

Why are we here?

Synoptic groundbased observations are important for research in solar and space physics and space weather operational forecast

But...

- we need better coordination (including between ground- and space- based)
- better long-term planning for operations (funding shortage, aging facilities, the SolarNet/SPRING community, GONG refurbishing, CHAIN-/SONG-/STOP-networks, etc)
- addressing issues with data preservation

Approximate agenda

1. Introduction: statement of problem and perhaps, mentioning the related activities by the IAU working group on coordination of synoptic observations of the Sun
2. Overview of existing groundbased observatories/synoptic programs with summary of current issues (Alexei)
3. Summary of current state of preservation of solar data (Frederic)
4. Future plans for synoptic networks (Markus)
5. ... other presentations?
6. Open discussion



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Inter-Division B-E WG Coordination of Synoptic Observations of the Sun — **Functional**

Description

The mission of this working group is to facilitate international collaboration in synoptic long-term solar observations, which includes past, current, and future synoptic programs, preservation, calibration, and access to synoptic solar data products. The working group provides a forum for discussion of all issues relevant to synoptic long-term observations of the Sun including (but not limited to) coordination between synoptic programs in different countries (both in respect to exchange of information and planning for future synoptic programs) and a proper calibration of historical data from different sources (sunspot drawings, CaK plage indices, magnetic field measurements etc).

[Working Group Members \(54\)](#)

Under

[Division B Facilities, Technologies and Data Science](#)

[Division E Sun and Heliosphere](#)

Brief Description of WG

WG was created at the end of 2011-early 2012; in 2015 after the IAU restructuring, it became "*Inter-Division B and E WG on Coordination of Synoptic Observations of the Sun*" (functional).

Co-Chairs: Frederic Clette (Belgium) and Alexei Pevtsov (USA)

WG web pages:

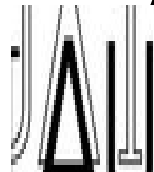
http://www.iau.org/science/scientific_bodies/working_groups/255/

<http://www.nso.edu/IAU-Com12> – direct link to

WG Discussion Questions:

Following questions were posted for discussion by all members of the WG:

1. Synoptic data and data products: What kind of data and data products should be part of long-term synoptic programs?
2. Funding sources for long-term synoptic programs?
3. Should this IAU working group serve as an expert board for defining/recommending ground-based synoptic data standards?
4. How can we improve the compatibility of synoptic data collected at different times and different observatories?
5. How can we build better synergies between ground based synoptic observations and solar space missions?
6. What is the best way to provide synoptic data to users? Data preservation.



Why do we need long-term synoptic programs?

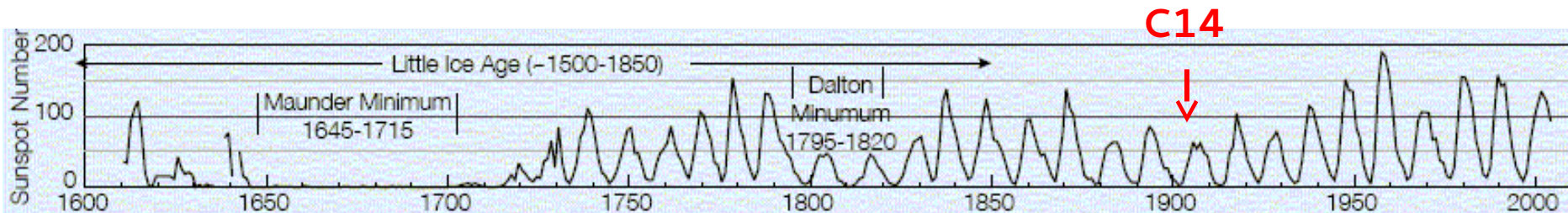
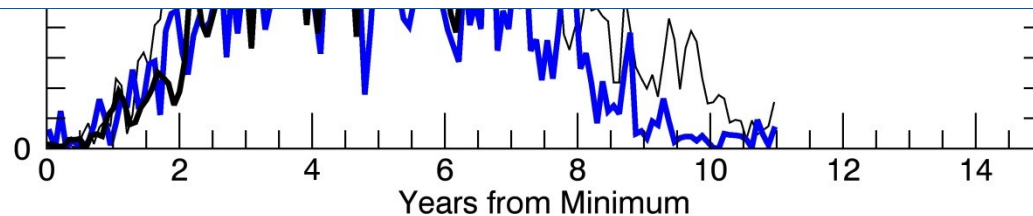
Alexei A. Pevtsov

US National Solar Observatory

How Unusual Cycle 24 is?



- What is a "typical" sunspot/flare/filament?
- Would sunspots disappear some day?
- Does Sun approach new grand (Maunder-type) minimum?
- How solar activity will change over next 20 years?



Why long-term/synoptic programs?

