2ⁿᵈ Sunspot Number Workshop
SIDC, ROB, Brussels, 21-25 May 2012

Workshop Summary / Discussion
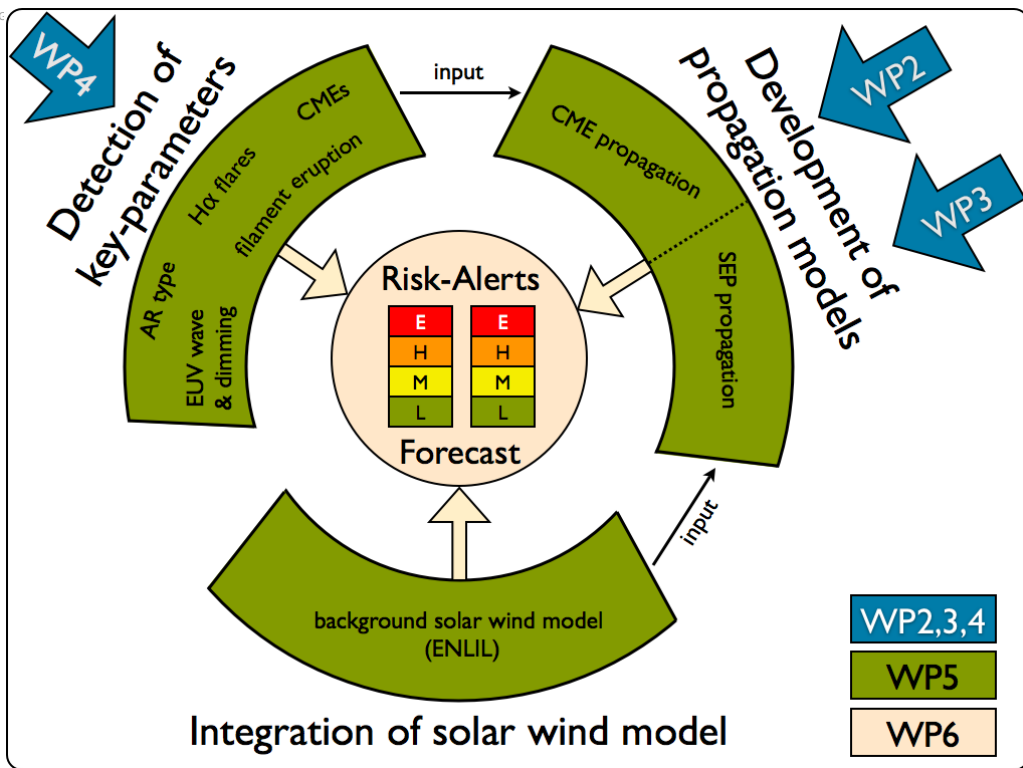
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COMESEP [COronal Mass Ejections and Solar Energetic Particles]: forecasting the space weather impact

Project Coordinator: Norma B. Crosby
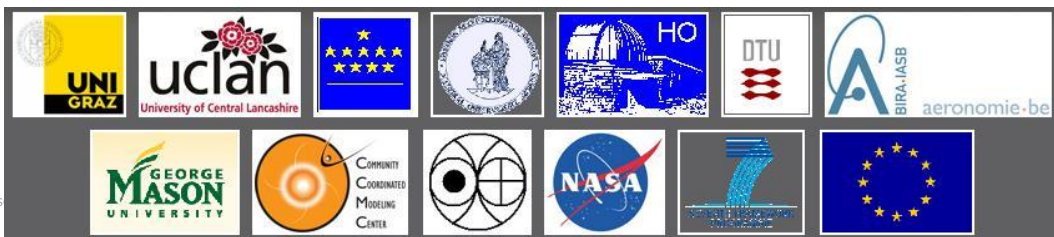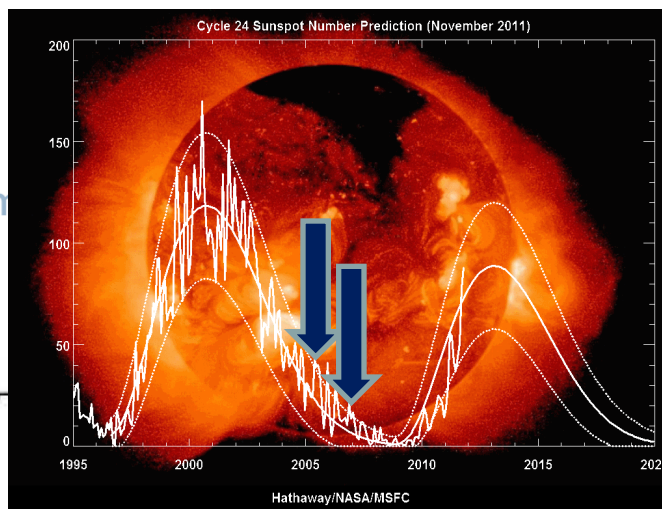

