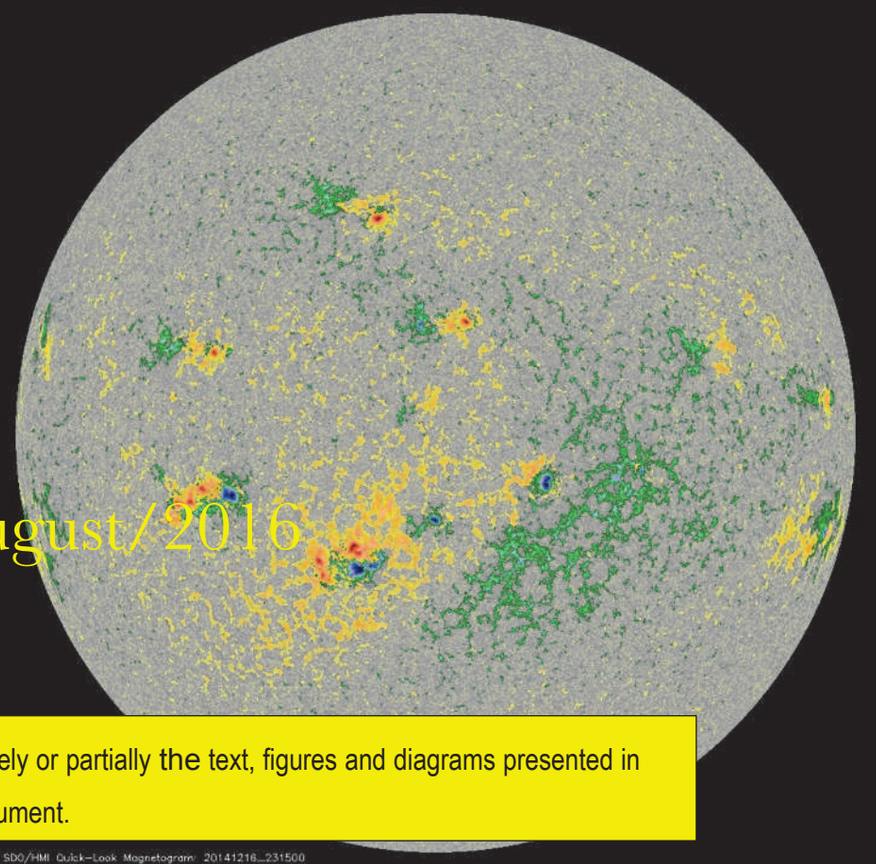
Brazilian Experimental Solar Telescope

1º WIN - INPE

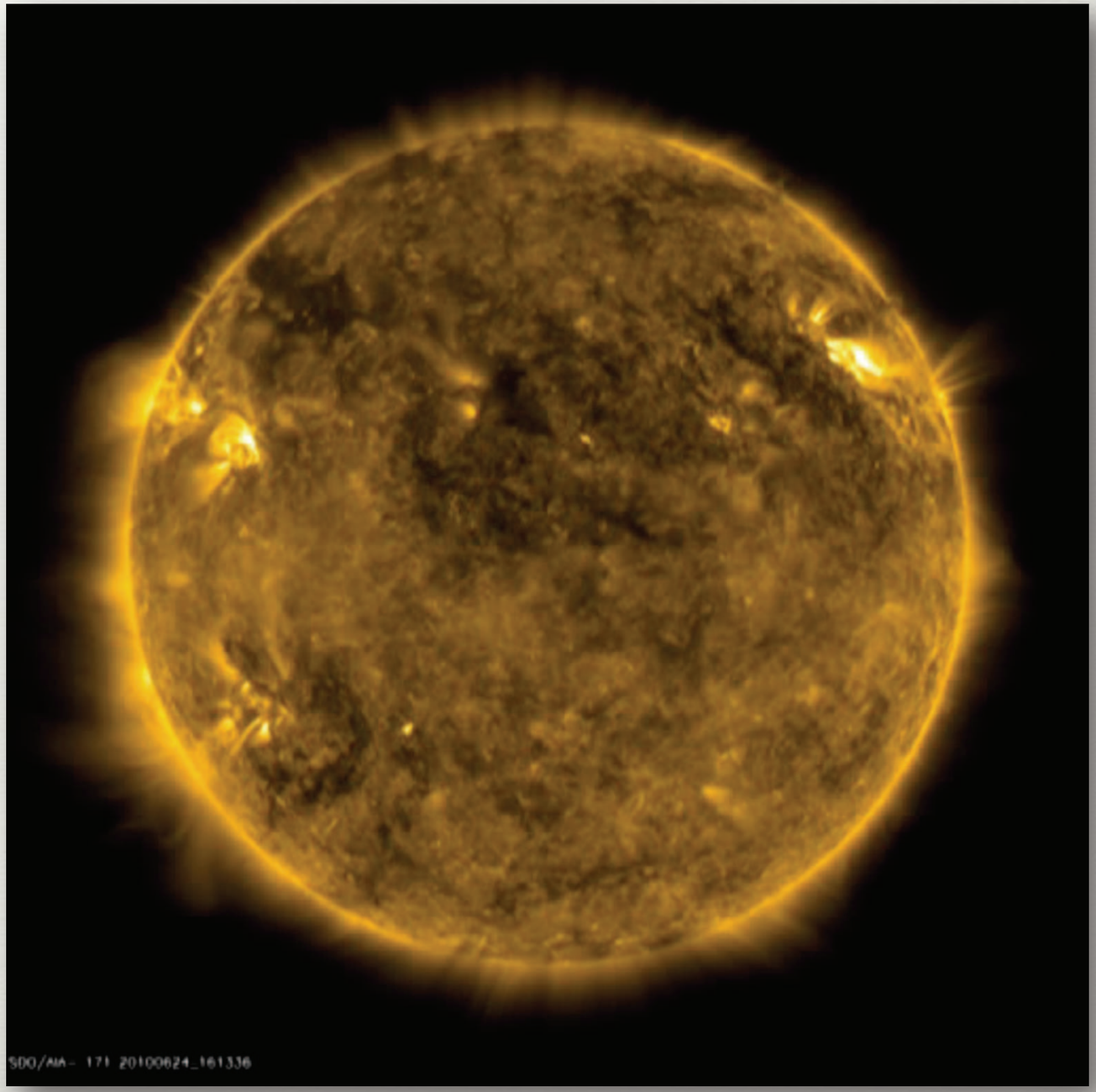


INPE, São José dos Campos, August/2016

