

# STOP telescope, the current status and Perspectives.

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*Kislovodsk mountain astronomical station,  
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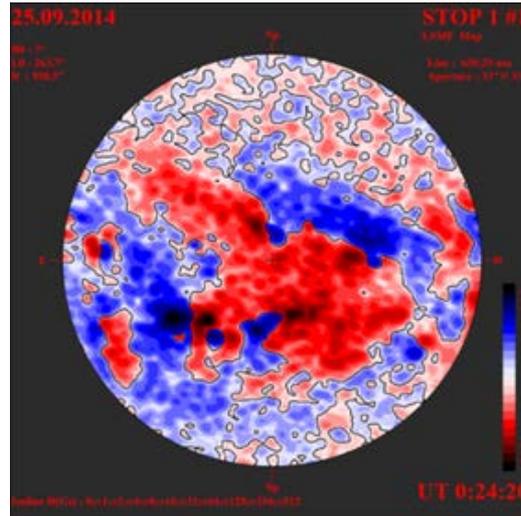
On July 1, 2014 began regular monitoring of large-scale magnetic fields of the Sun on the telescope STOP established on the Mountain Astronomical Station in Kislovodsk

The telescope is mounted on a single foundation (~ 4.5 m) and is equipped with a windscreen pavilion dome. The pavilion is divided into two parts: the heated - operator and not heated - the actual telescope.

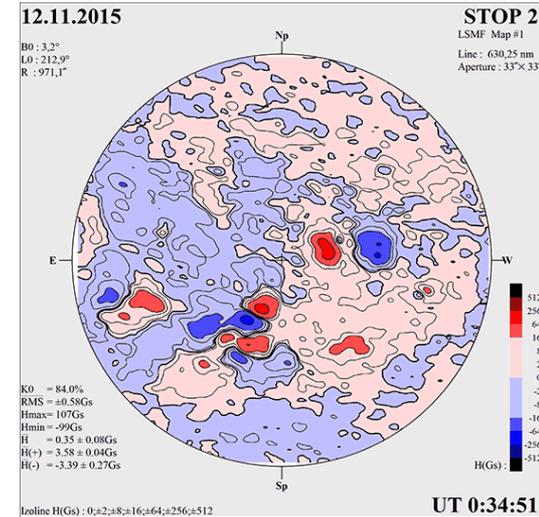




## Irkutsk (STOP1)



## Ussuriysk (STOP2)



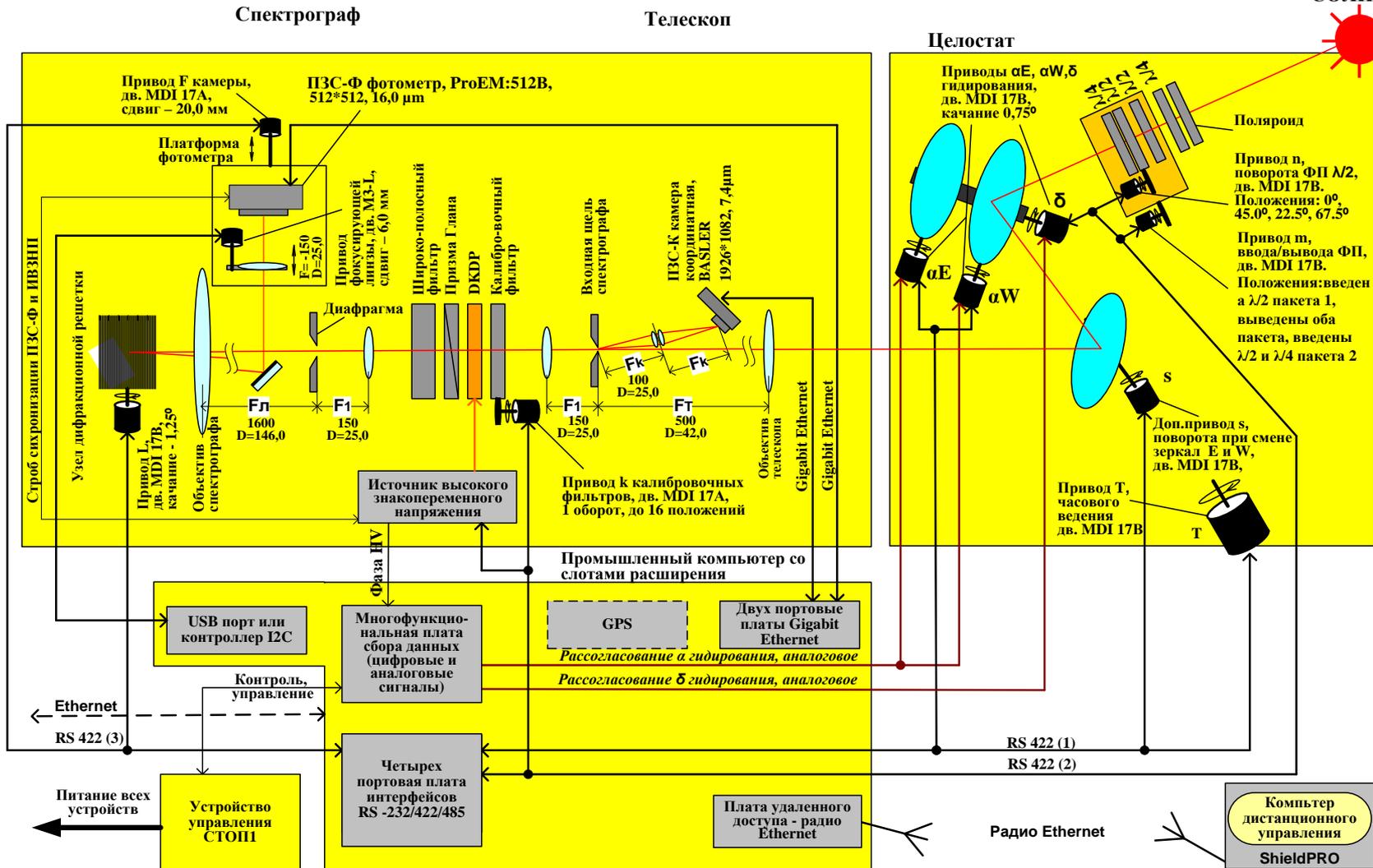
Telescope STOP (highly magnetograph last for measuring weak magnetic fields of the Sun) of the Baikal Astrophysical Observatory ISTP and magnetogram received September 25, 2014.

However, it really works only telescope in Kislovodsk.

Reason:

- 1) there is no money for maintenance.
- 2) In Irkutsk and Ussuriysk broken camera and modulators.

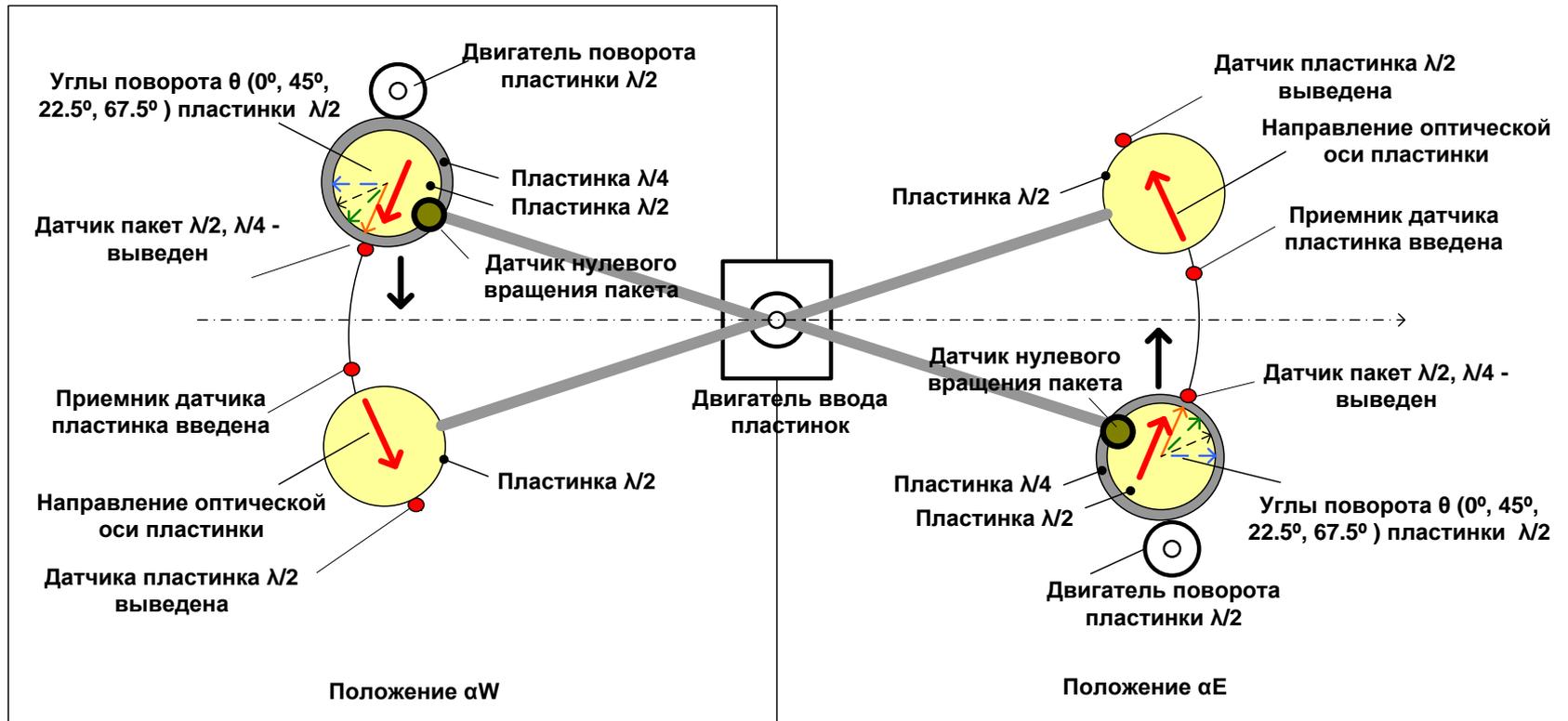
СОЛНЦЕ



Functional scheme the telescope

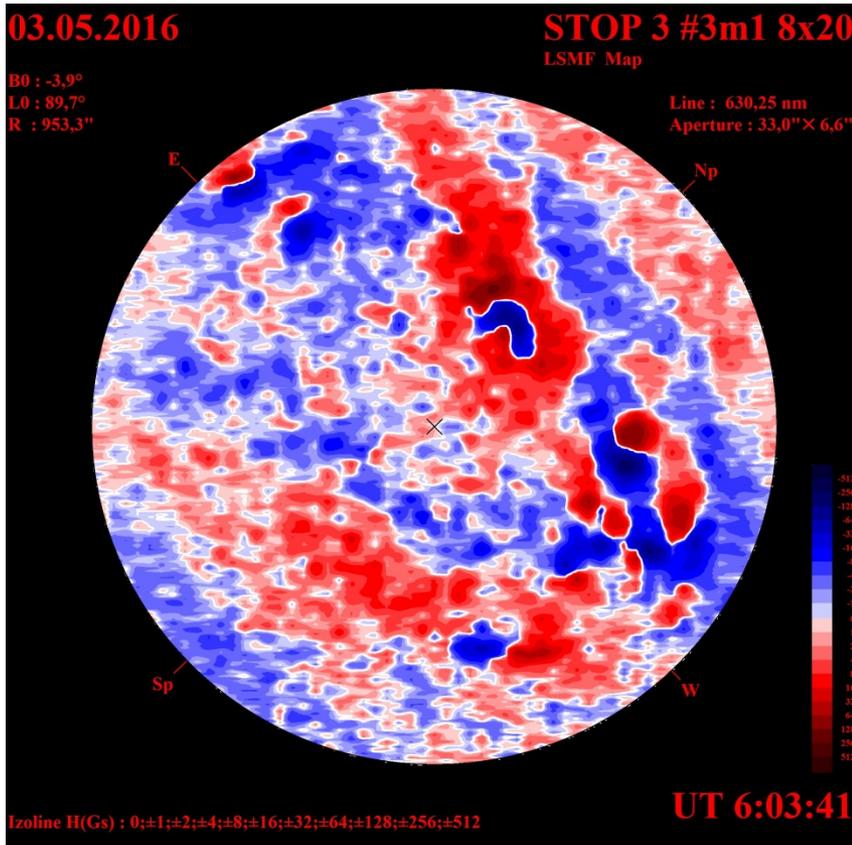
Initially, the telescope was designed as a vector-magnetograph.

Drives a half-wave  $\lambda / 2$  and the quarter-wave  $\lambda / 4$  plates provide control of the zero level of the analyzed signal and modulation of the light flux in polarization measurements.

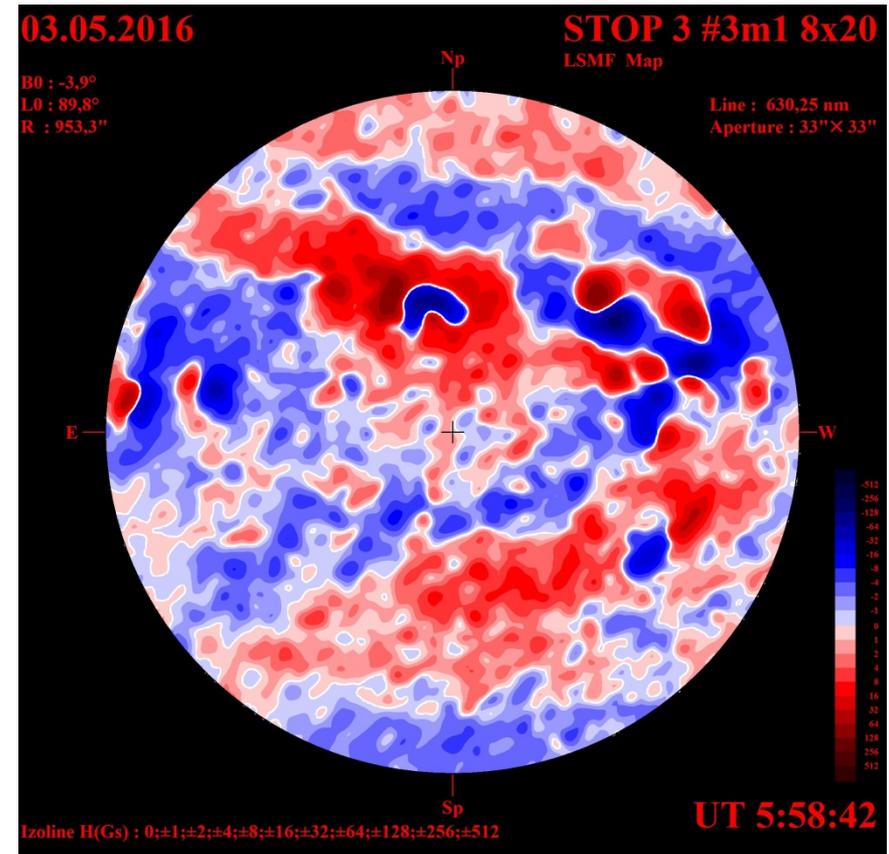


Currently, we only use a half-wave plate. This makes it possible to measure the magnetic field only along the line of sight.