- Benchmarking: provide reference for “typical/normal” state of natural systems (sun)
- Systemic change: Provide information about evolutionary changes in natural systems
- Exploratory: synoptic observations of solar activity feed future research to solve issues that may not be identified at the time when data are acquired

Synoptic. But Why?

Pure science (curiosity):

- Solar and stellar processes and their changes (e.g., solar flares, coronal mass ejections, etc.).
- Sun-Earth connections and space climate

**Observations are not well-defined.
Monitor as long as possible !**

Applied science (space weather):

- Providing routine observations for space weather forecasting.

**Observations are well- (better) defined.
Monitor as long as needed !**

Brief History of Early Synoptic Programs

- Sunspot numbers (1600-present; Rudolf Wolf, 1848), sunspot drawings, RGO photographic observations (1874-1976), CaK observations (Kodaikanal, India 1907-1999, MWO 1915-1985), Meudon synoptic maps (1919-), sunspot field strength measurements (MWO, 1917-present), etc (other e.g., NAOJ).
- **Modern era (late-1940th):** Kislovodsk Mountain Astronomical Station (1948), Sacramento Peak Observatory (1949), radio (2800 MHz/10.7 cm, Ottawa/Dominion 1946-present), magnetographic measurements (NSO, MWO, WSO).
- **Networks (late-1950th):** "Sun Service" program (USSR, mid-1950th-2010), the Solar Observing Optical Network (SOON, 1970th-present), helioseismology networks, GONG (1995-present) , global high resolution H-alpha network (GHN).

Solar Observatories Around the Globe

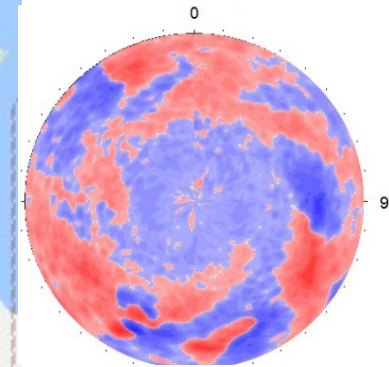
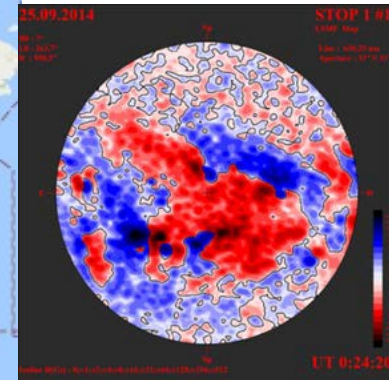


Some current issues

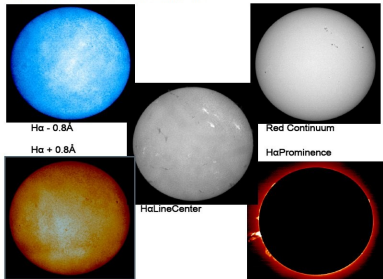
- Long-term datasets are often *ad hoc* collections.
- Lack of coordination between national programs/observatories (non-uniform/ duplicate data).
- No critical evaluation (what do we need to observe, what is missing etc).
- Lack of long-term planning (no well-defined goals, diminishing funding, aging facilities).
- Data preservation.
- Coordination with space missions is not well-defined.

Observatory	BBSO	KANZELHÖHE	CATANIA	MEUDON	Uccle	Pic du Midi	YUNNAN	HUAIROU
Time zone	UTC-8	UTC+1	UTC+1	UTC+1	UTC+1	UTC+1	UTC+8	UTC+8
APT	10 cm	10 cm	15 cm	25 cm	8 cm	9 cm	18 cm	14 cm
F/S	Filter	Filter	Filter	Spctrgrp	Filter	Filter	Filter	Filter
B-PASS	0.025nm	0.07nm	0.05/0.025 _{nm}	0.025nm	0.05nm	<0.05nm	0.06nm	0.05nm
Range	±0.3nm	±0.3nm	±0.1 _{nm}	N/A	±0.25nm*	±0.05nm	±0.05nm	±3.2nm
CCD	2048x2048	2048 x2048	1360 x1200	1500 x1340	2048x2048	2048x2048	2Kx2K	2Kx2K
Bits	12	12	16	14	12	16	8	8
Cadence				1/min – one image	15 min, 1/d, 20/ _{sec}			10 min

Solar Observatories Around the Globe



Solar Telescope of Operational Prognosis



Continuous $H\alpha$ Imaging Network



The Solar Probe Plus Ground Based Network

V3

November 5, 2015

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<http://sppgway.jhuapl.edu/sites/default/files/Pubs/SPP-GBN-WhitePaper-v5.0.pdf>

What we shall do next?

- Develop list of required observables, identify key stations that would take responsibility, and establish source of funding
 - a. International collaborative project funded at National levels?
 - b. Establishing single source of funding based on National contributions?

Some current issues

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