Goals

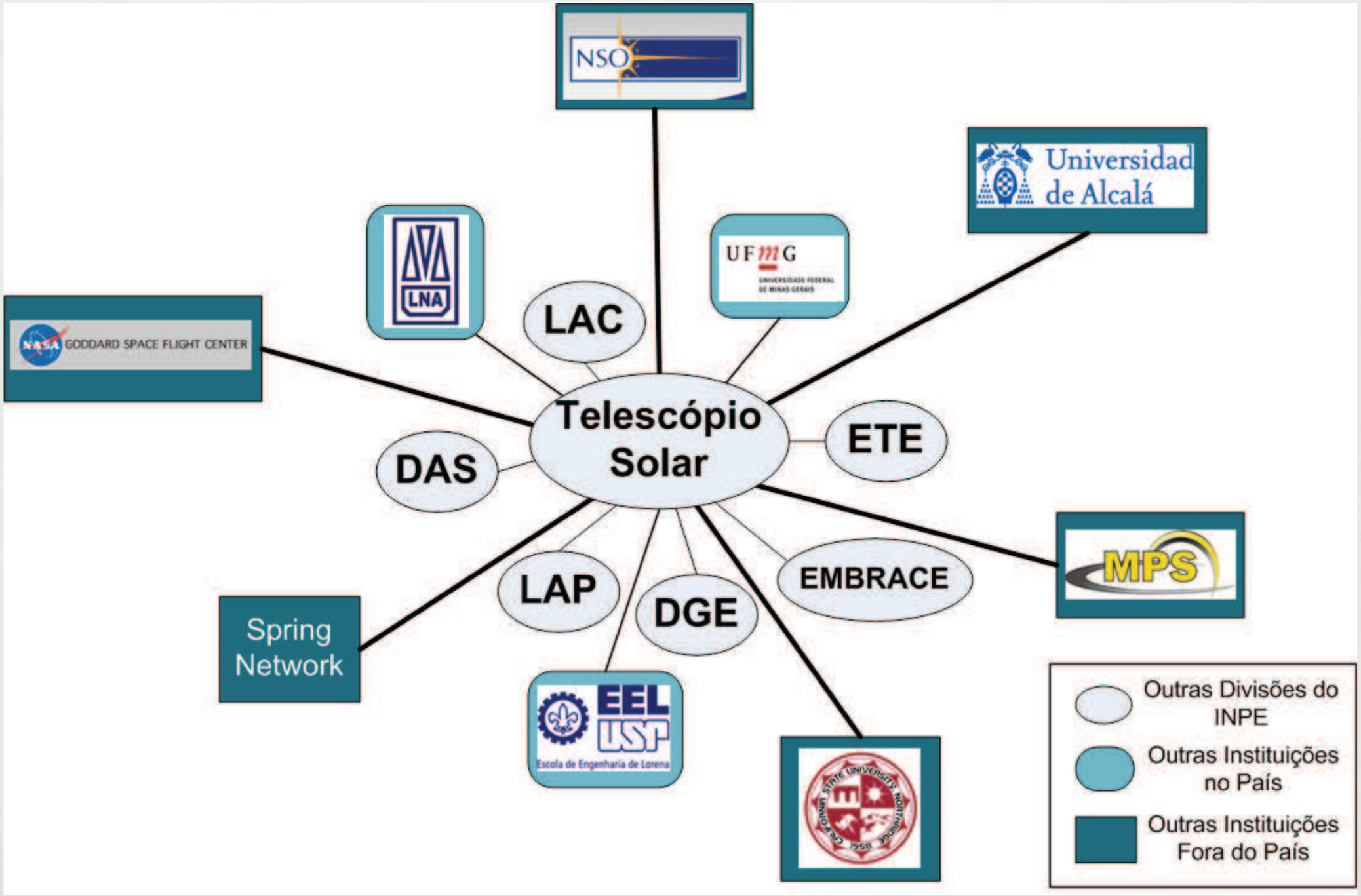
- Capacity building on instrumentation development for Heliosphysics exploration.

- Build a visible-light imager and magnetograph for solar observations.
- Create a scalable instrument for balloon and space based platforms.
- Create an internationally competitive instrument for space missions.



Overview:

Project Team Members and External Collaboration

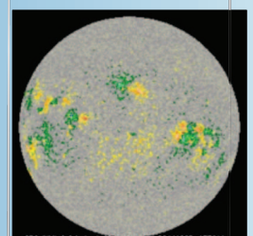


TIMELINE - PROJECT PLANNING

10 Years

2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023

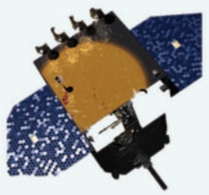
Development of the Solar Telescope



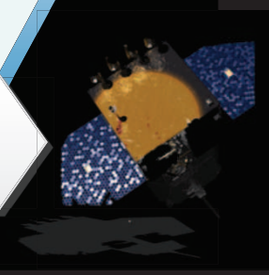
Ground Based Solar Telescope

Balloon-Borne Solar Observatory

Galileo Solar Space Telescope



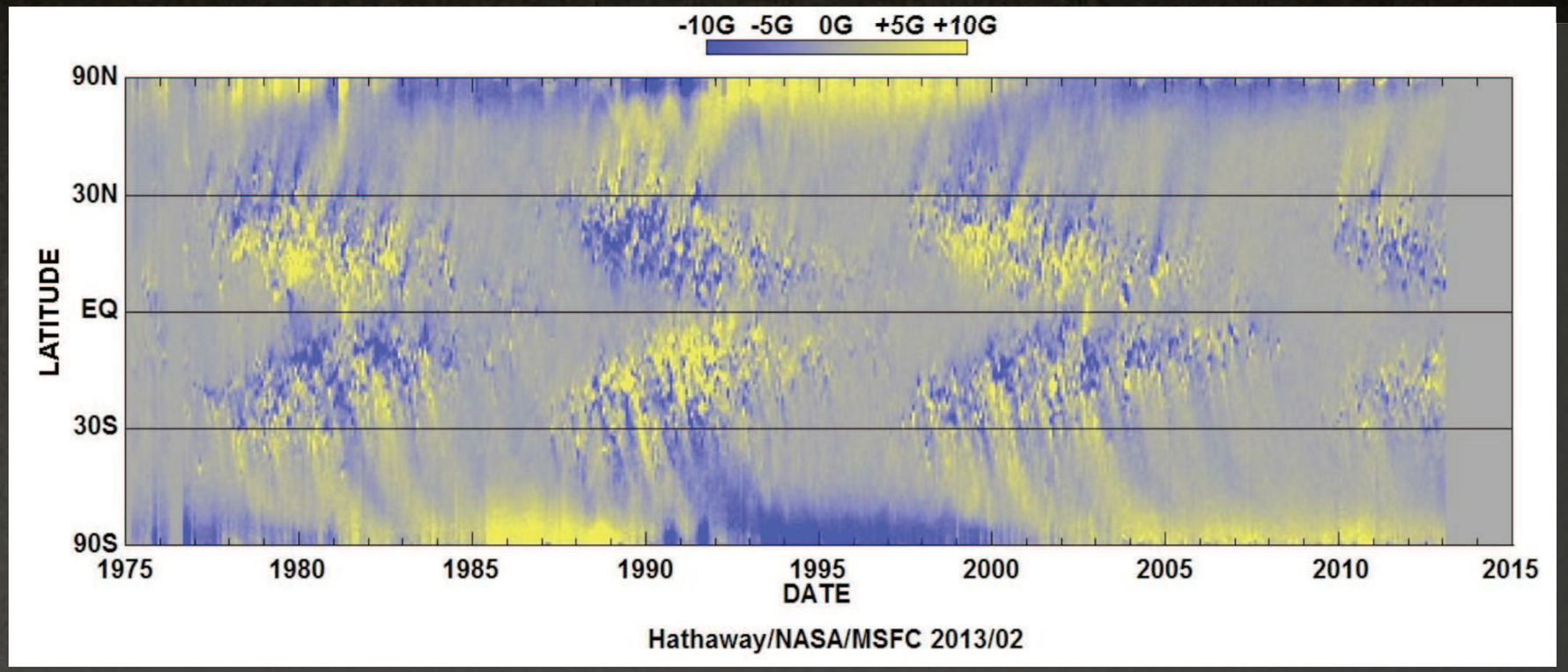
Out-of-the-ecliptic Solar Observatory



Understanding the Origin of Solar Activity and its Impact on Geospace. Out-of-the-Ecliptic Observations of the Solar Atmosphere, Magnetic Field and Irradiance

Scientific Motivation:

Probe the Solar Dynamo by Observing the Sun's Magnetic Field, Flows, and Seismic Waves



Source: http://solarscience.msfc.nasa.gov/dynamo.shtml

Solar Dynamo:

1) The 11-year period of the sunspot cycle,

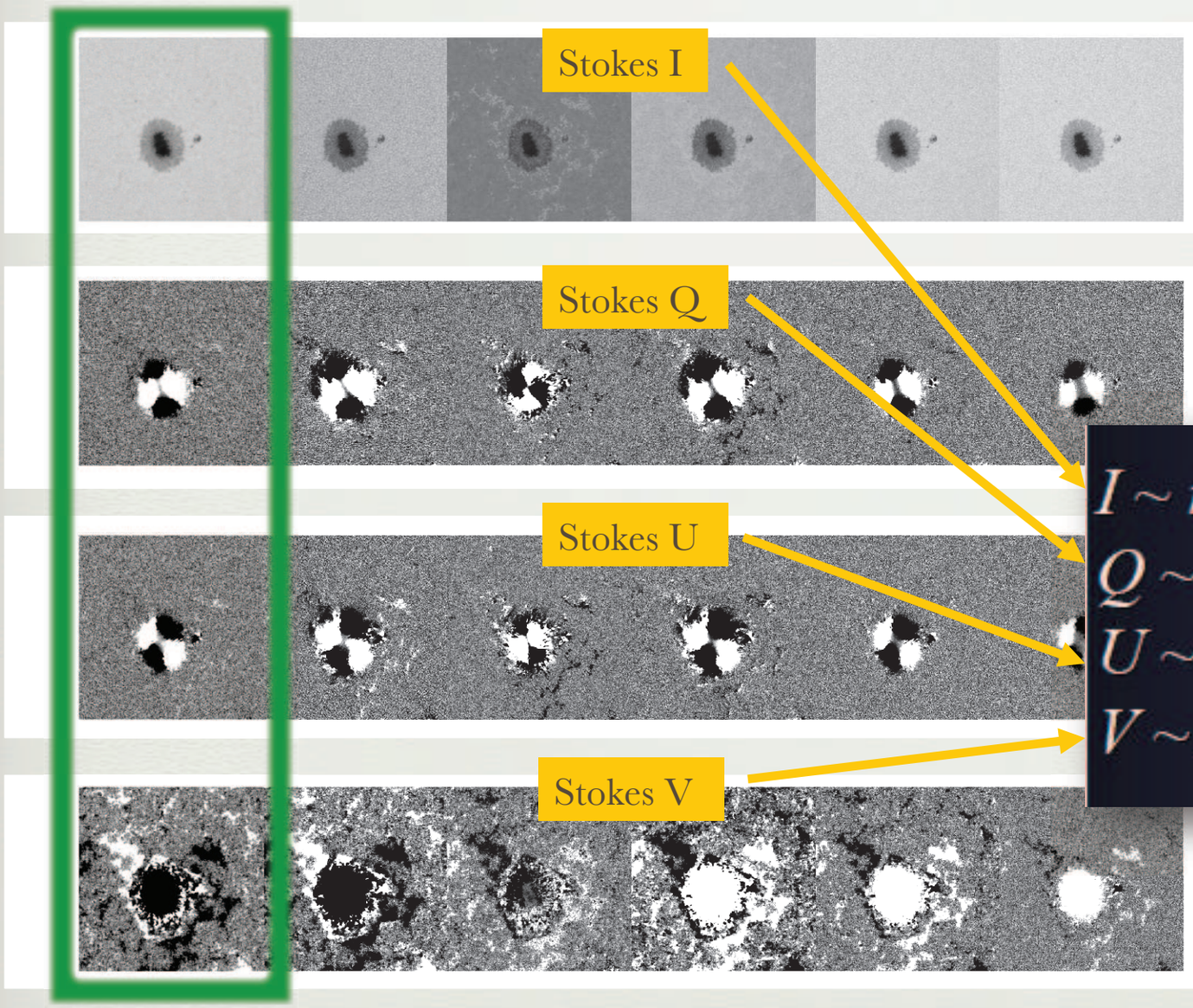
2) The equator-ward drift of the active latitude as seen in the butterfly diagram,