http://www.comesep.eu/

WP3: SOLAR ENERGETIC PARTICLES

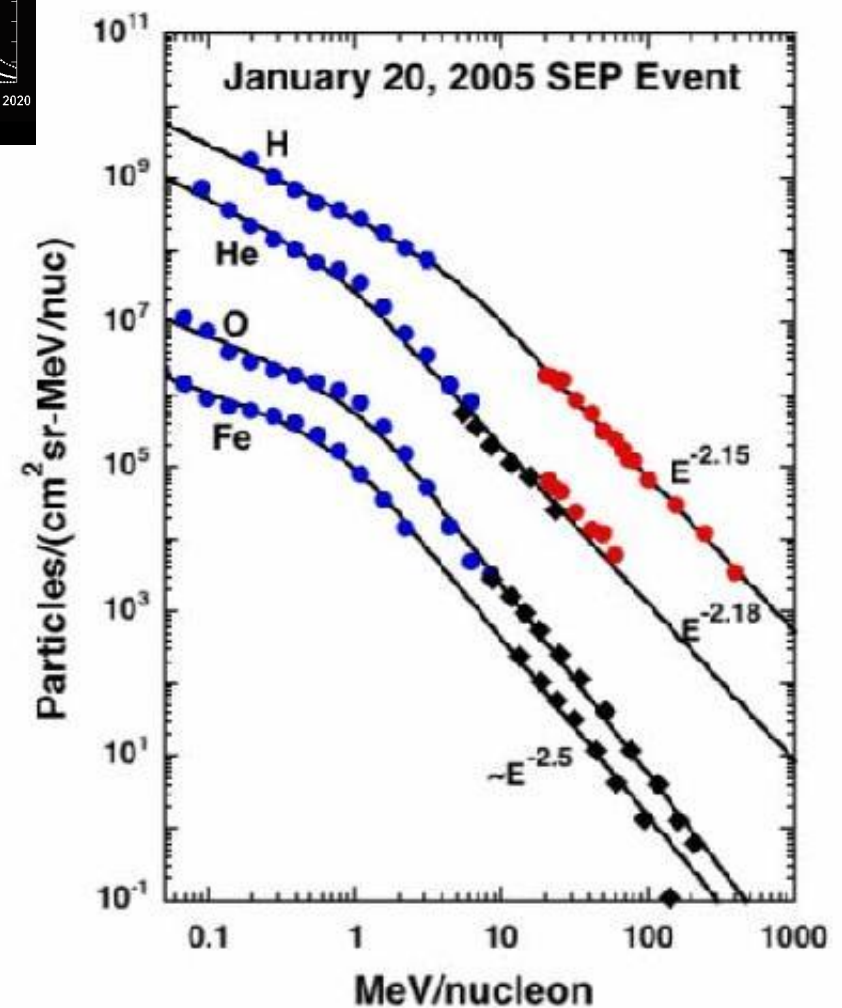• Enhance our understanding of the source of SEP events and acceleration processes, as well as SEP propagation.
