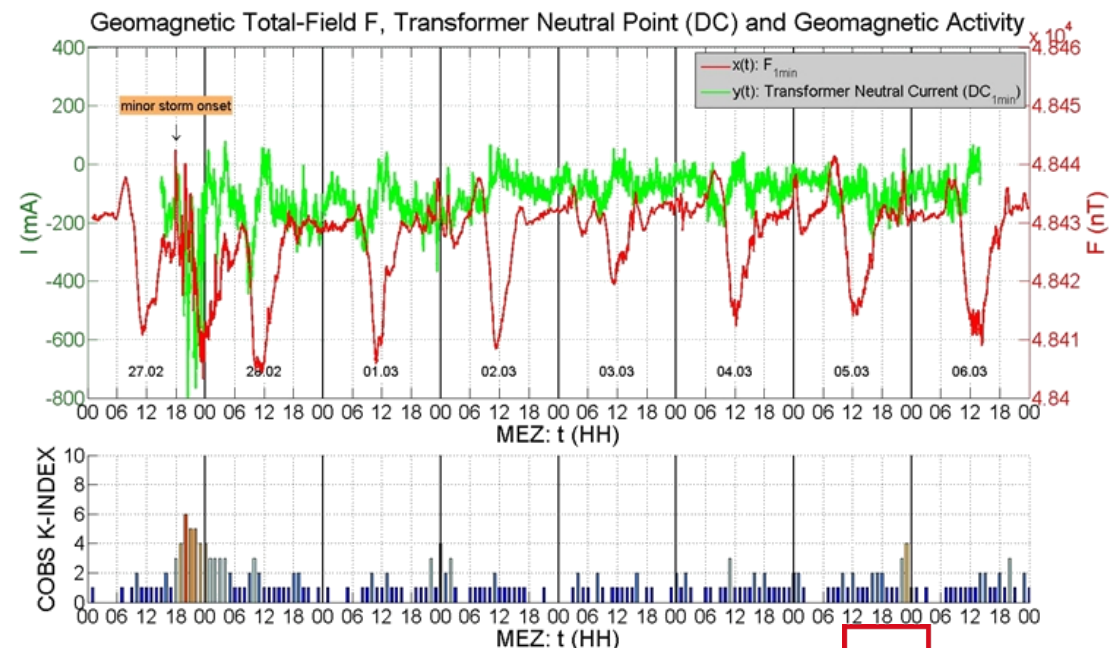
GIC in Austria could be larger than in nearby countries due to highly resistive alps

Measurements by Austrian Power Grid (APG) already show **considerable DC currents** in transformers