# The spatial resolution of the telescope



33"x 6,6" (512 pxl)  
original



33"x 33"

# Data daily observations are presented online

The screenshot displays the website for the Kislovodsk Mountain Astrophysical Station (Kislovodskaya Gornaya astronomicheskaya stantsiya). The page is titled "Наблюдение магнитного поля" (Observation of the magnetic field). It features a navigation menu with options like "Главная", "О станции", "Сотрудники", "Новости", and "Фотогалерея". A search bar and language selection (Russian and English) are also present.

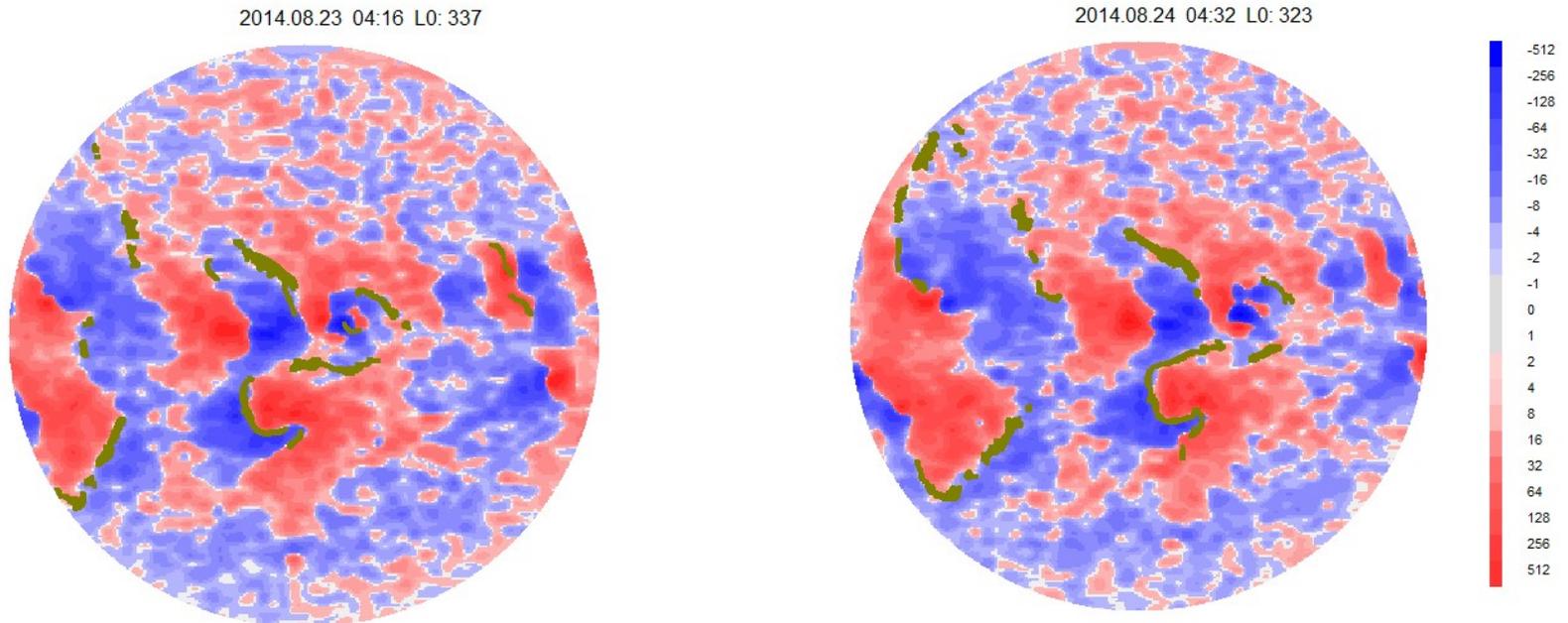
The main content area includes a sidebar with a list of services and activities, such as "Служба солнца", "Наблюдение фотосферы", "Наблюдение хромосферы", "Наблюдение короны", "Значение K-индексов", "Наблюдение в радиодиапазоне", "Патрульные наблюдения", "Наблюдение магнитного поля", "Прогноз скорости солнечного ветра", "X-Ray", "Индексы солнечной активности", "Сводная карта активности", "H-alpha синоптическая карта", "Научная и учебная деятельность", "Проекты", "Студенческая практика", "Архив наблюдений", "Фильм о горной станции", and "Старая версия сайта".

The central part of the page shows a "Синоптическая карта" (Synoptic map) and two circular magnetograms. The magnetograms are labeled "STOP 3 #1m1 8x20 21.09.2015" and "STOP 3 #2m1 8x20 21.09.2015". They display magnetic field strength in Gauss, with a color scale ranging from -100 to 100. The magnetograms are dated "20.09.2015" and "21.09.2015".

At the bottom of the page, there is a weather widget showing "+ 12°C", a search bar, and a footer with contact information: "(87-937) 2-03-67", "(87-937) 3-93-91 (Факс/Офис)", "GAG-GAO", "solar@maglog.ru", and "solarstation.ru - Kislovodskaya Gornaya stantsiya GAO RAN".

[http://solarstation.ru/sun-service/magnetic\\_field](http://solarstation.ru/sun-service/magnetic_field)

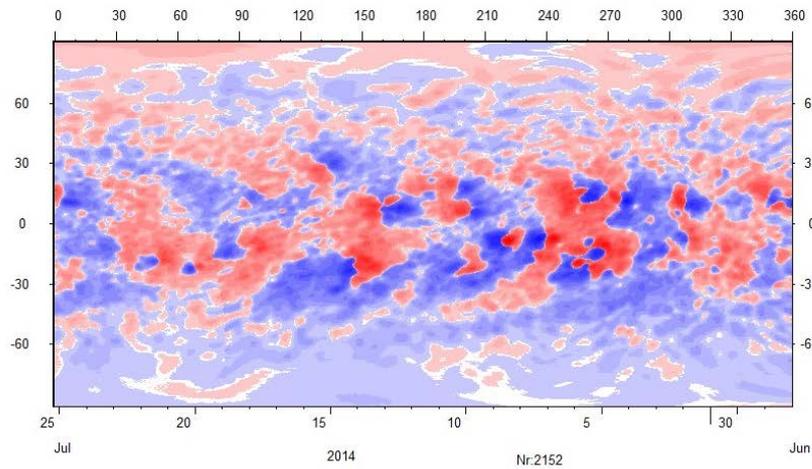
# Verification of zero to the position of the filaments



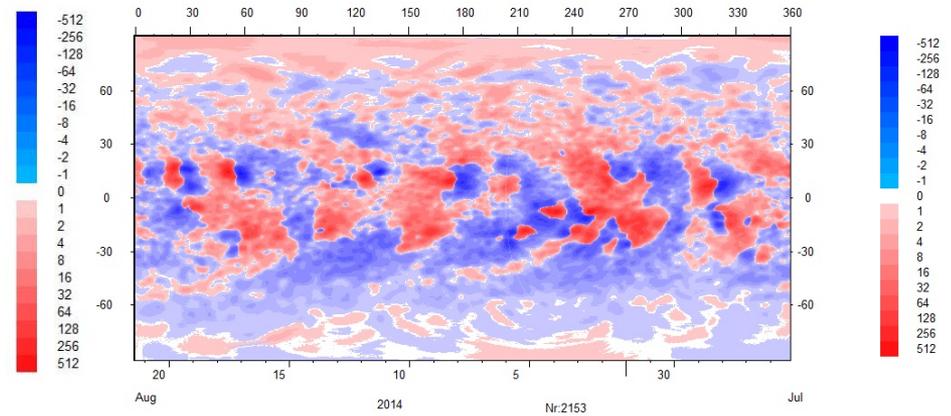
The provisions of filaments are in good agreement with lines separation the large-scale magnetic field polarity

# Synoptic maps of the magnetic field.

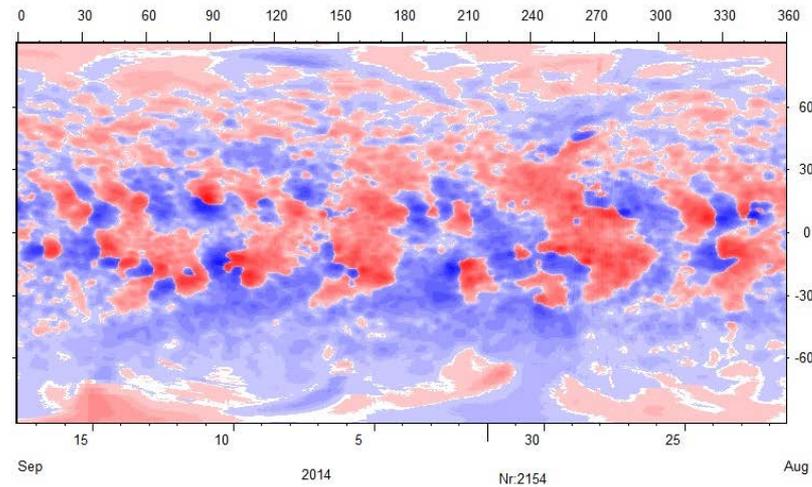
Kislovodsk Mountain Astronomical Station



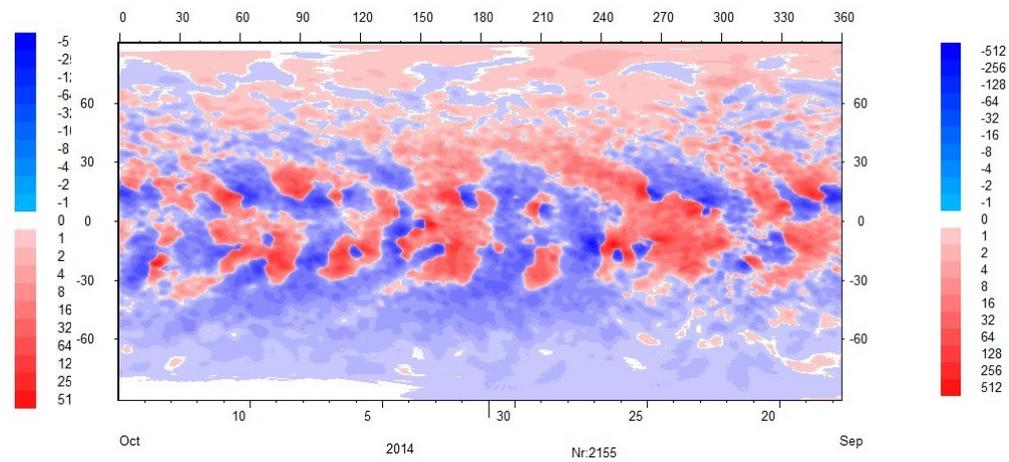
Kislovodsk Mountain Astronomical Station



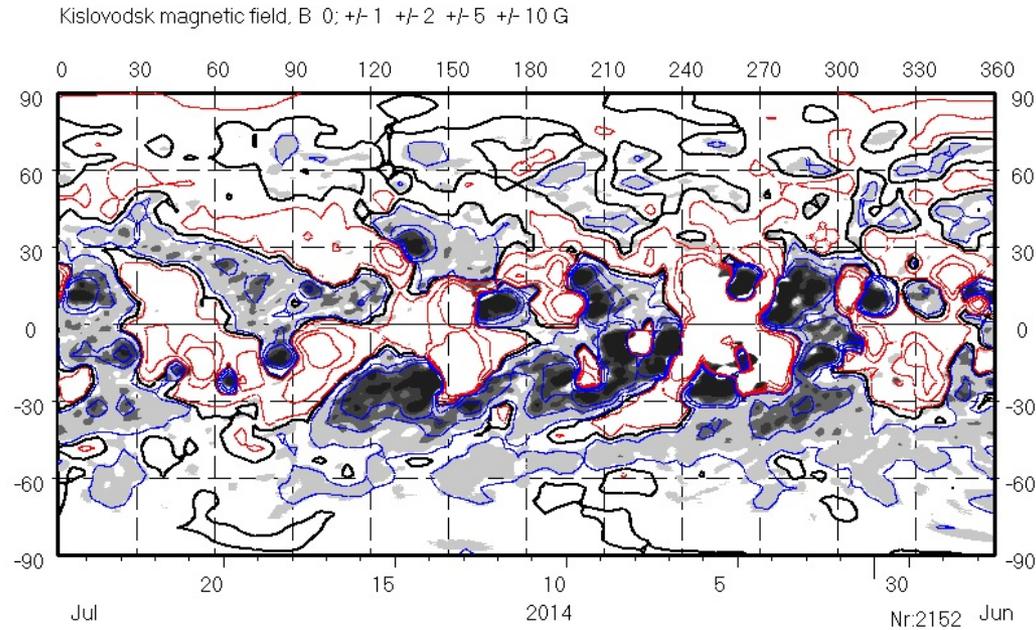
Kislovodsk Mountain Astronomical Station



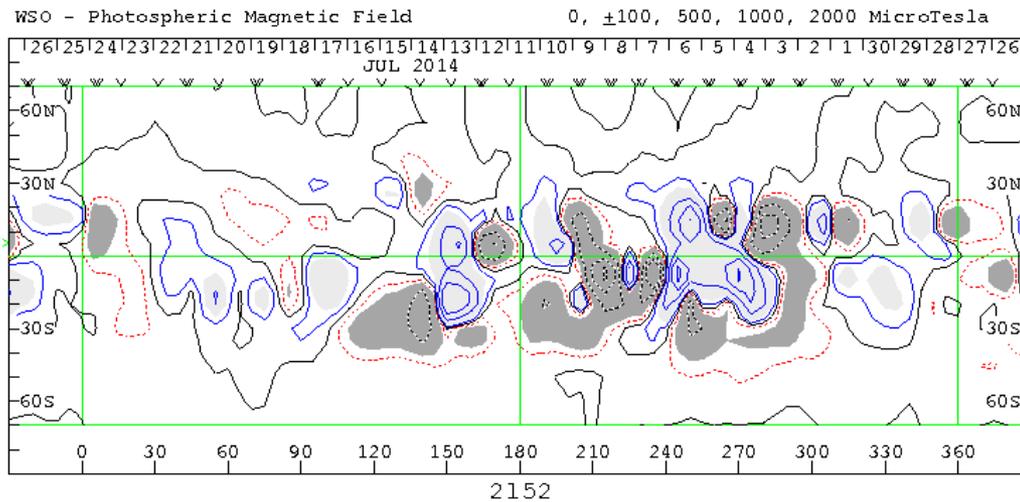
Kislovodsk Mountain Astronomical Station