3) Hale's polarity law and the 22-year magnetic cycle,

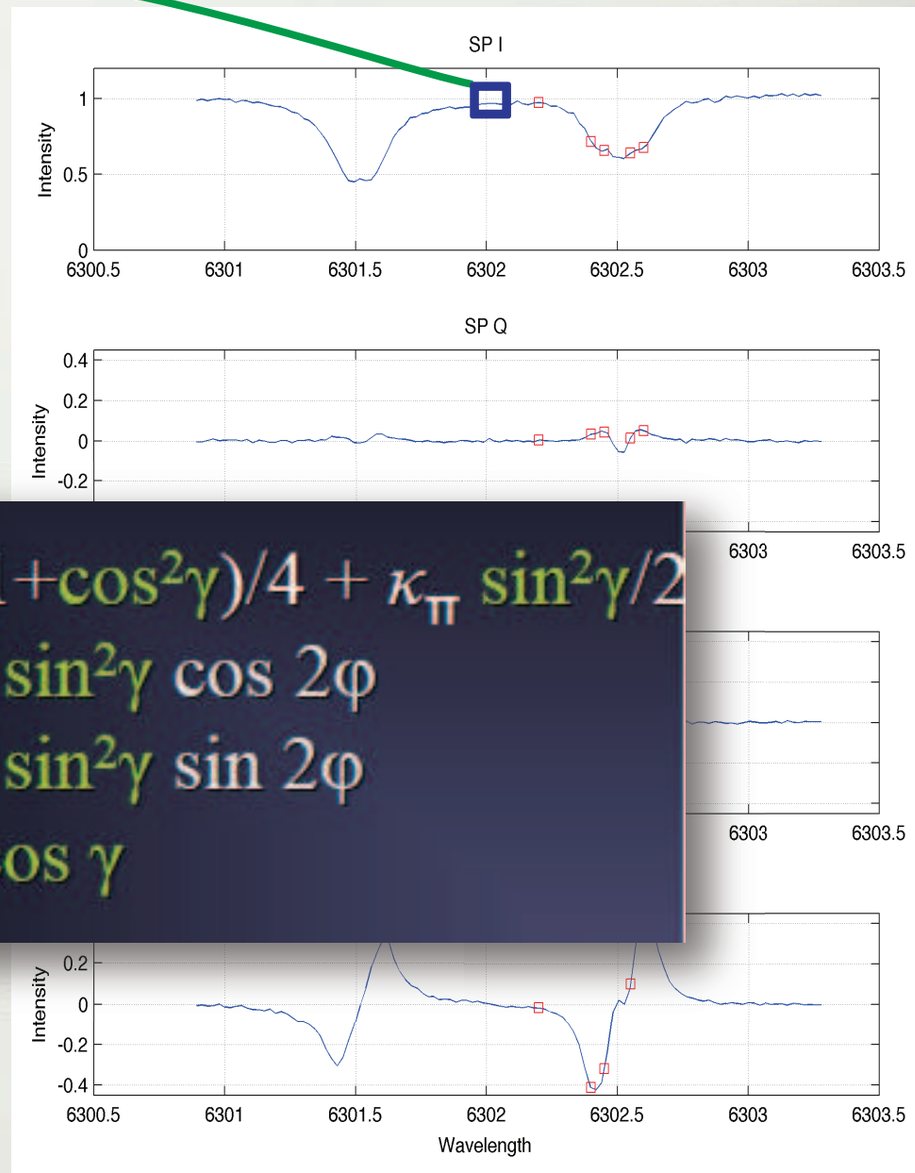
4) Joy's law for the observed tilt of sunspot groups and,

5) The reversal of the polar magnetic fields near the time of cycle maximum as seen in the magnetic butterfly diagram.

Methodology and workplan
Spectropolarimetry



$$I \sim \kappa_\sigma(1+\cos^2\gamma)/4 + \kappa_\pi \sin^2\gamma/2$$
$$Q \sim B^2 \sin^2\gamma \cos 2\varphi$$
$$U \sim B^2 \sin^2\gamma \sin 2\varphi$$
$$V \sim B \cos\gamma$$