FFG project **GEOMAGICA** looks at GIC in **Austria / Central Europe**



Credit: PSE&G



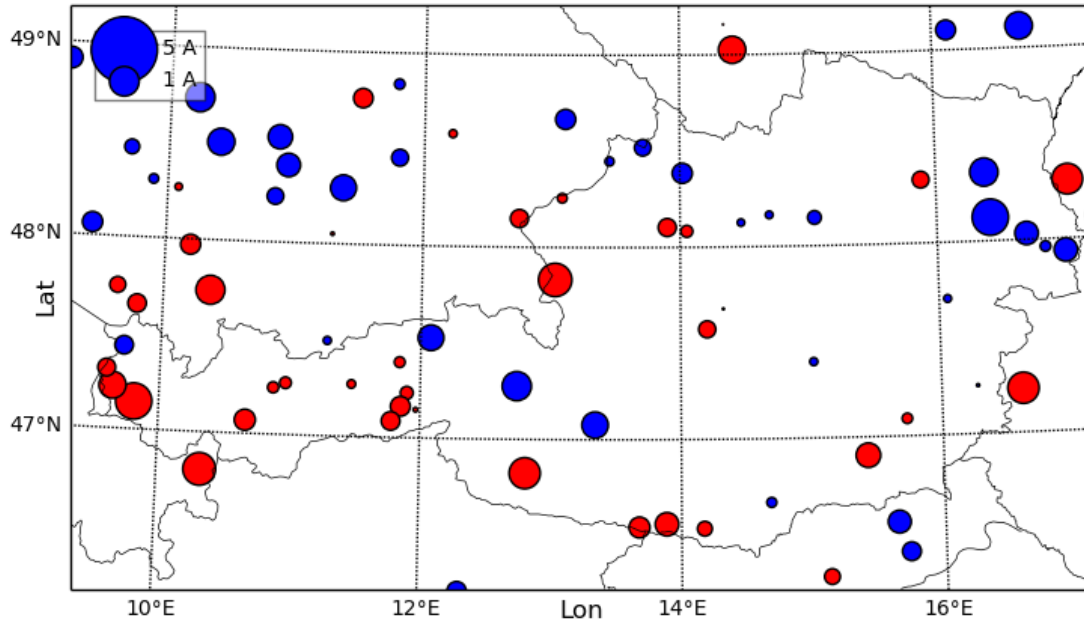
Credit: APG

Conrad Observatory – Space Weather Activities

Geomagnetically induced currents in Austria

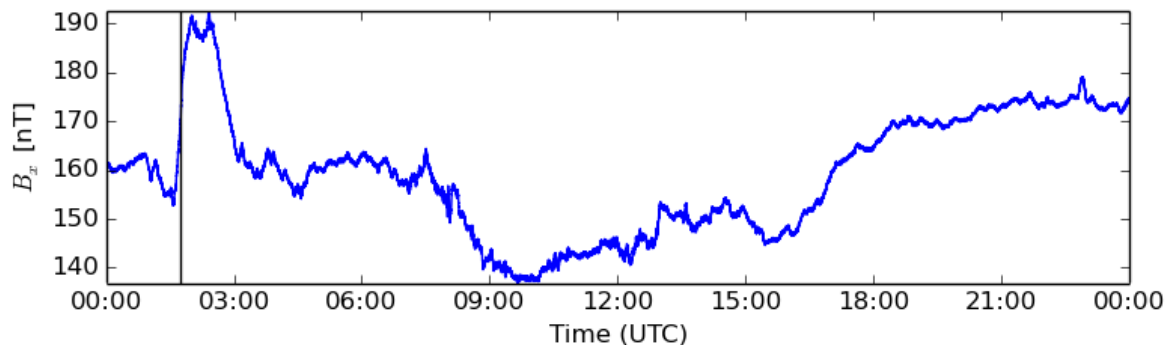


GIC in Austria on 2014-10-15



FWF project partners: Austrian Power Grid, British Geological Survey, TU Graz, ...

Contact: Roman Leonhardt and Rachel Bailey



IWF/OEAW SPACE WEATHER ACTIVITIES

- Hardware & data analysis & theory contribution to ongoing and future space missions for studying effects and causes of space weather
- Reserach topics:
 - CME propagation
 - Solar wind- Earth's/planets' magnetosphere interaction
 - CME/flare induced atmospheric density disturbances
- Hardware contributions to future missions for space-weather sciences
 - SOSMAG (Service Oriented Spacecraft Magnetometer): a ready-to-use space weather monitoring system
 - ESA's Space Situational Awareness program finished in 2016
 - onboard Korean *GEO-KOMPSAT-2A* mission (Launch 2018)
 - DPU for Soft-X ray Imager onboard ESA/CAS Mission SMILE (Solar wind Magnetosphere Ionosphere Link Explorer) (Launch 2018)

Contact: Rumi Nakamura

UniGraz – ESA Expert Service Center for Heliospheric Weather (operational since October 2016)



See also swe.uni-graz.at

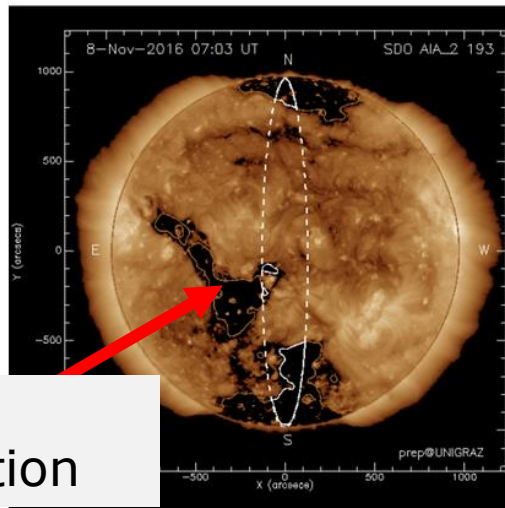


About SWE
What is Space Weather
SSA Space Weather Activities
Current Space Weather
Contact
Applications Preferences
Service Domains
Spacecraft Design
Spacecraft Operation
Human Space Flight
Launch Operation
Transitionospheric Radio Link
Space Surveillance and Tracking
Power Systems Operation
Airlines
Resource Exploitation System Operation
General Data Service
Expert Service Centres
Solar Weather
Space Radiation
Ionospheric Weather
Geomagnetic Conditions
Heliospheric Weather
Other Resources
Documents
SWWT
SWEN Newsletter
Upcoming Events
Sign-In
Roland Maderbacher is signed in
Sign Out