# Comparison of the magnetic fields of synoptic charts



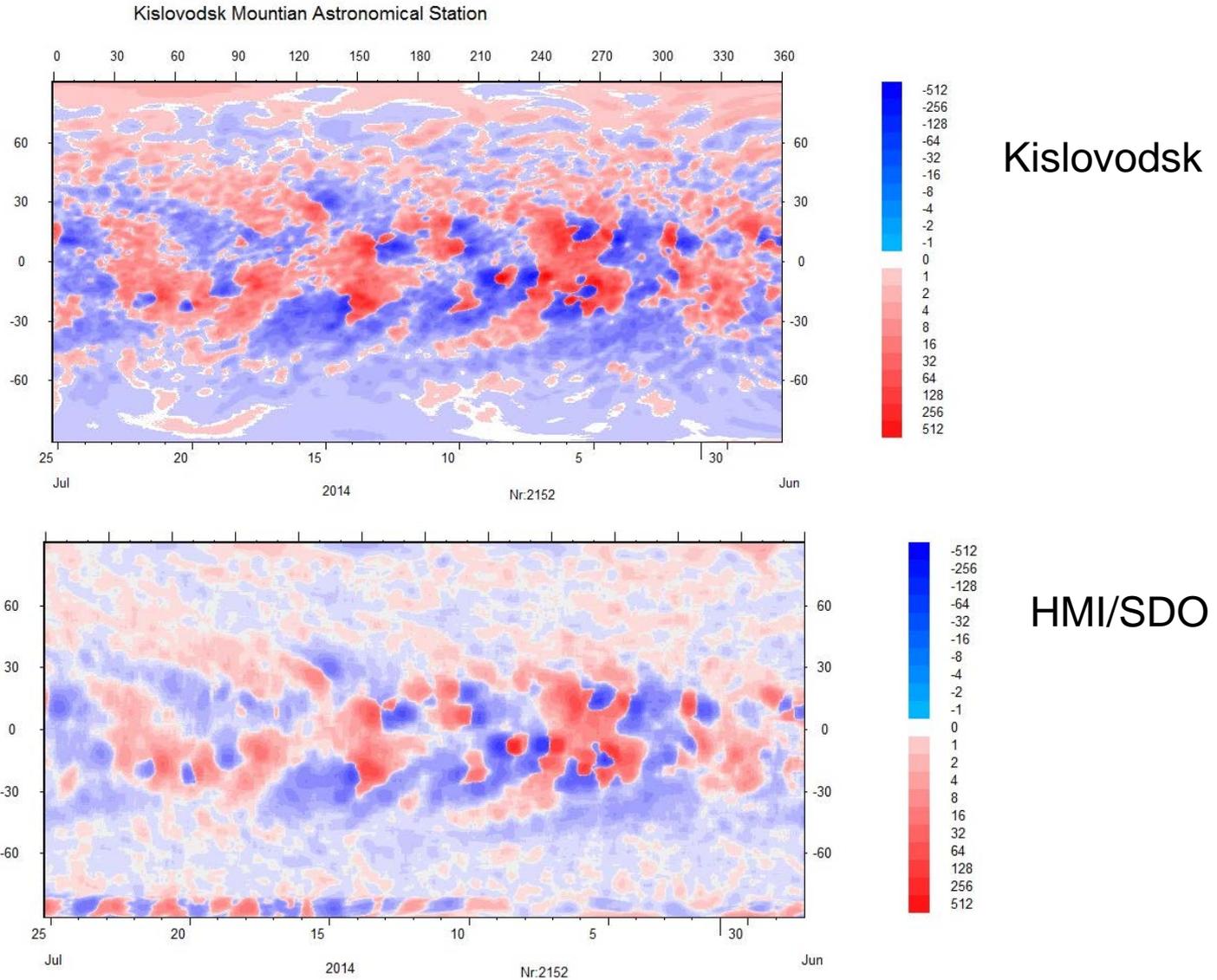
Kislovodsk



WSO

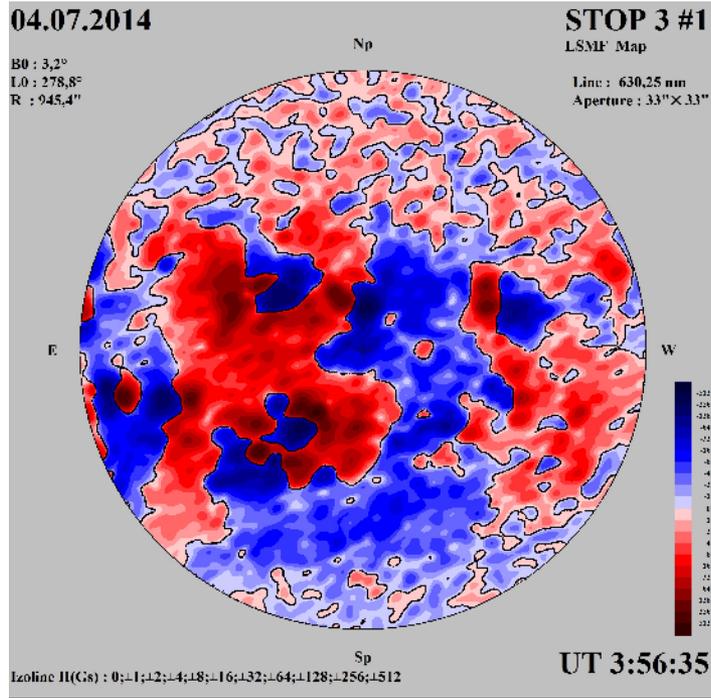
Kislovodsk has a better spatial resolution

# Comparison of the magnetic fields of synoptic charts

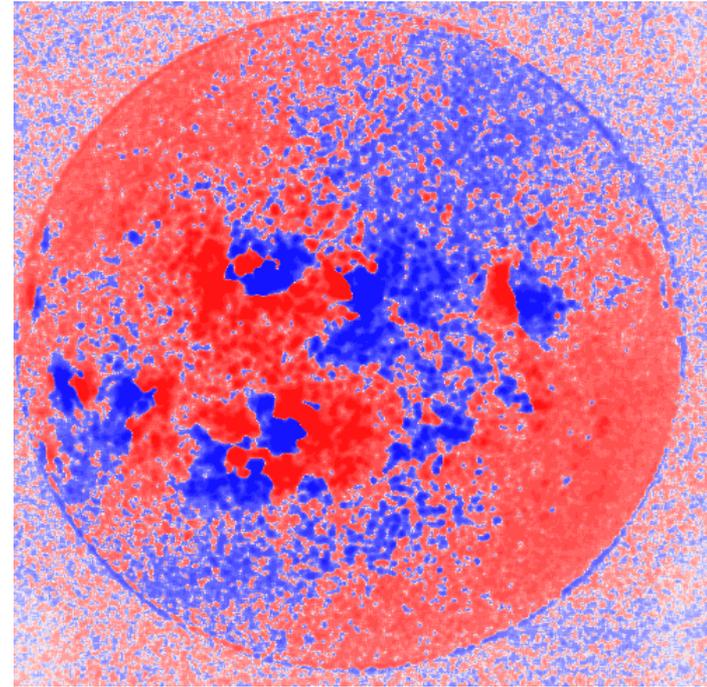


There are differences of structure large-scale field, especially in the polar regions