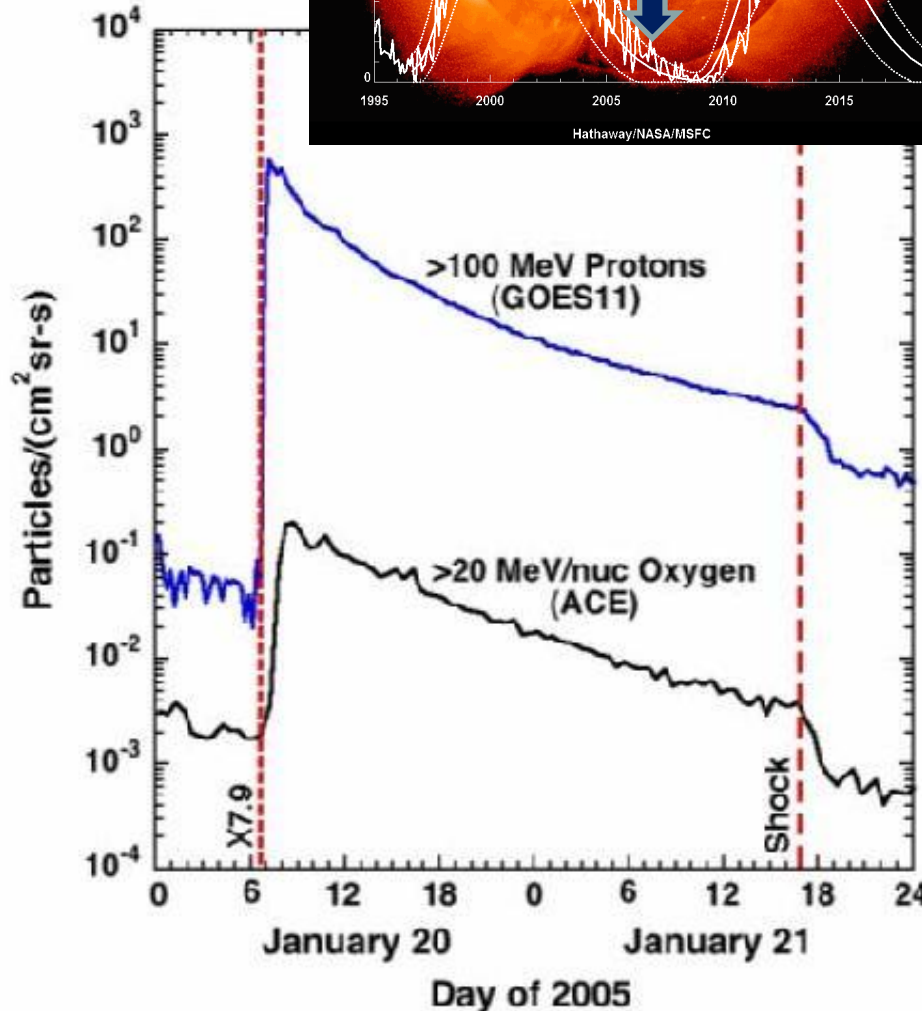
• Advance SEP modelling to include CME propagation effects, cross-field diffusion and heavy ions.
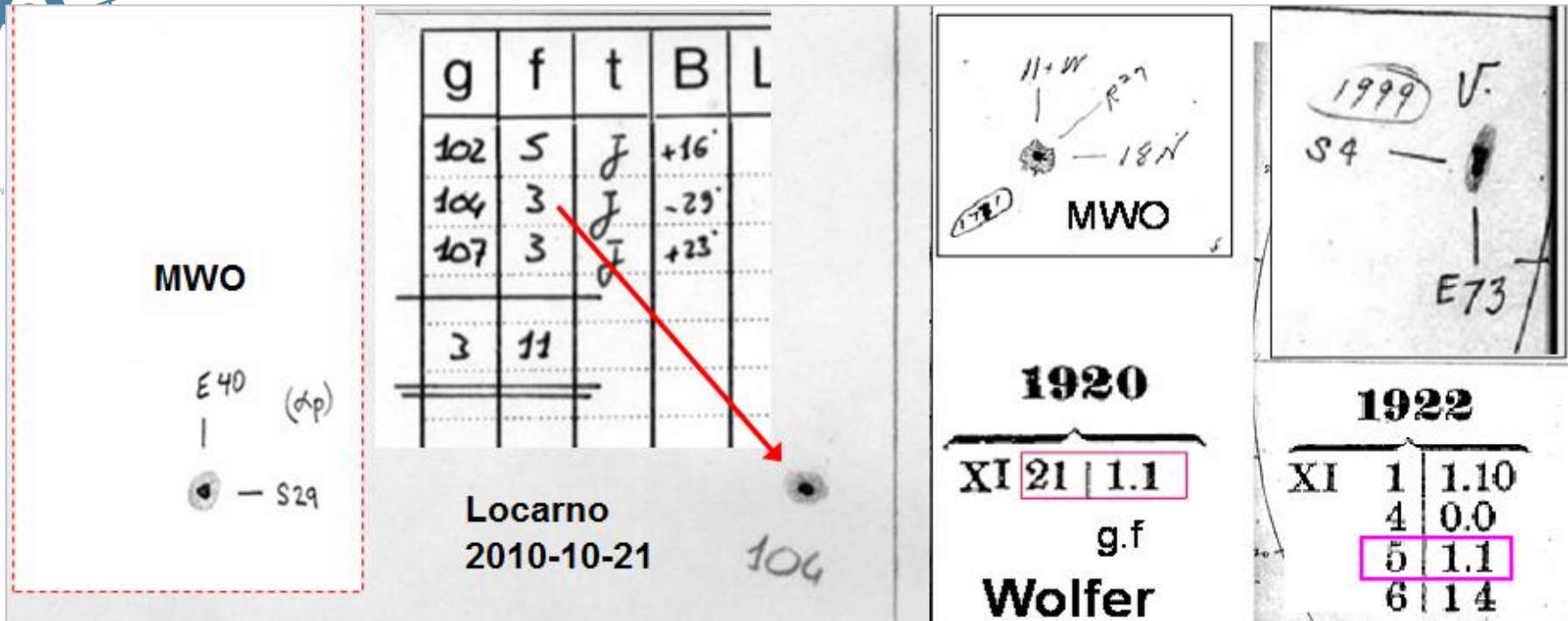
SEP "anomaly" events:

- Jan. 2005
- Dec. 2006

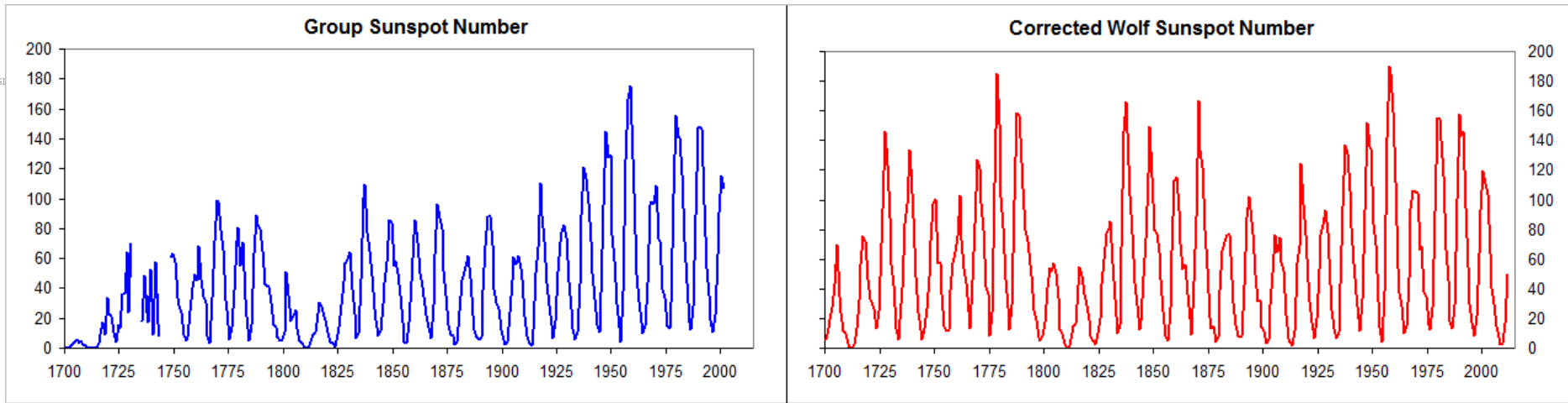# COMPARING METHODS

[Leif Svalgaard, Comparative Magnetic Minima: characterizing quiet times in the Sun and stars Proceedings, IAU Symposium No. 286, 2012]

World Sunspot Number (Wolf Sunspot Number = Zurich Sunspot Number = International Sunspot Number)

Group Sunspot Number (based solely on the number of sunspot groups)
- Overestimation during solar min.
- Underestimation during solar max.

COMPARING METHODS

[Leif Svalgaard, Comparative Magnetic Minima: characterizing quiet times in the Sun and stars Proceedings, IAU Symposium No. 286, 2012]

- Has solar activity changed or not changed during the last centuries?
- Corrected / non-corrected data
- Weighting / no weighting.

THE PAST

Defining a sunspot; variations between stations/ observers may be caused by:

- <u>Detector characteristics</u> (calibration, spatial resolution, …)

- <u>Objective factors</u> (latitude, seeing - weather conditions, solar min./max., GCRs – cosmogenic isotopes, Earth's magnetic field (tilt, seasons), geomagnetic indices, CO_2 concentration ?, …)

- <u>Subjective factors</u> (each observer has their own observing routine, eyesight changes with time, "sunspot location on disk - hemispheric variation" …) are biased.

THE PAST – cont.

What are good proxies for correlation studies?

- Direct measurements: F10.7 cm, Ca II K-line, ….

- Indirect measurements: Kp-indices (5 or greater indicate storm-level geomagnetic activity), … [errors accumulate]

Correlations seem to get better for longer periods of time averaging (=> bias ?).

THE PAST – cont.

Wolf could not see groups of Zurich classes A and B
[=> spatial resolution constraint]

- Pores vs. the smallest sunspot [will higher spatial resolution observations show smaller sunspots in the future?]

- Bright points in X-rays.

For the datasets should "-99" or "0" be used?

THE FUTURE

International standardization of the World Sunspot Number and Group Sunspot Number

Harmonization !

Why?
- ground-based observations (problems will not disappear)
- space-based observations (huge quantities of data!)

An automatic procedure – the way forward:
- Optimize methods used on past data to develop one common method [important to document procedure]
- Use good proxies for sunspots (F10.7 cm, Ca II K-line, …) for the optimization
- Inter-disciplinary approach.