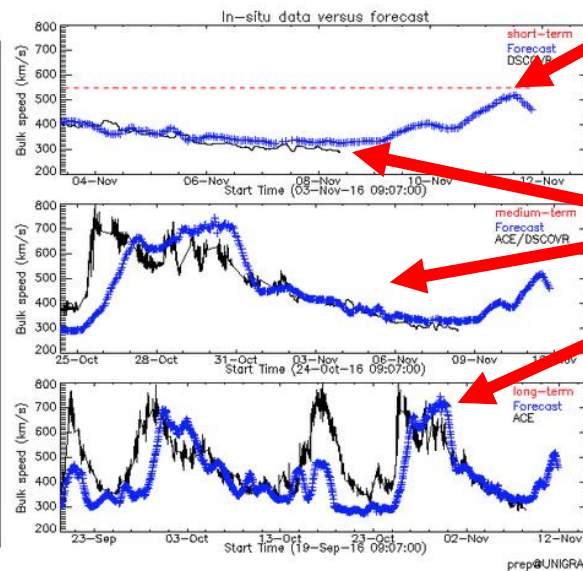
Federated products from the University of Graz (UNIGRAZ)



ESWF (Empirical Solar Wind Forecasting)



CH detection



Critical SW speed

Comparison to measurements (ACE, DSCOVR)

UNIVERSITY OF GRAZ

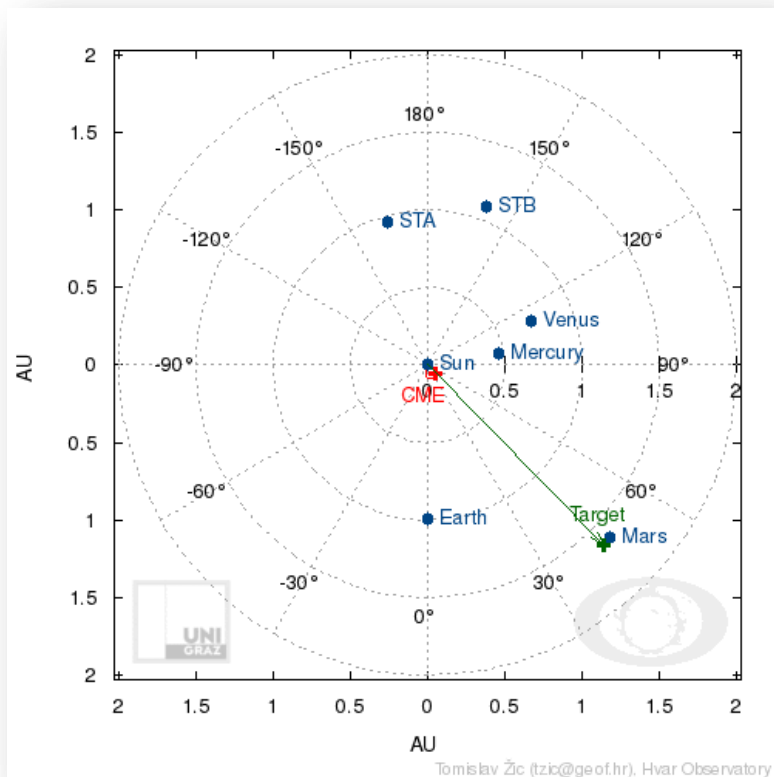
The ESWF uses an empirical relation to derive the solar wind speed at Earth distance (Vrsnak, Temmer, Veronig, 2007). The Sun is monitored in EUV (NASA/SDO) from which coronal hole areas are extracted to calculate the solar wind speed at 1AU with a lead time of about 4 days (Reiss et al., 2016). We compare the forecast for three different time ranges to in-situ data (ACE/DSCOVR). The red dashed line marks the arrival of solar wind streams of enhanced speed. This service is updated automatically every hour.

This web page forms part of the ESA Space Situational Awareness Programme's network of space weather service development activities, and is supported under ESA contract number 4000113183/15/D/MRP. For further product-related information or enquiries contact helpdesk. E-mail: helpdesk.swe@ssa.esa.int. All publications and presentations using data obtained from this site should acknowledge UNIGRAZ and The ESA Space Situational Awareness Programme. For further information about space weather in the ESA Space Situational Awareness Programme see: www.esa.int/spaceweather. Access the SSA-SWE portal here: swe.ssa.esa.int.