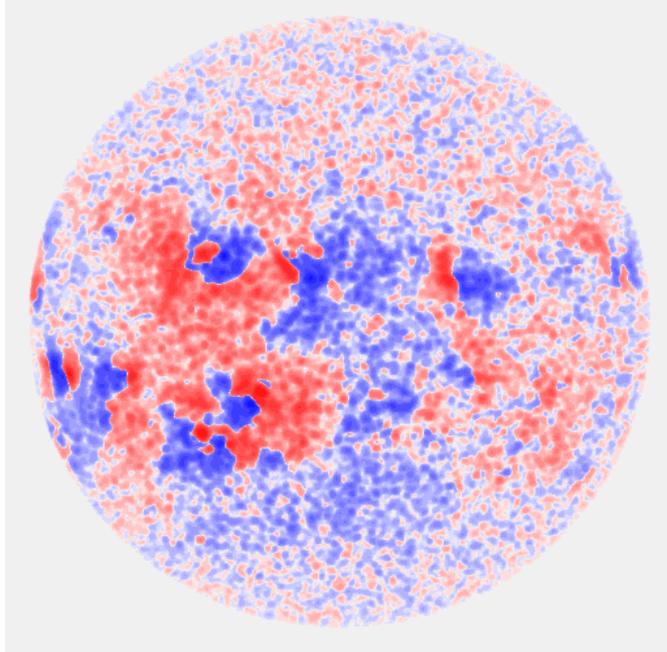
# Kislovodsk



# Huairou Solar Observatory. 04.07.2014



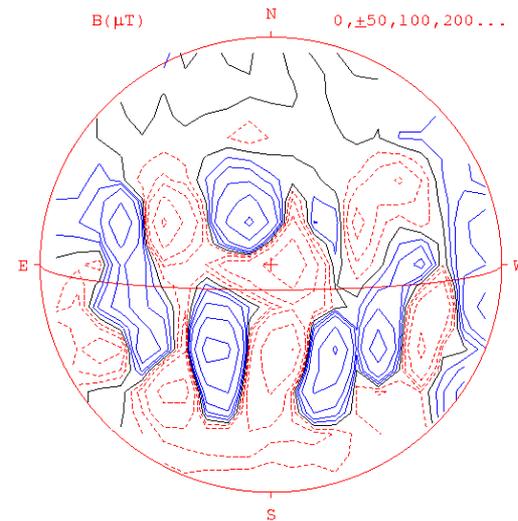
# Solis



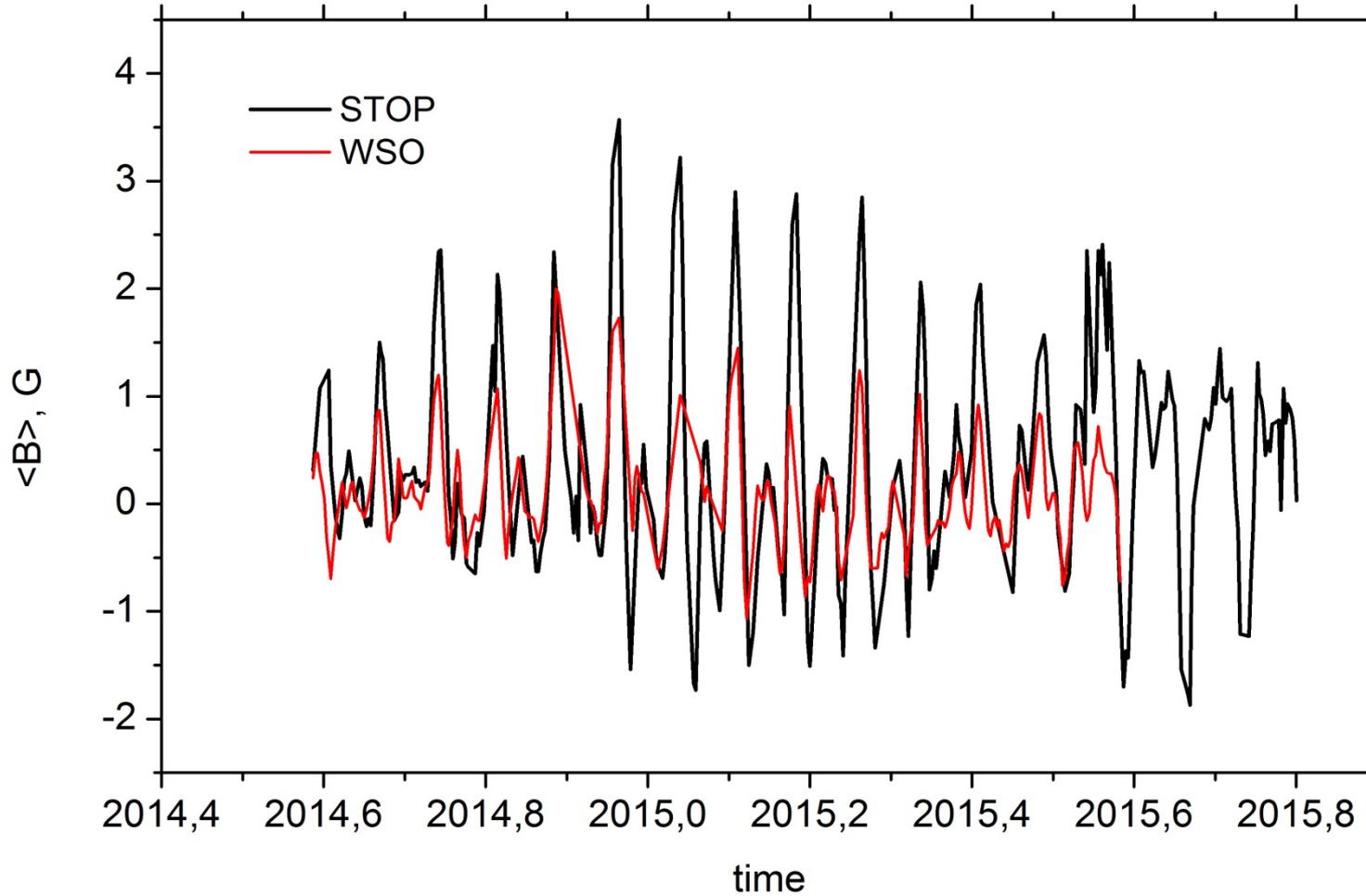
Stanford Magnetogram  
#11977

7 Oct. 2014  
21:55 UT

# WSO

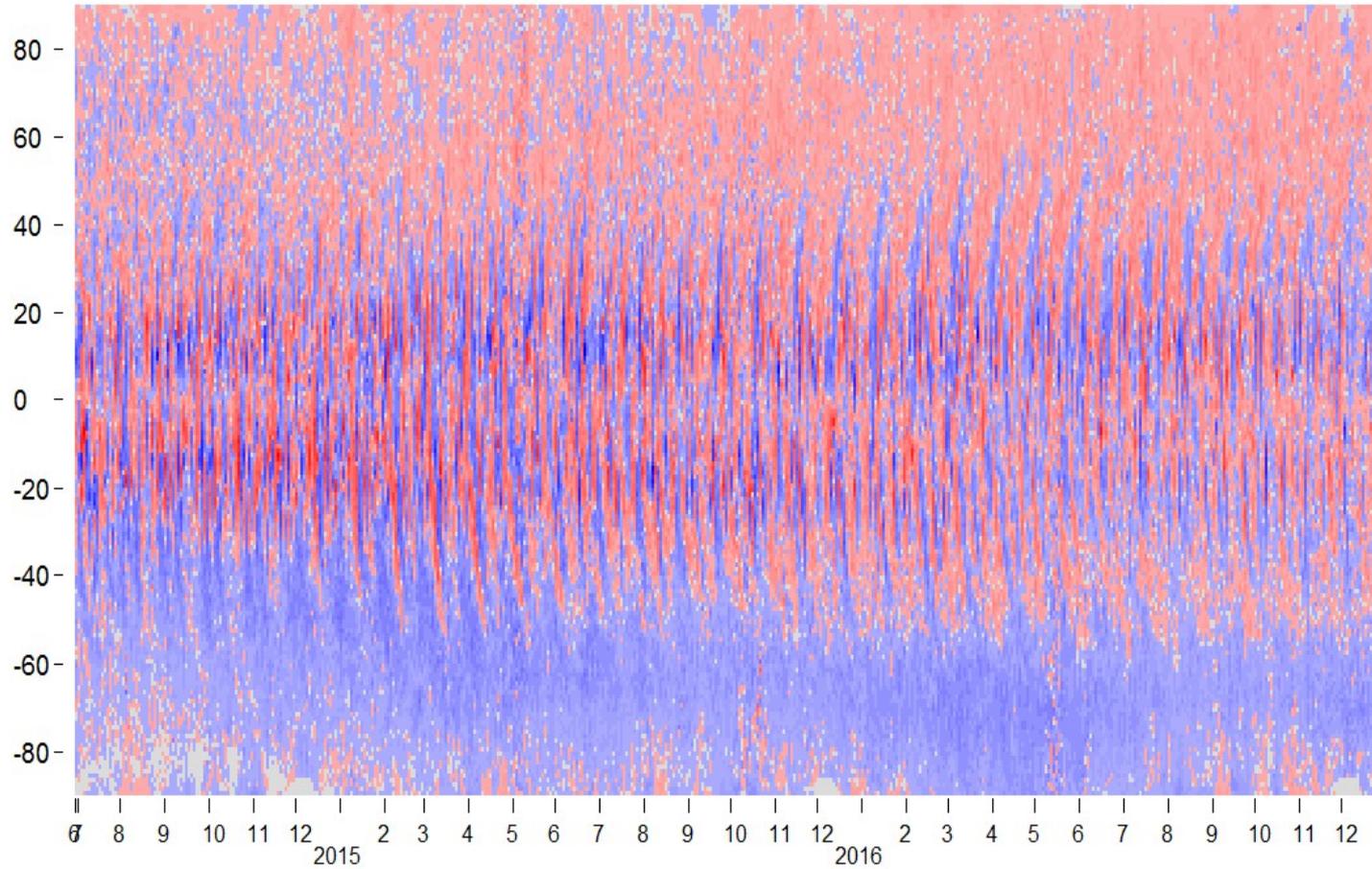


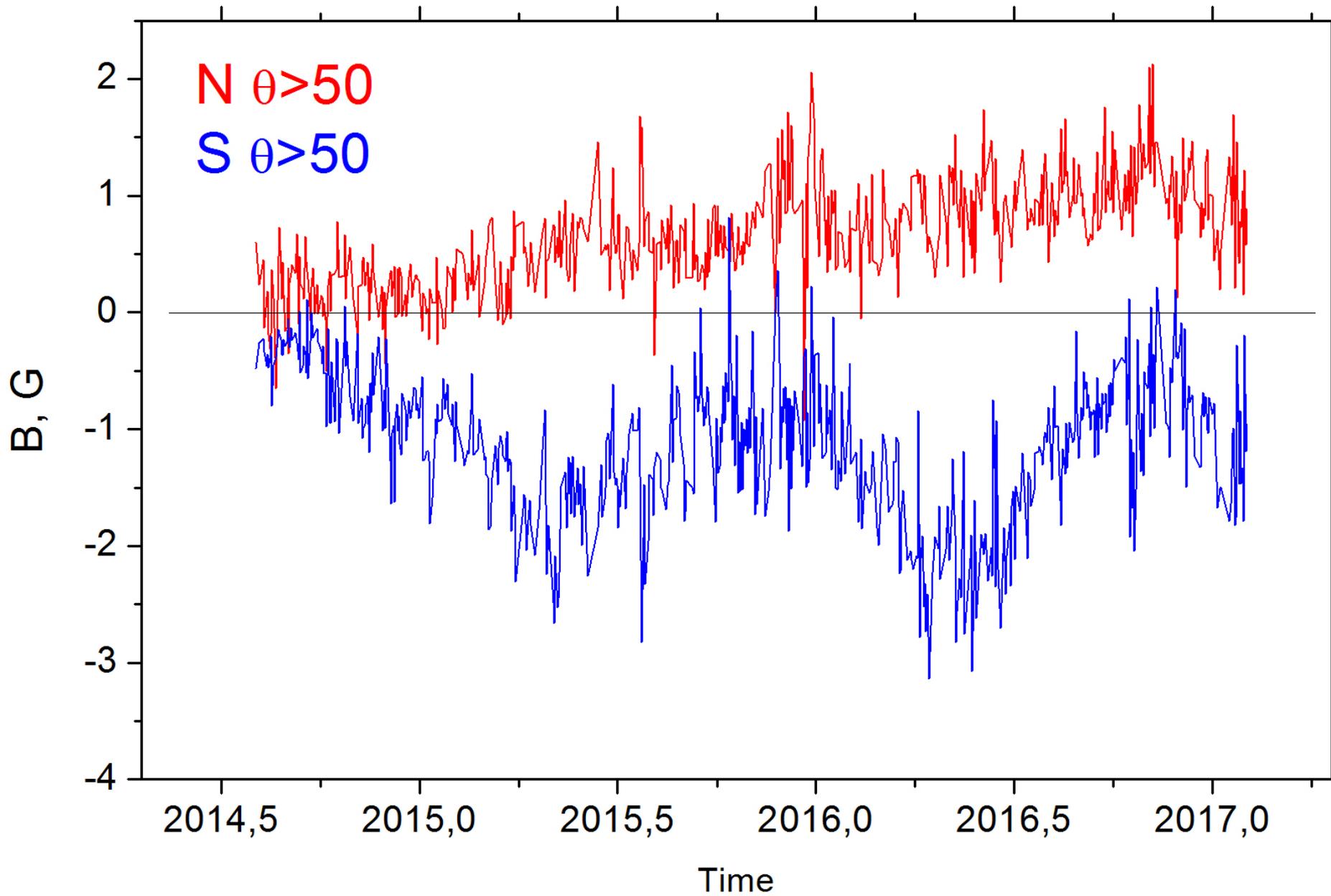
Measurement of total magnetic field of the sun (the sun as a star).  
Sectoral structure of the magnetic field



The typical period of changes in the total magnetic field of the Sun ~ 27 days

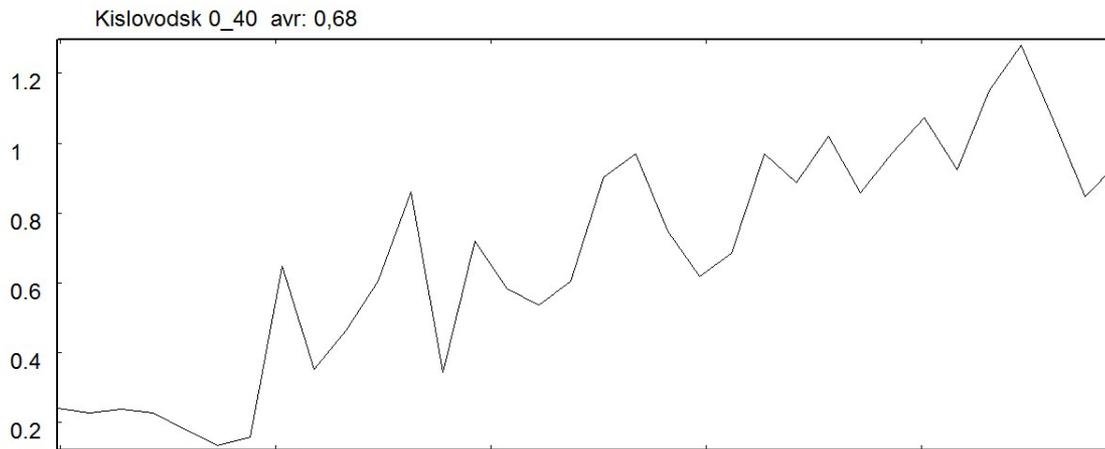
Latitude-time diagram of the distribution of the magnetic fields according to the STOP.



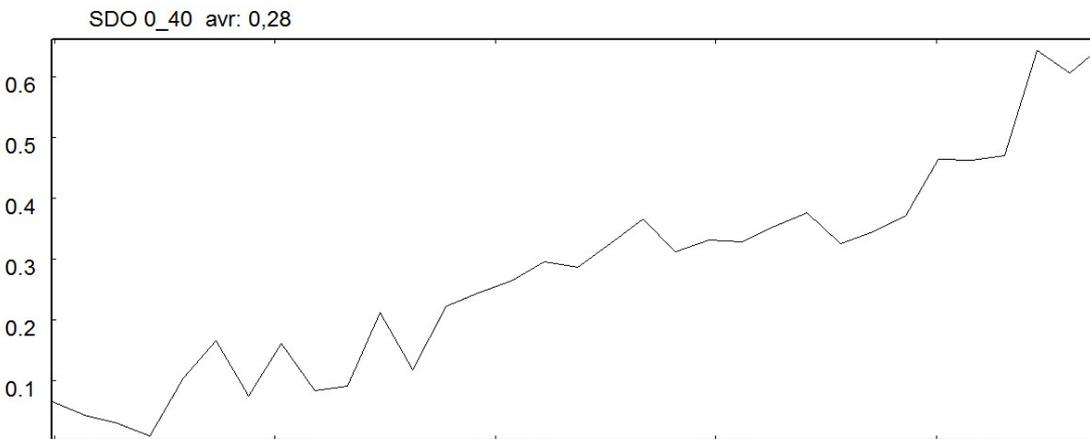


Currently, there are several synoptic magnetographs full disk. Characteristics of the most currently used in comparison with the characteristics of the telescope STOP.

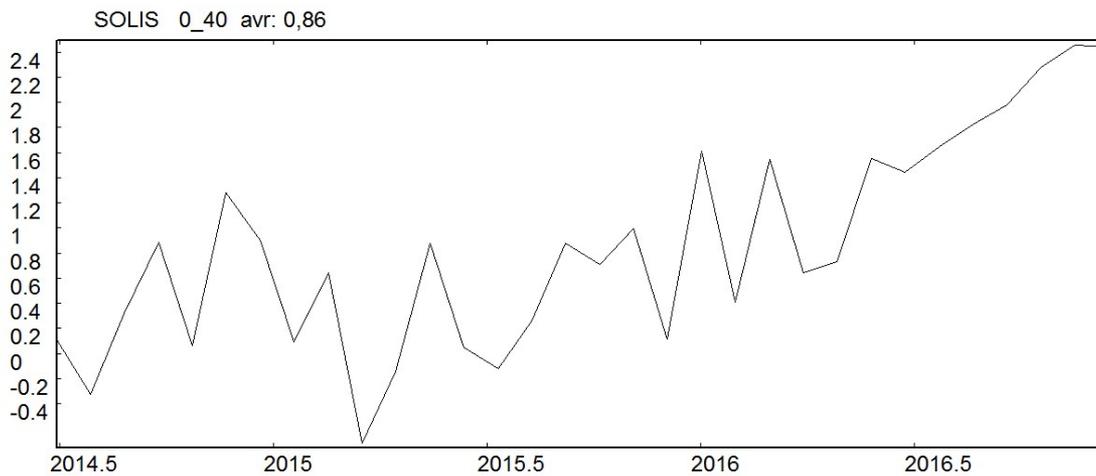
Observatory	WSO	MDI	HMI	SOLIS	GONG	STOP
Start obs.	05.1975	12.1995	02.2010	2003	1995	07.2014*
Place	Ca, USA	L1 point	Геоостац.	USA	netw	Kisl
Spectr. Line	Fel5250/52 47	Nil6768A	Fel6173	Fel 6301.5- 6302.5	Nilline at 6768 Å	Fel 6301.5- 6302.5
Resolution	3 min	4"	1"	1-2"	8"	33x6"
Regime	Daily	96-min	45 & 720 sec.	Daily	1 hr	Daily
Sensitivity	0.05G	7G	10G	1-2G	1G	0.5G