See also swe.uni-graz.at



- Geomagnetic Conditions
- Heliospheric Weather
- Other Resources**
- Documents
- SWWT
- SWEN Newsletter
- Upcoming Events
- Sign-In**
- Roland Maderbacher is signed in
- Sign Out



ational awareness

Federated products from the University of Graz (UNIGRAZ)

Drag-Based Model: Arrival-Forecasting of ICMEs

Results Kinematic plot CME geometry plot Documentation

Output:

CME arrival at target (date & UTC time): **10.11.2016 at 13h:57min**
 Transit time: **52.42 h**
 Impact speed at target (at 0.99 AU): **580 km/s**

Input parameters:

CME take-off date & UTC time: **08.11.2016 at 09h:32min**
 $\gamma = 0.20 \times 10^{-7} \text{ km}^{-1}$, $w = 396 \text{ km/s}$,
 $R_0 = 20 r_{\text{Sun}}$, $v_0 = 1000 \text{ km/s}$, $\lambda = 30^\circ$, $\varphi_{\text{CME}} = 0^\circ$
 $R_{\text{target}} = 0.99 \text{ AU}$, $\varphi_{\text{target}} = 0^\circ$

Calculated in 2.45 seconds.
[Download the output files!](#)

2 options

Real-time Custom

Select drag parameter γ based on event: normal: 0.2 $\times 10^{-7} \text{ km}^{-1}$ Select

Select value for the constant solar wind speed w : mean: 396 km/s Select

Starting radial distance of CME, $R_0 = 20 r_{\text{Sun}}$

Speed of CME at R_0 , $v_0 = 1000 \text{ km/s}$

CME's angular half-width, $\lambda = 30 \text{ deg}$

Longitude of source region, $\varphi_{\text{CME}} = 0 \text{ deg}$

The real-time forecasting is only valid for **Earth!**

[Calculate](#) [Reset!](#)

© Tomislav Žic, Hvar Observatory, 2015 | Number of visits: 2015

Download all results

Results

2 options

User input

Fast and easy download for Kanzelhöhe Observatory image data (new! 01/2017)

kanzelhohe.uni-graz.at



Kanzelhöhe H α , Whitelight and CaIIK Data Archive

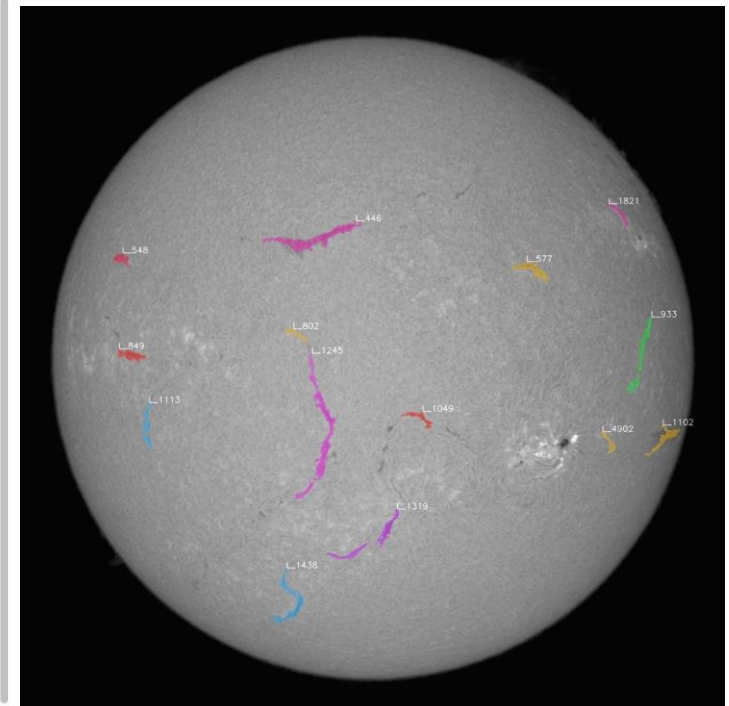
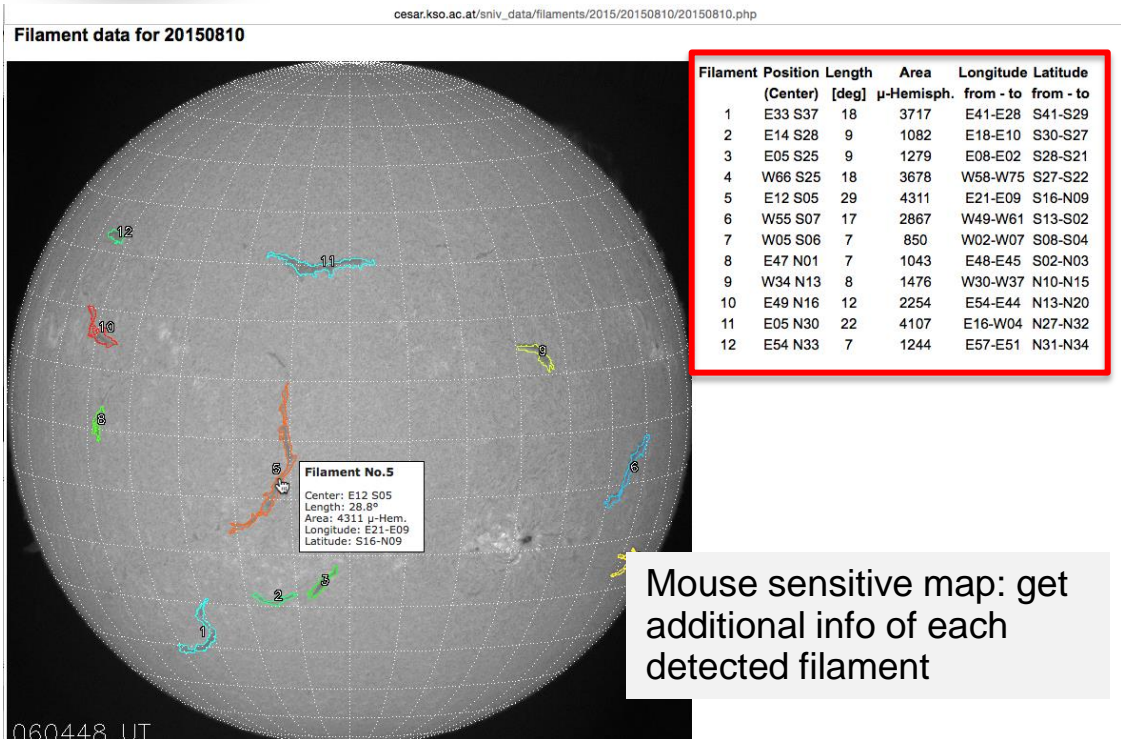
H α Archive	Whitelight Archive	CaIIK Archive
(latest H α image from KSO)	(latest Whitelight image from KSO)	(latest CaIIK image from KSO)
» Archive...	» Archive...	» Archive...

VarSITI: scientific program of SCOSTEP (2014-2018)