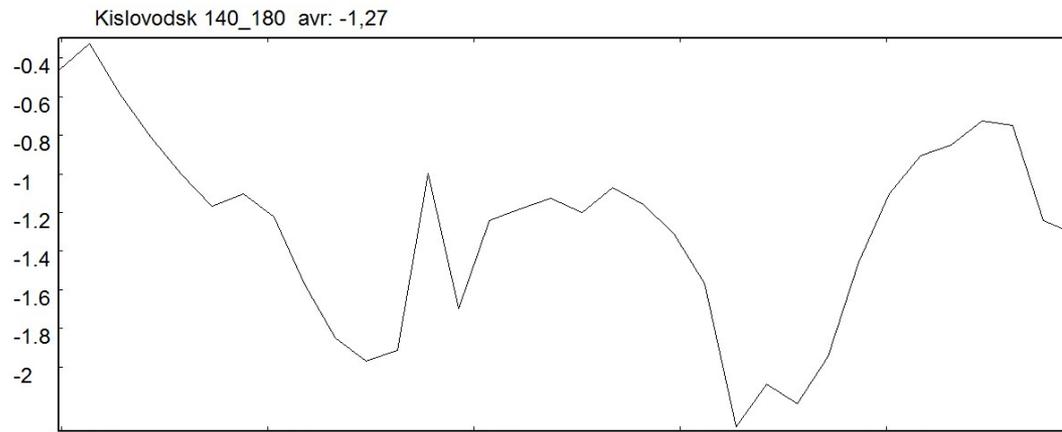
Polar field  
Latitude > 50 N



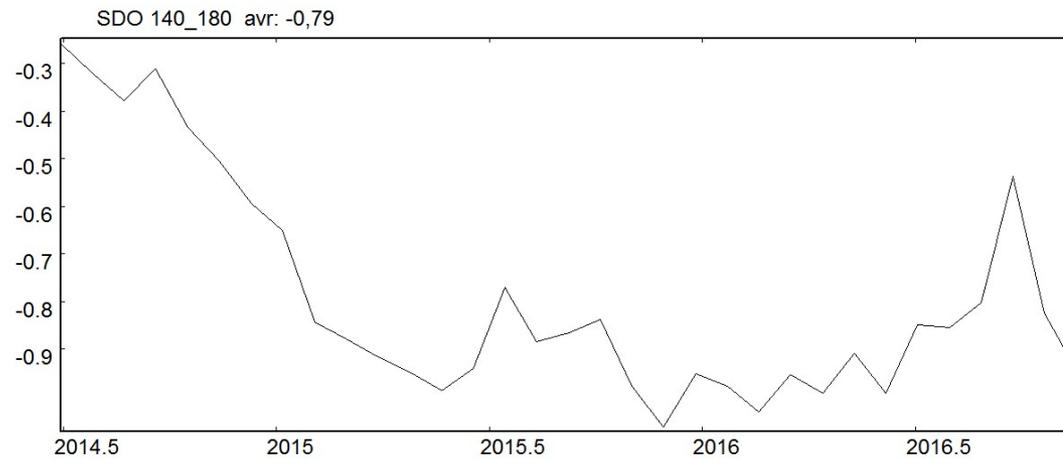
SDO \*MI.fits



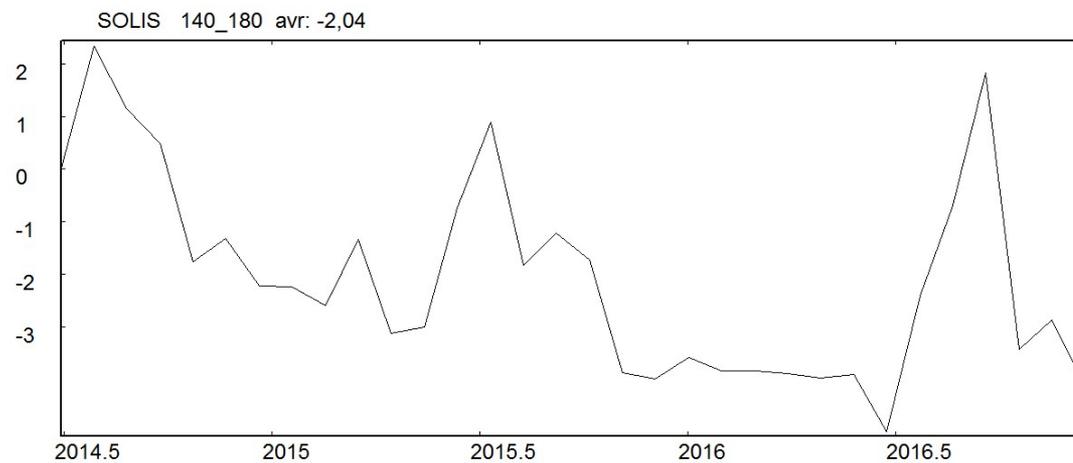
SOLIS kbv7g



Polar field  
South  
Latitude>50

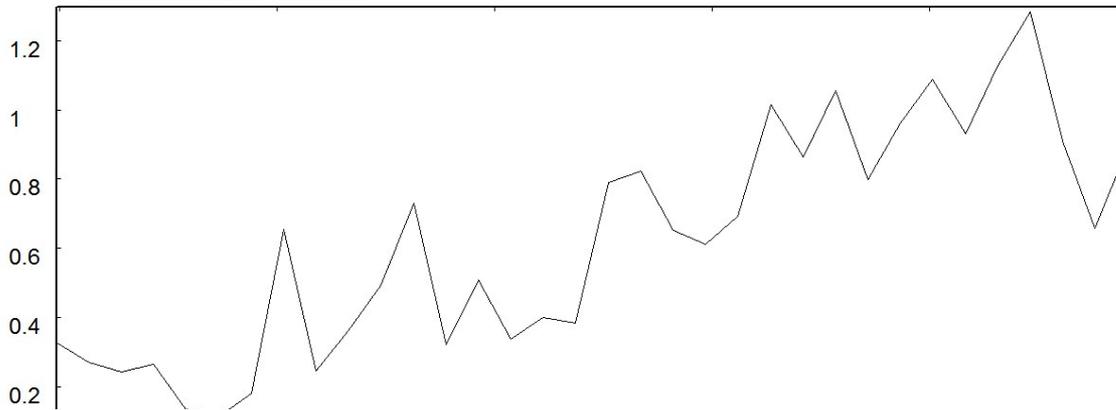


SDO \*MI.fits



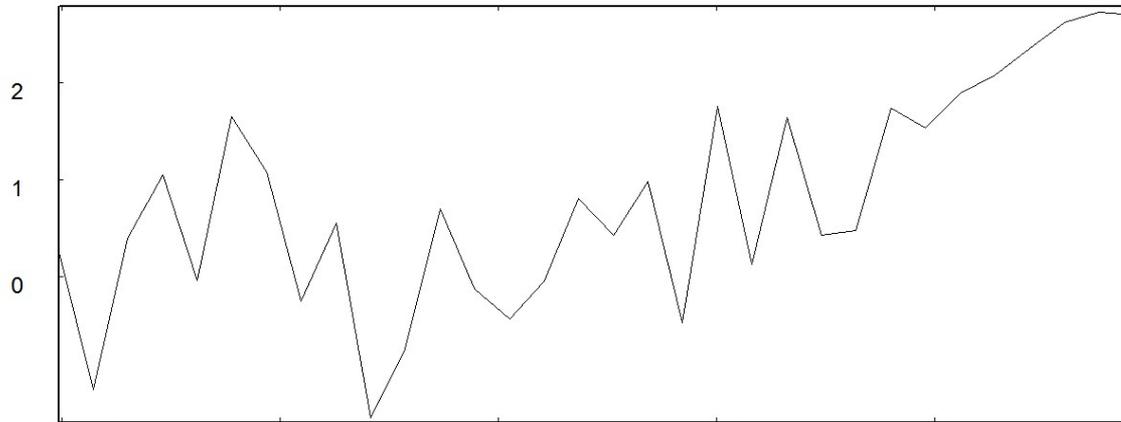
SOLIS kbv7g

Kislovodsk 0\_25 avr: 0,62



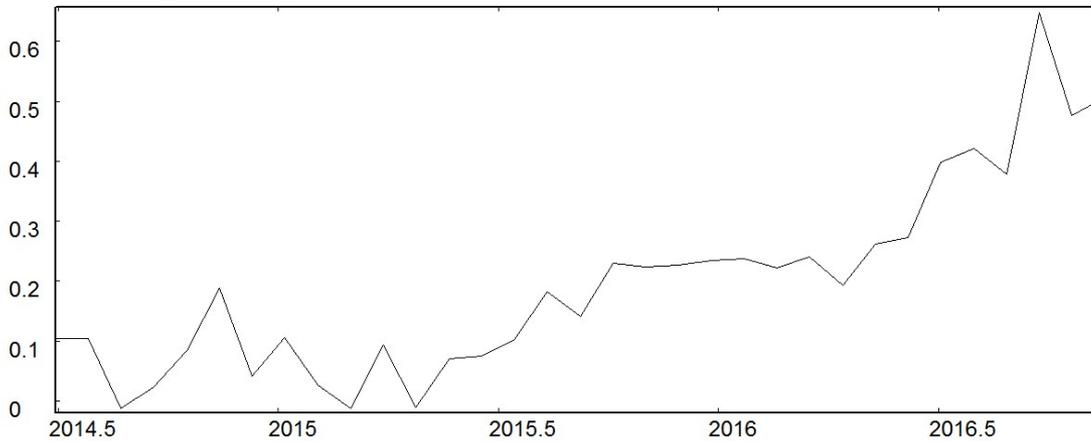
Polar field  
Latitude>65 N

SOLIS 0\_25 avr: 0,80

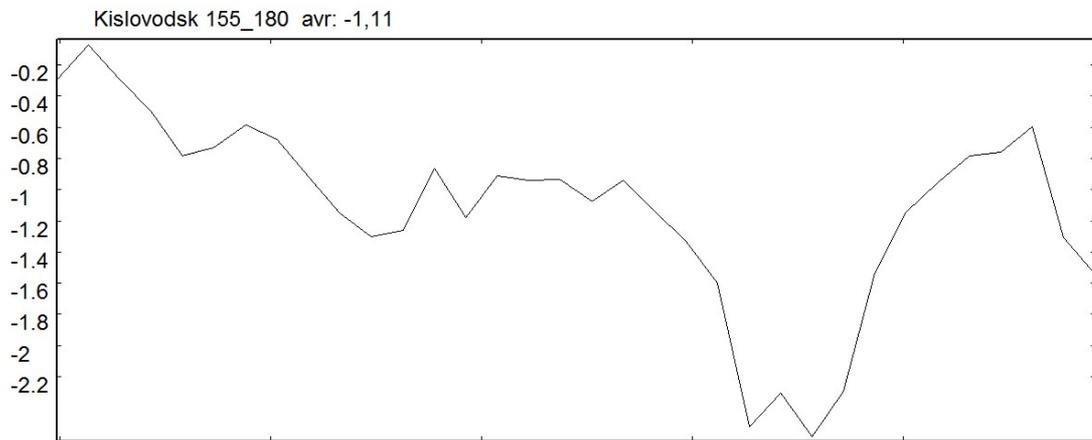


SDO \*MI.fits

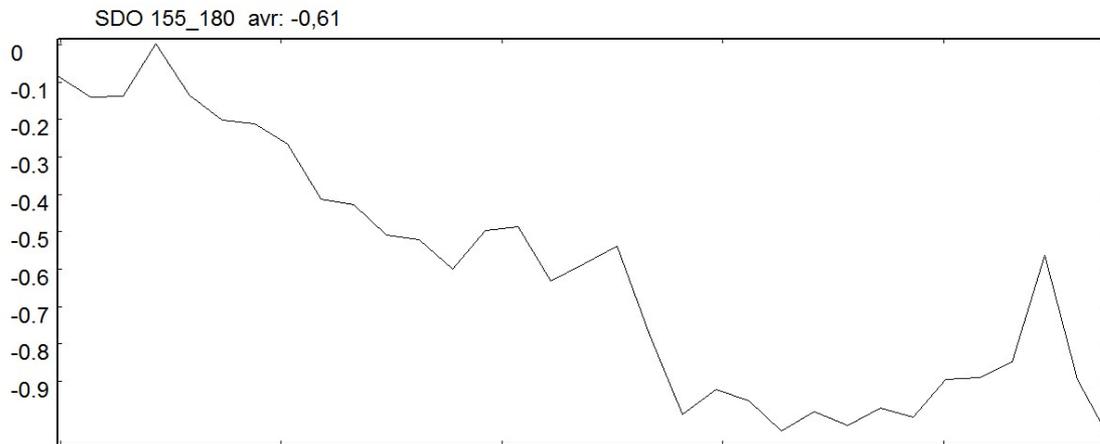
SDO 0\_25 avr: 0,20



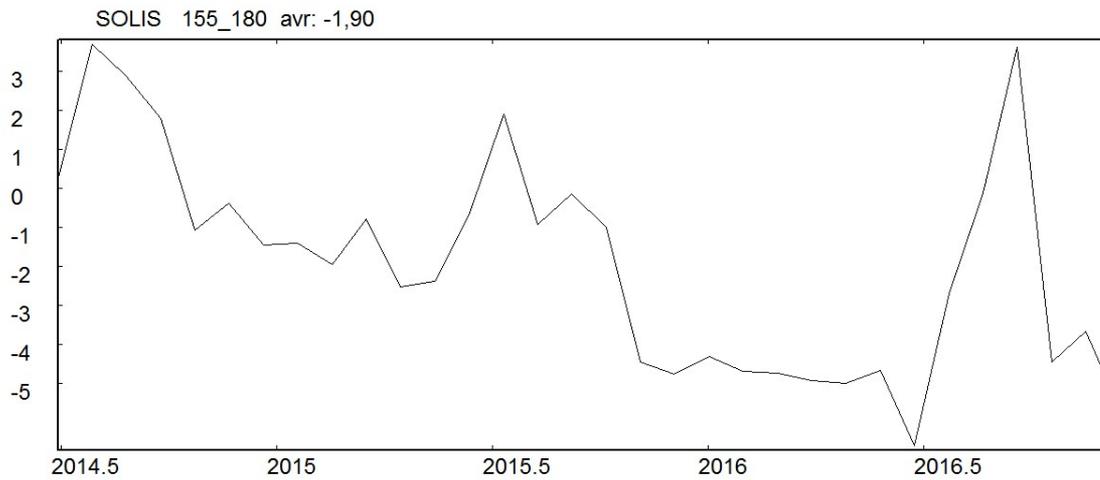
SOLIS kbv7g



Polar field  
Latitude>65 N



SDO \*MI.fits

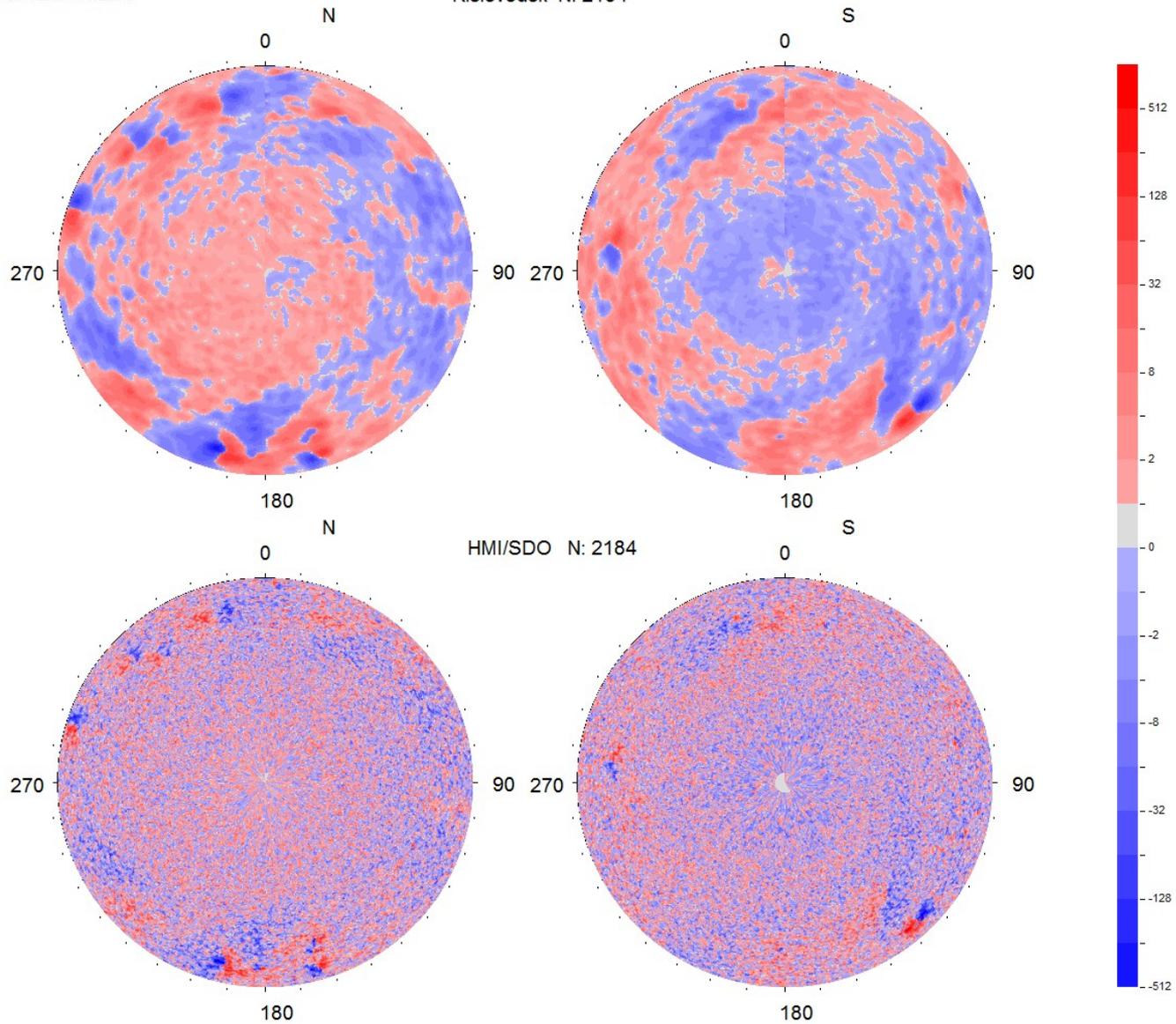


SOLIS kbv7g

# Comparison of the polar magnetic field.

R,x,c,y:c: 200 800 800  
Nr: 2184 16/11/2016 - 14/12/2016

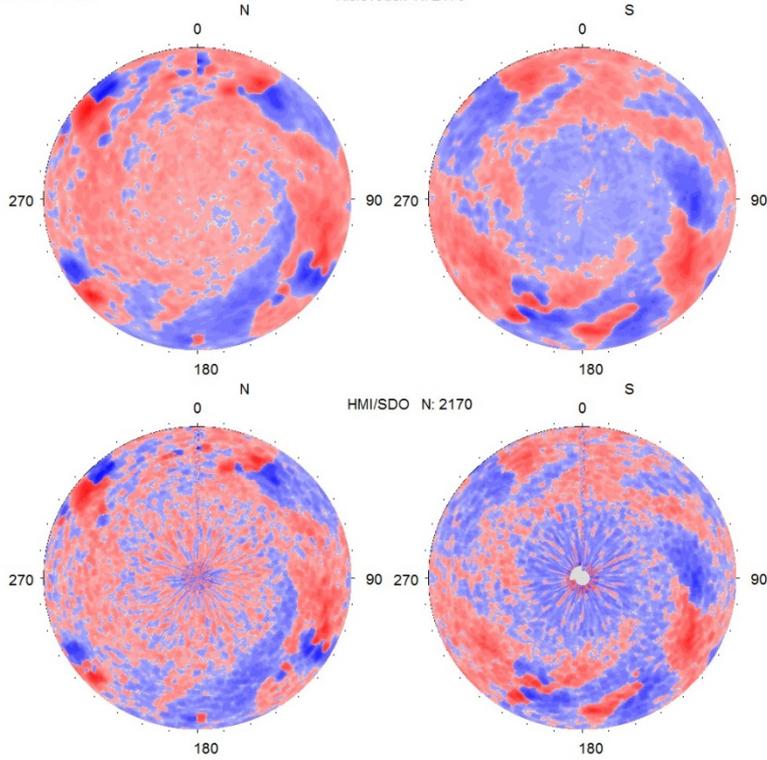
Kislovodsk N: 2184



# Kislovodsk

R,x,c,y,c: 200 800 800  
Nr: 2170 1/11/2015 - 28/11/2015

Kislovodsk N: 2170

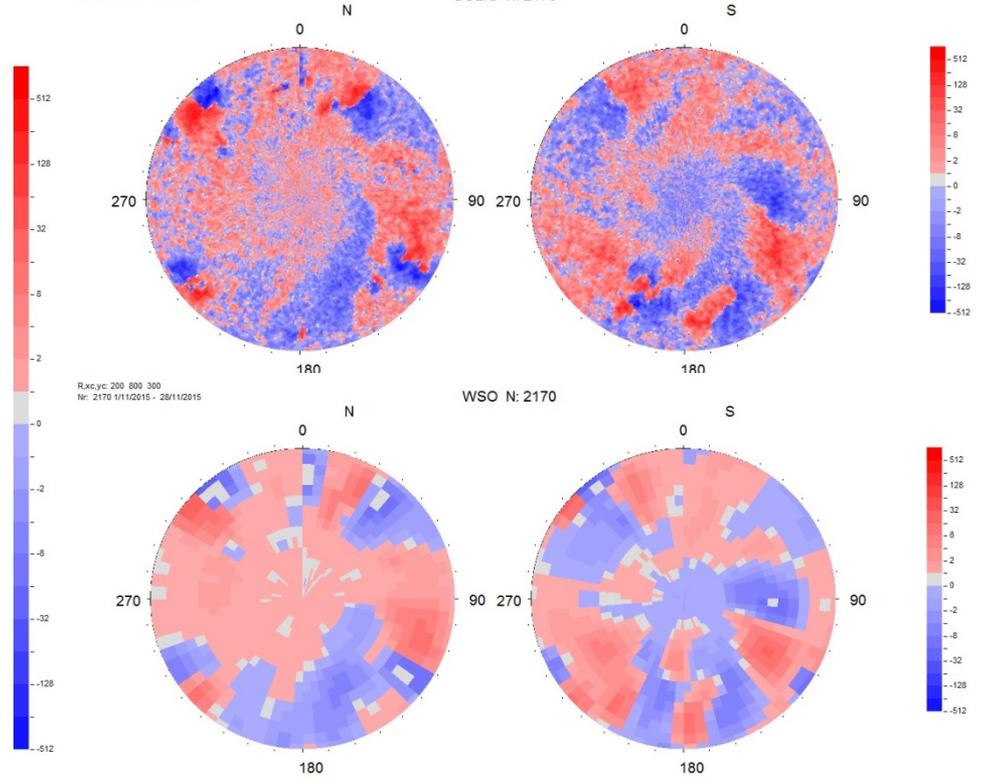


# HMI/SDO

# SOLIS

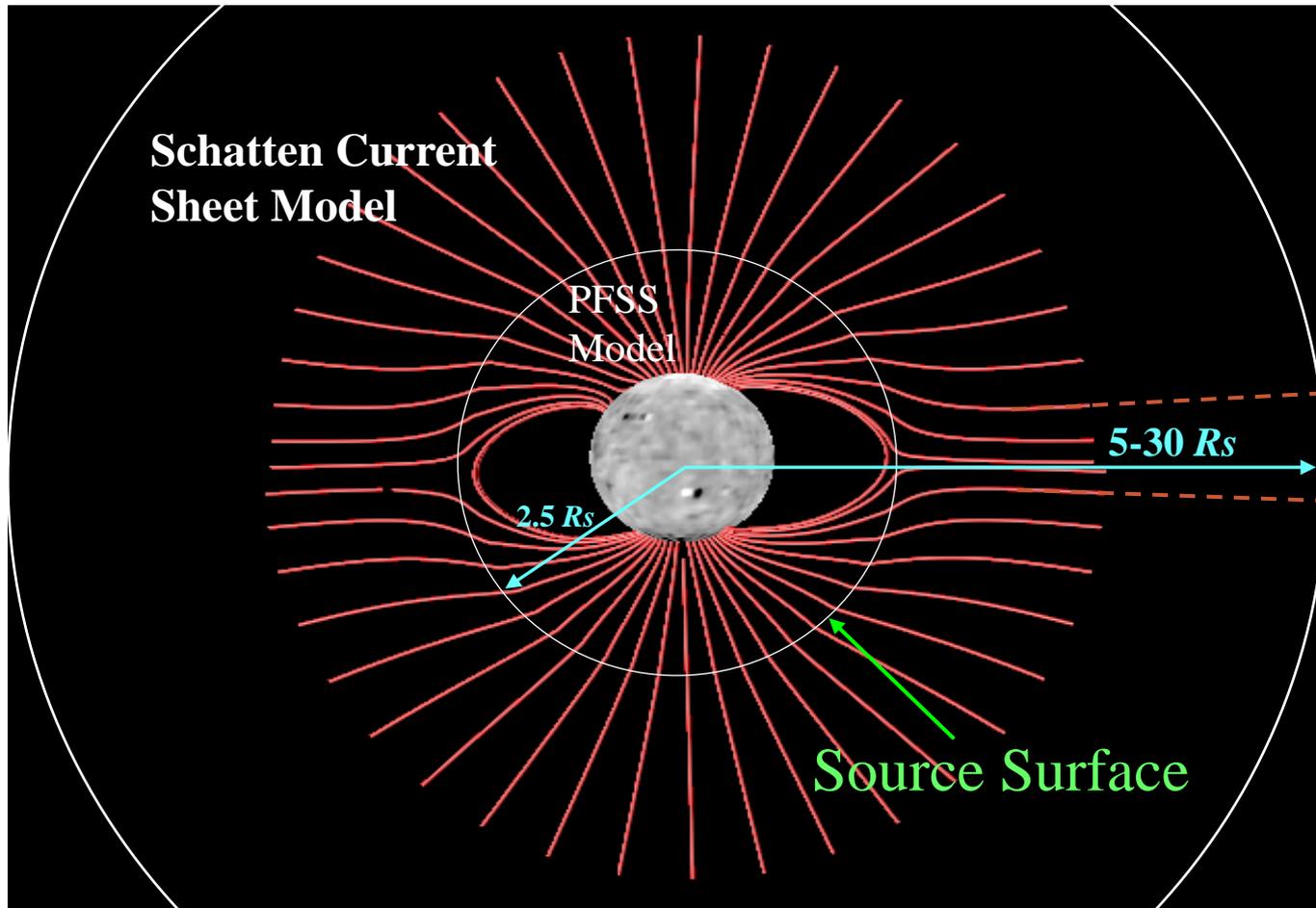
R,x,c,y,c: 200 800 300  
Nr: 2170 1/11/2015 - 28/11/2015

SOLIS N: 2170

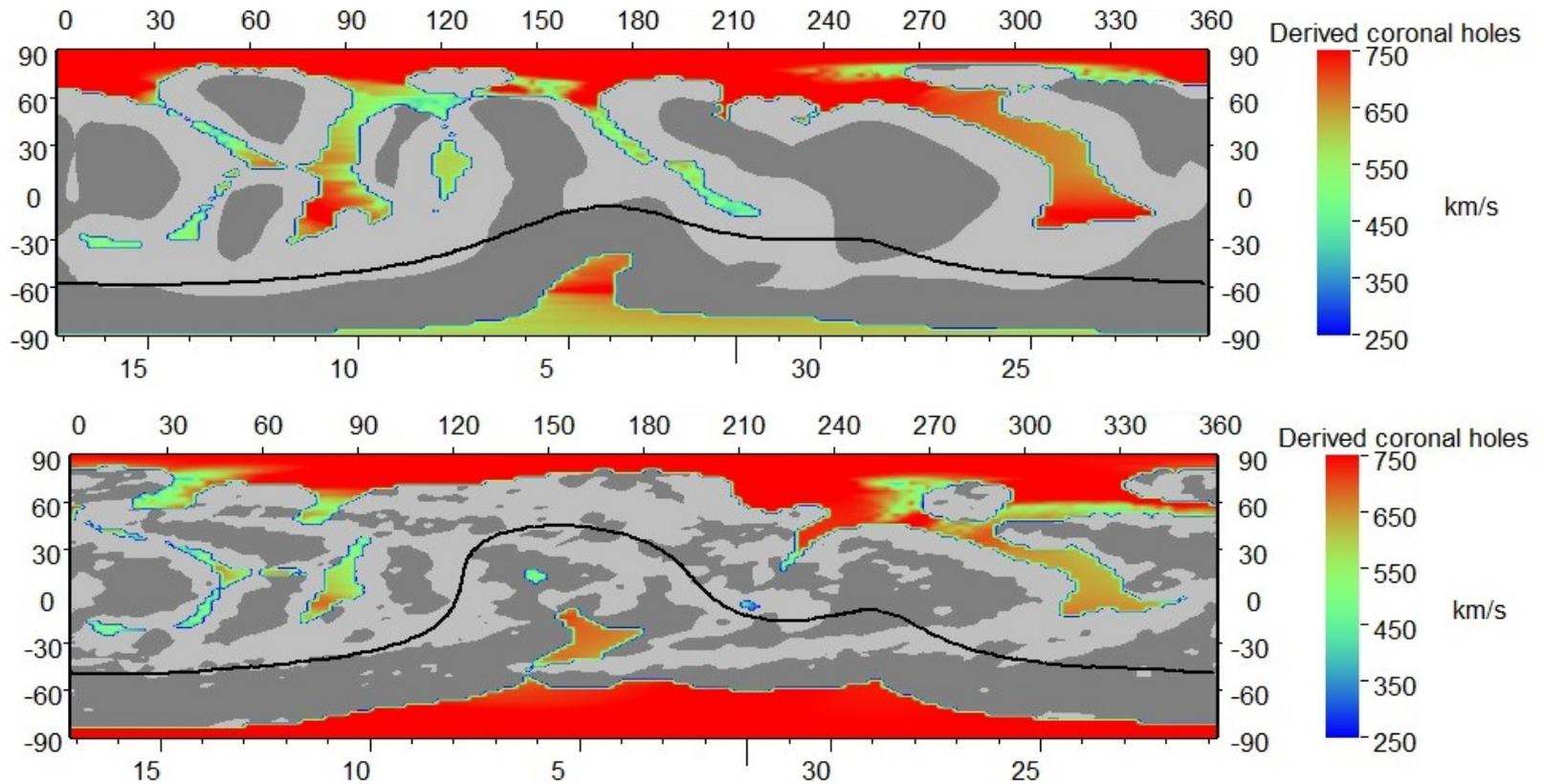


# WSO

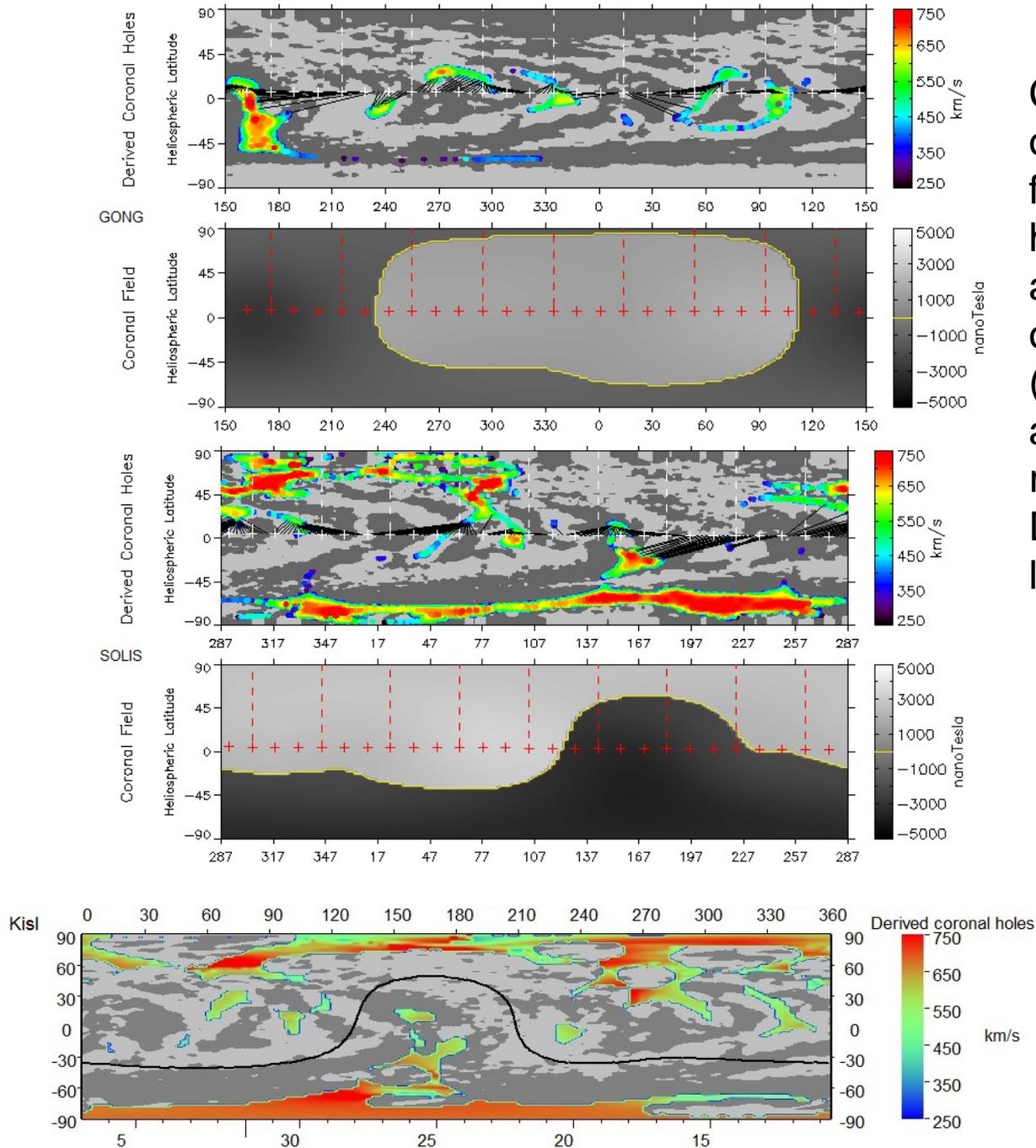
# WSA Coronal & Solar Wind Model



Solar Wind Model  
(e.g., 1D Kinematic model, ENLIL, HAF)  
(5-30 $R_s$  to 1AU)