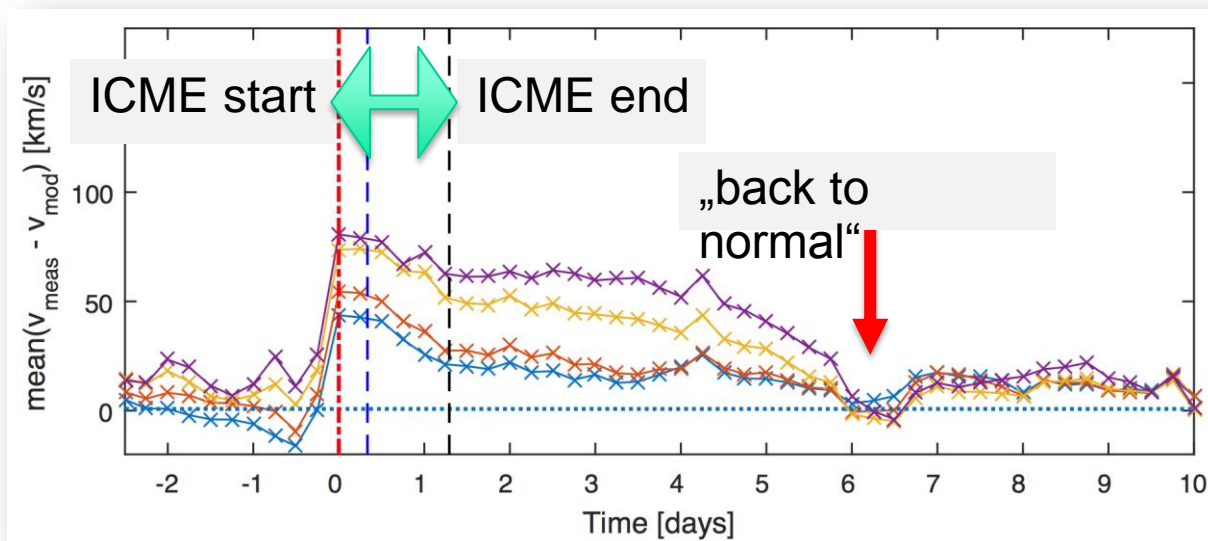
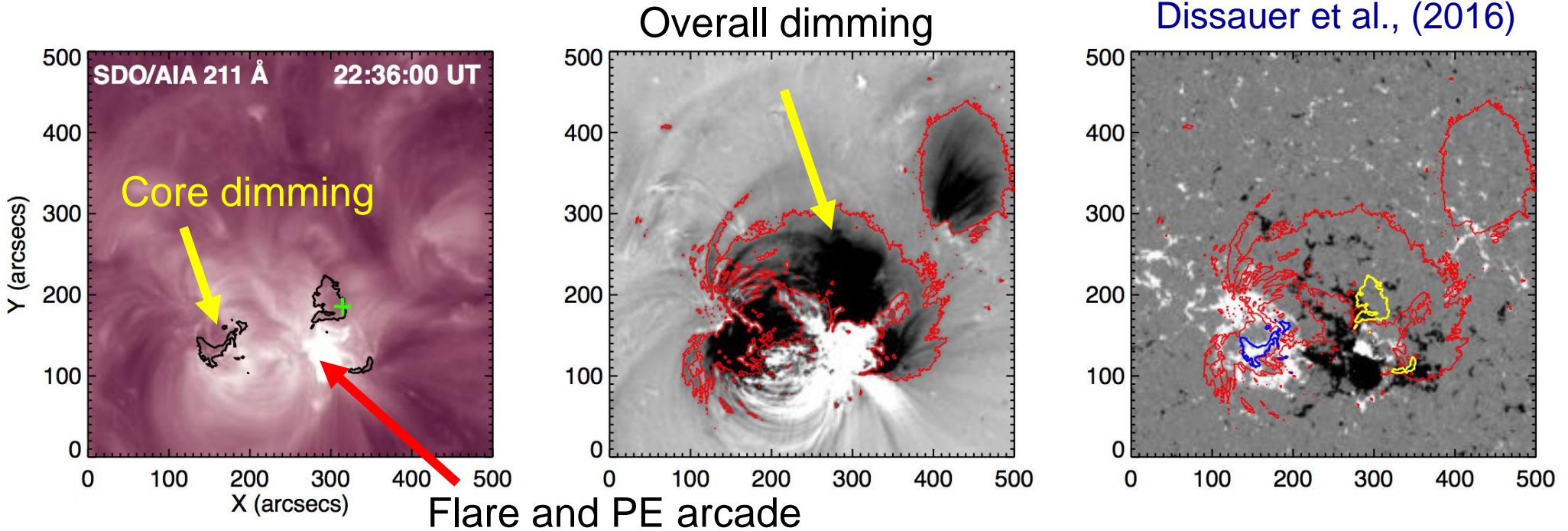


UNI Graz provides daily email service (ISEST/MiniMax24 campaign), giving forecasts of solar wind high speed streams and filament eruptions.

Automated filament detection at Kanzelhöhe (developed during ESA/SSA) is active since summer 2015.



Uni Graz – recent scientific results



IP space needs 4.25–6 days to recover from an ICME disturbance. Preconditioning :: input for Space Weather models and forecasts. [Temmer et al., \(2017; in press for ApJ\)](#)

SWE products „made in Austria“

- *Seibersdorf Laboratories*: AVIDOS – real-time aviation dose rates
- *Conrad Observatory*: GEOMAGICA – development of automated GIC warning system
- *Space Research Institute*: SWE satellite mission participation and research in planetary space weather as well as CME propagation
- *UNI Graz / Kanzelhöhe Observatory*:
 - Automatic near-real-time detection of flares and filaments (Pötzi et al., 2015; Veronig and Pötzi, 2016)
 - Automated verification of solar wind forecasting – swe.uni-graz.at (Reiss et al., 2016)
 - In collaboration with University of Zagreb (Croatia), the drag-based model (DBM) will be enhanced for ensemble modelling (M. Dumbovic, B. Vrsnak, M. Temmer)
 - Research in preconditioning of IP space, CME propagation and relation to solar surface activities (flares, coronal waves, magnetic field models, ...) [Temmer et al., 2017](#)