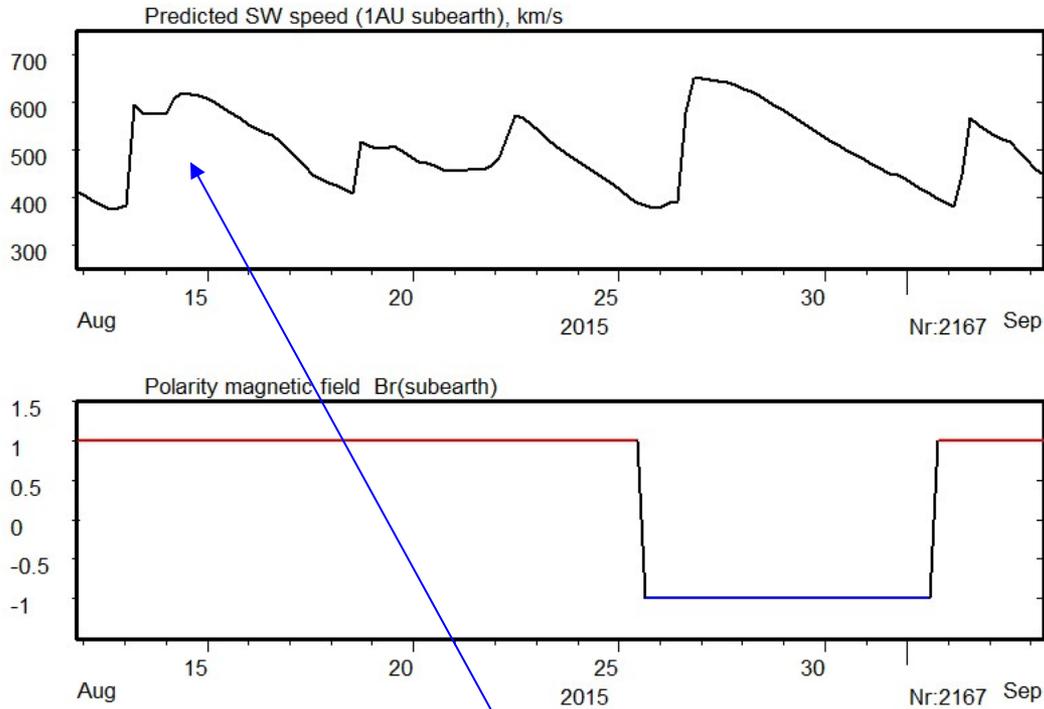


Comparison of calculations of areas of open magnetic field and the provisions the heliospheric current sheet at a surface of the source 2.5R were observed WSO (top) and Kislovodsk (below) for the rotation 2164.



Comparison of calculations of areas of open magnetic field and positions the heliospheric current sheet at a 2.5R source of surface observation data GONG (top), SOLIS (center panel) and Kislovodsk (below) for rotation 22/08/2015. GONG Data and SOLIS shifted longitudinally.

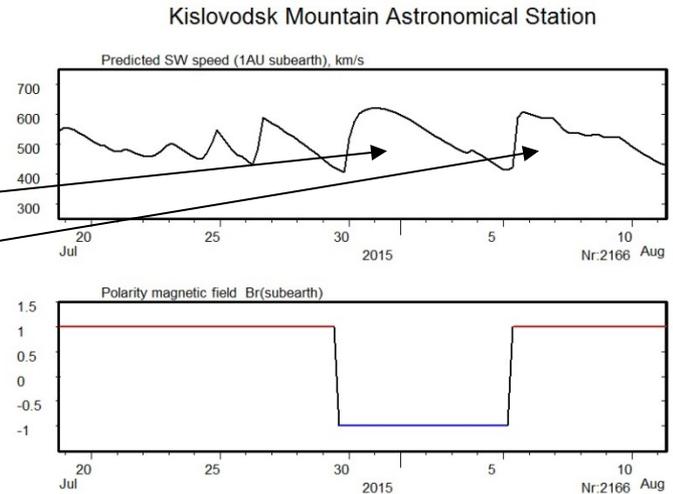
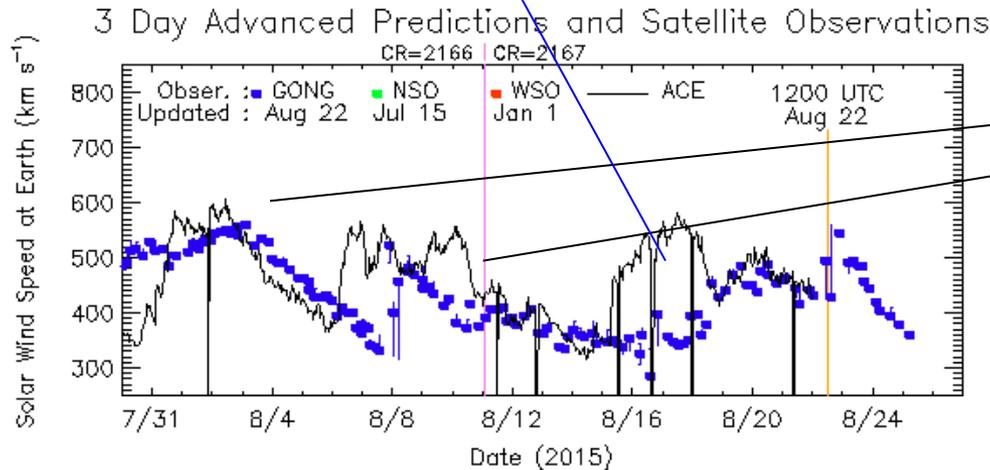
# Kislovodsk Mountain Astronomical Station



Comparison of the solar wind Kislovodsk and NOAA forecast

Текущий прогноз (21.08)

Created 2015.08.21

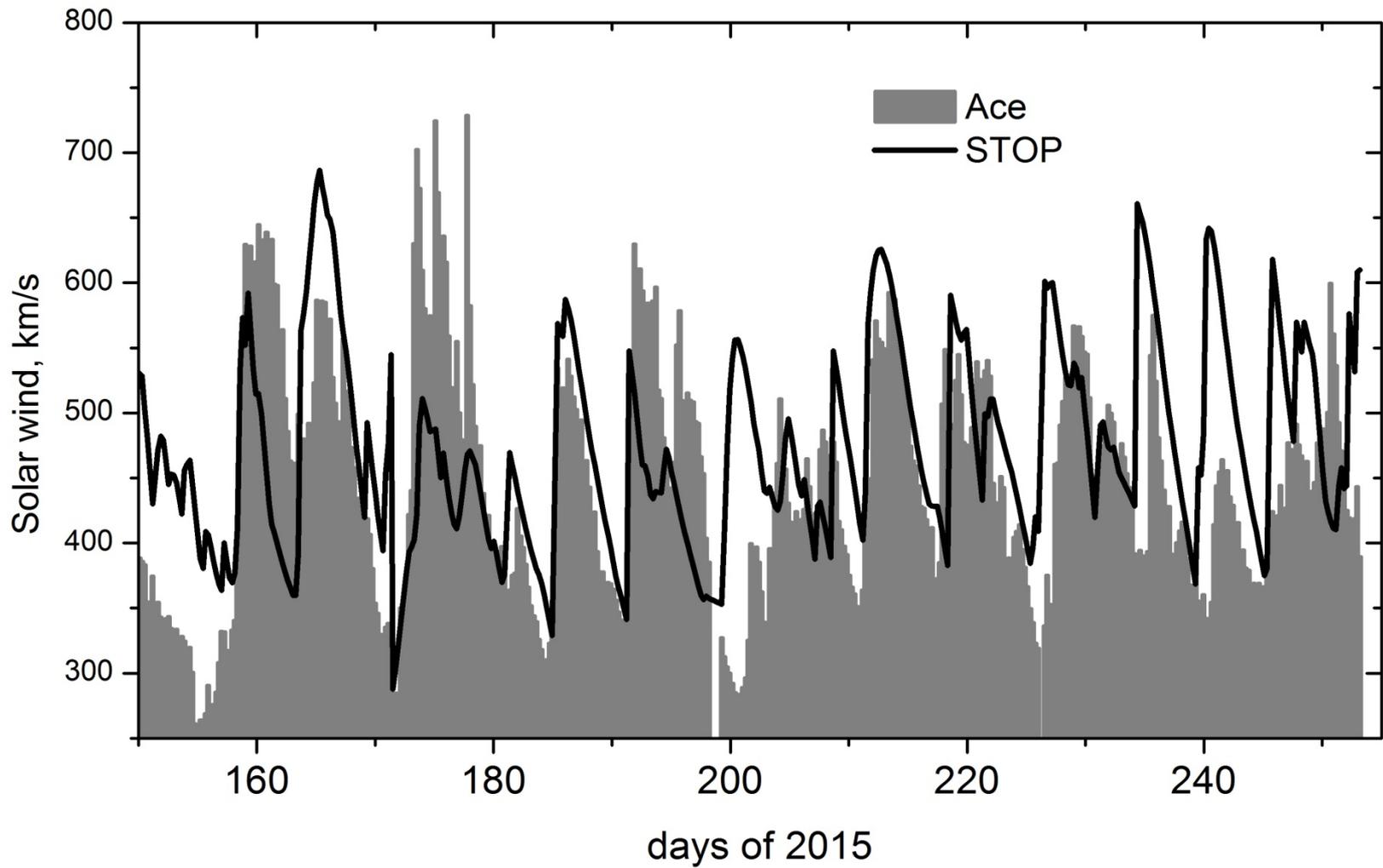


Created 2015.08.21

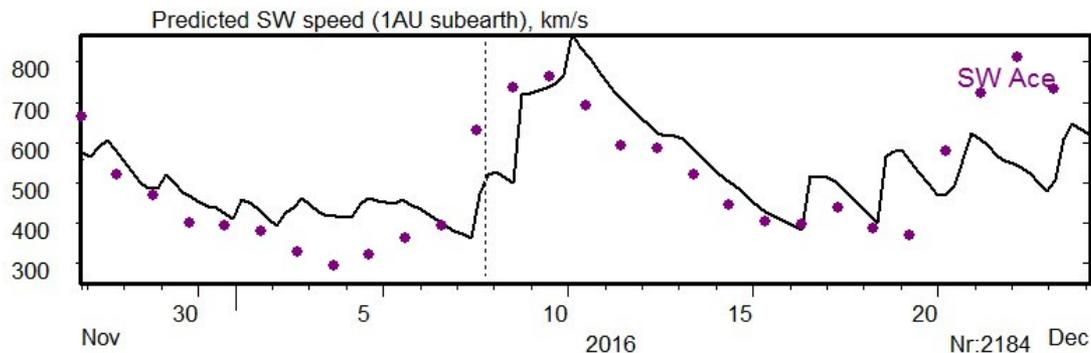
Created 2015 Aug 22 512 UTC

NOAA/SWPC, BOULDER, CO, USA

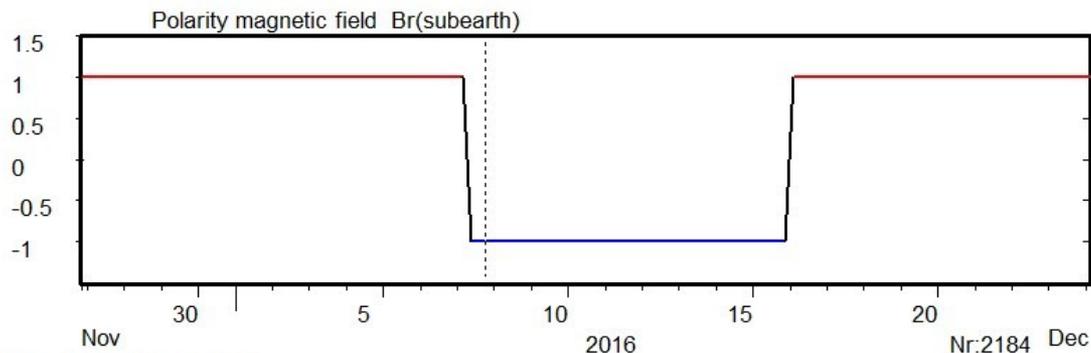
Comparison of the solar wind speed results ACE satellite measurements.



# Kislovodsk Mountain Astronomical Station

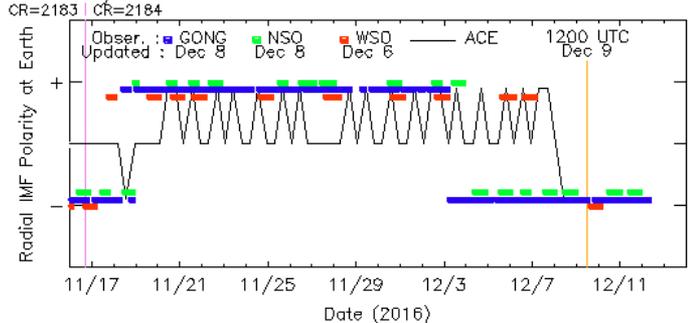


Forecast different magnetographs and comparison and measurement of the solar wind



Created 2016.12.07

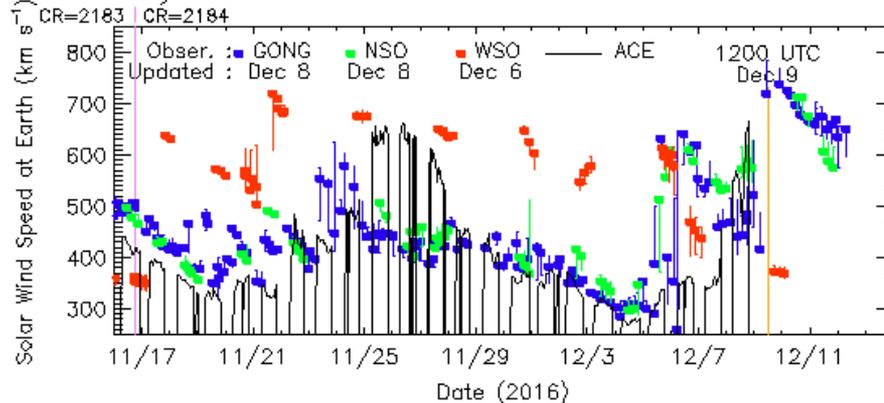
## 3 Day Advanced Predictions and Satellite Observations



Created 2016 Dec 9 1225 UTC

NOAA/SWPC, BOULDER, CO, USA

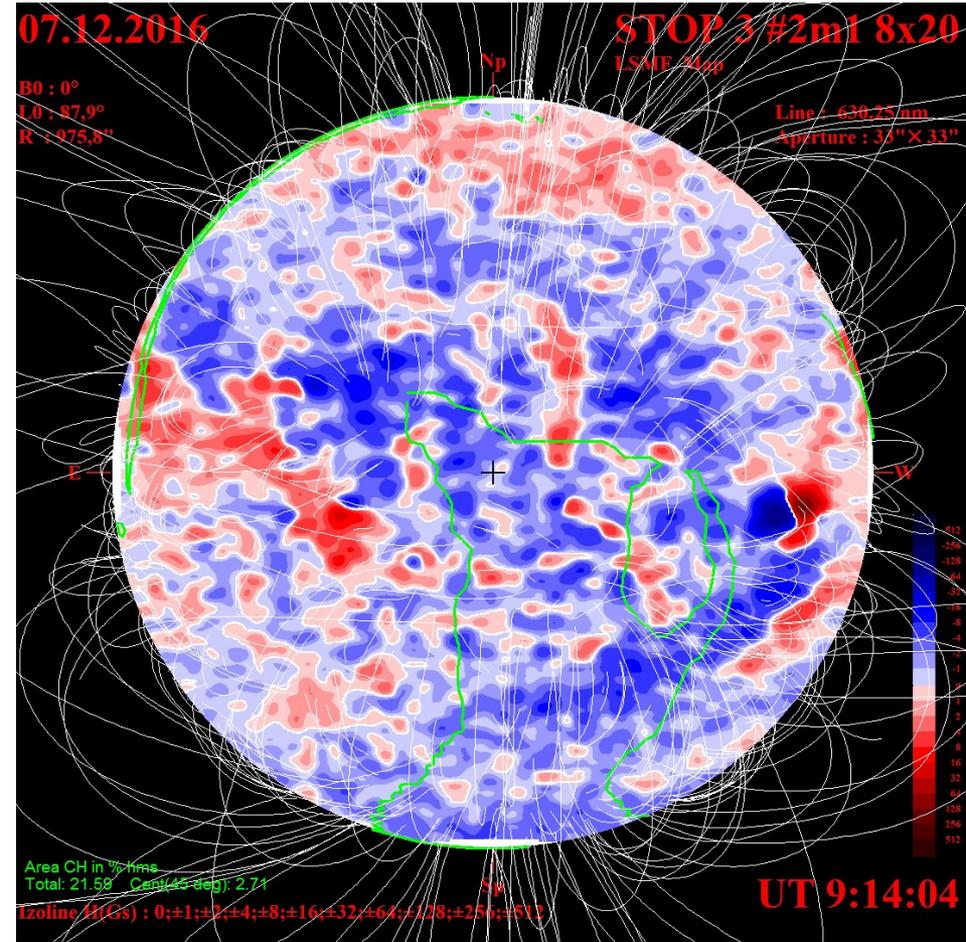
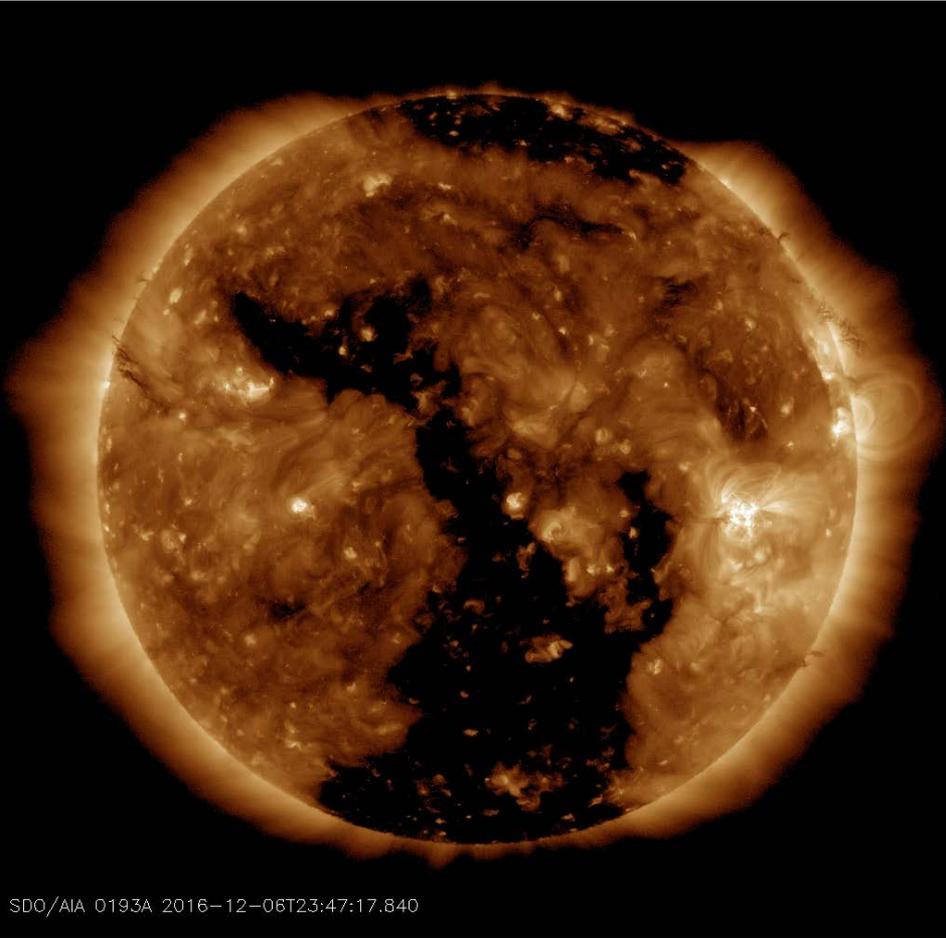
## 3 Day Advanced Predictions and Satellite Observations



Created 2016 Dec 9 1225 UTC

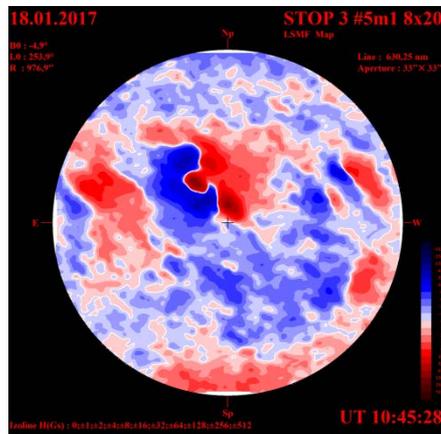
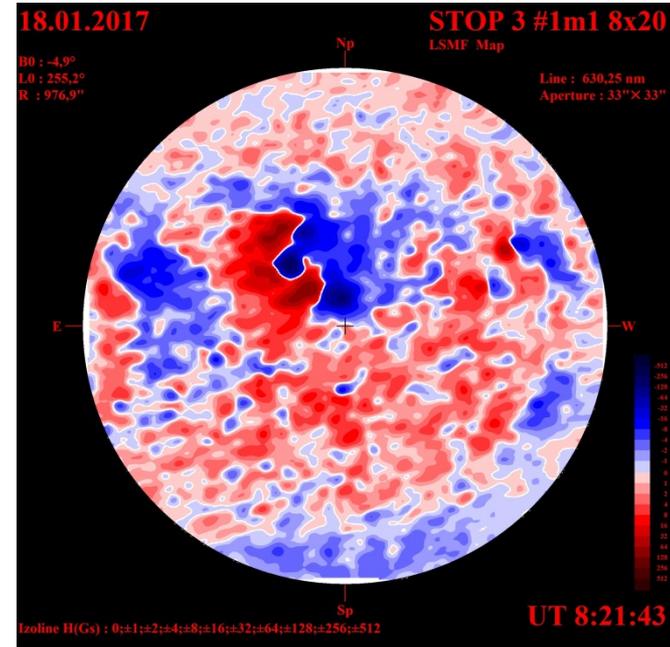
NOAA/SWPC, BOULDER, CO, USA

# Comparison of shapes coronal hole observed and calculated.

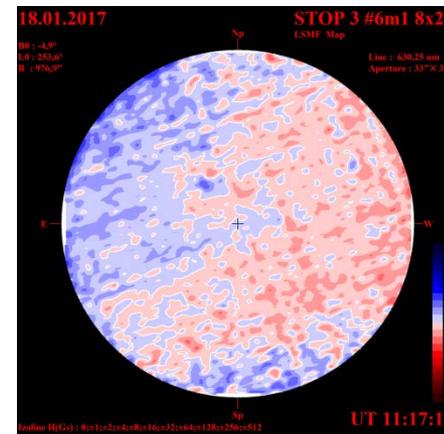


# Modernization of the telescope to the vector magnetograph

We do not have the original wave plates. At the suggestion A. Pevtsov we placed quarter-wave plate in front of the lens.



45  
degree



90  
degree

Conclusions :

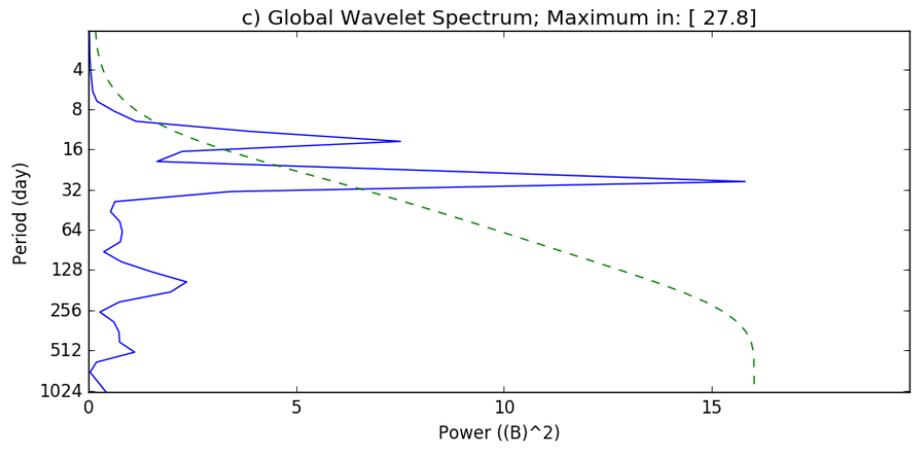
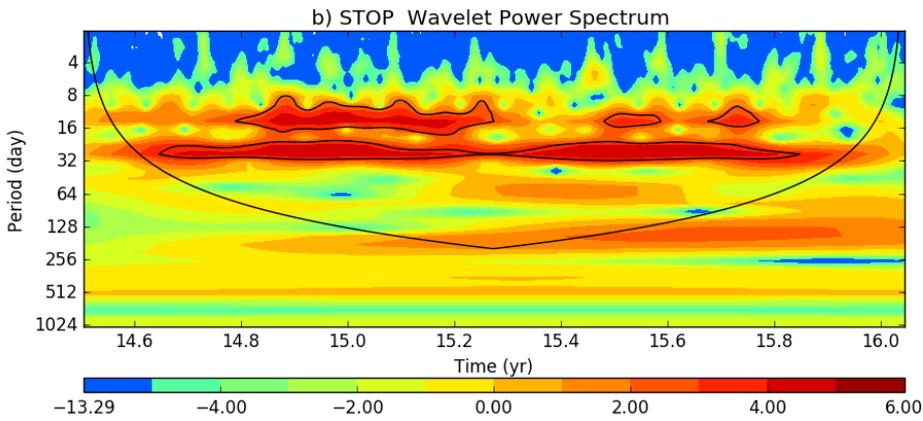
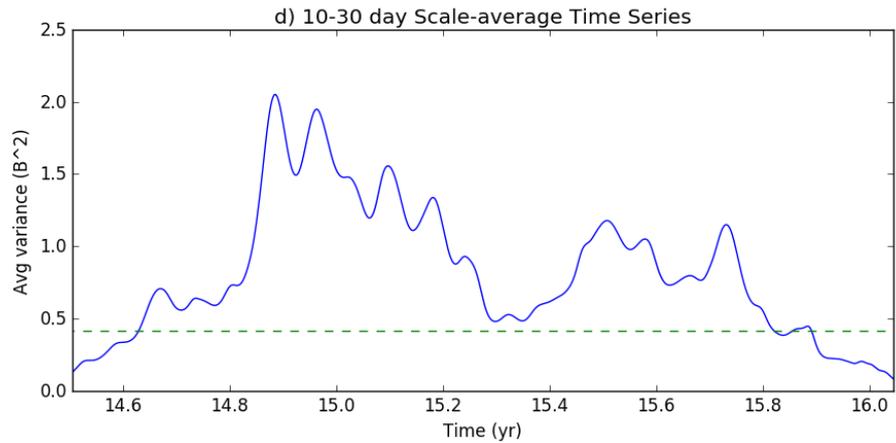
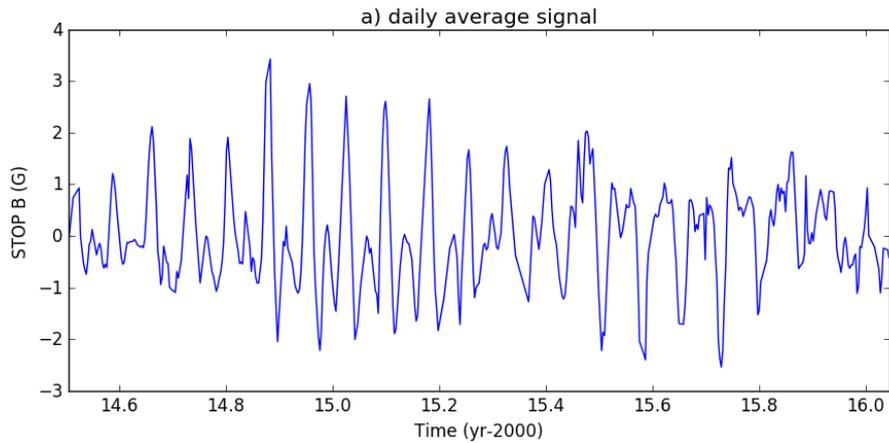
STOP (Kislovodsk) telescope shown that it can work stably in the synoptic programs.

The telescope can be used to create a service of the solar wind forecast on the basis of calculations of areas of open magnetic field configurations.

The telescope can be upgraded to the vector Magnetograph (?)

<http://observethesun.com/>

<https://www.facebook.com/observethesun>



The main periods of the time series of the average magnetic field at the daily charts Magnetograph STOP. a) the time profile; b) wavelet analysis; c) the spectral power in the range of periods of 10-30 days; d) the spectral power depending on the period.