HMI/SDO/NASA Observations – 2016.06.15 23h12

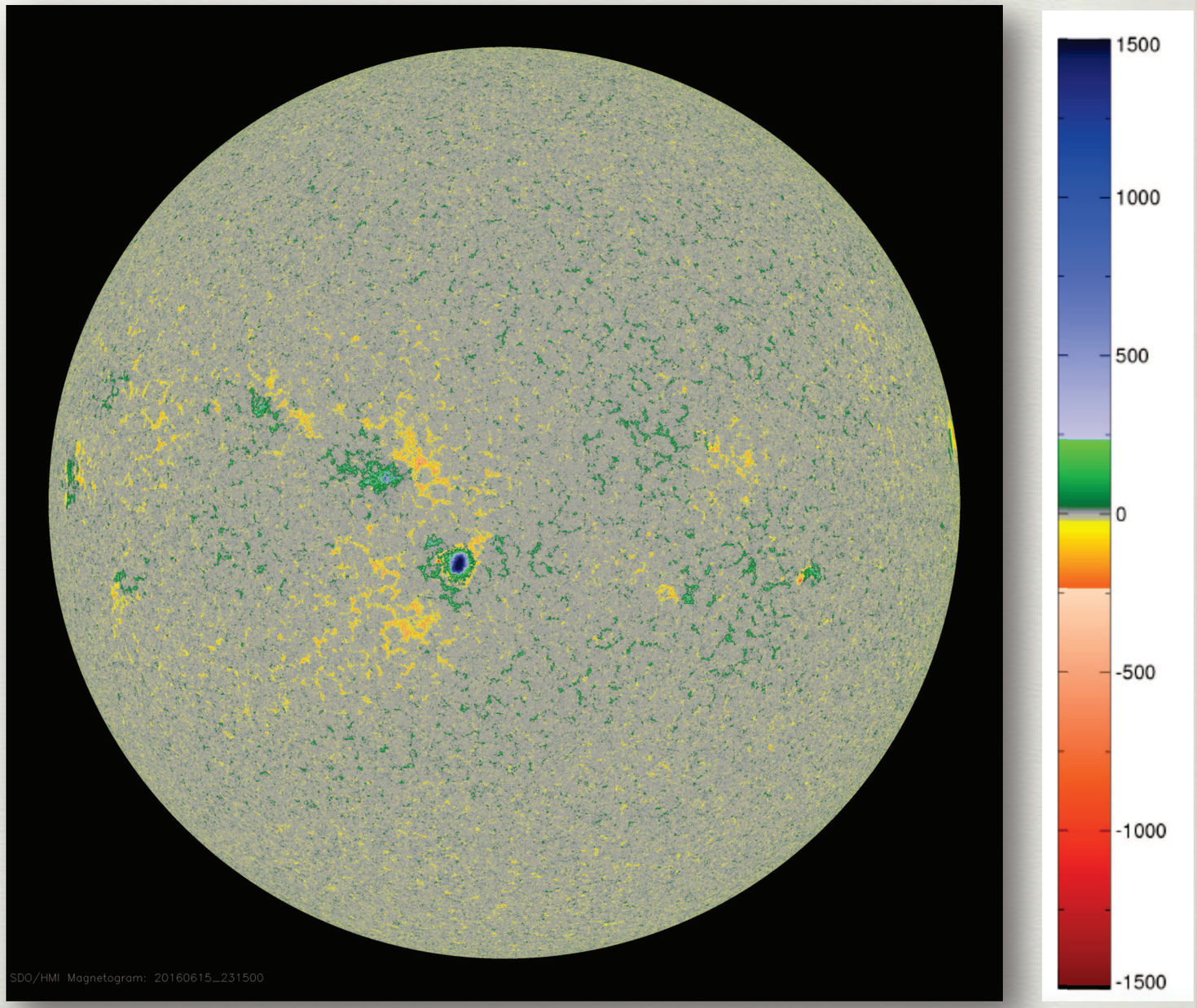
Technological Challenges

- Acquire high cadence images at high resolution and fine pointing;

- Reduced number of optical elements for achieving low polarization uncertainties;

- State of the art ultra narrow band filters, demanding a high qualified provider;

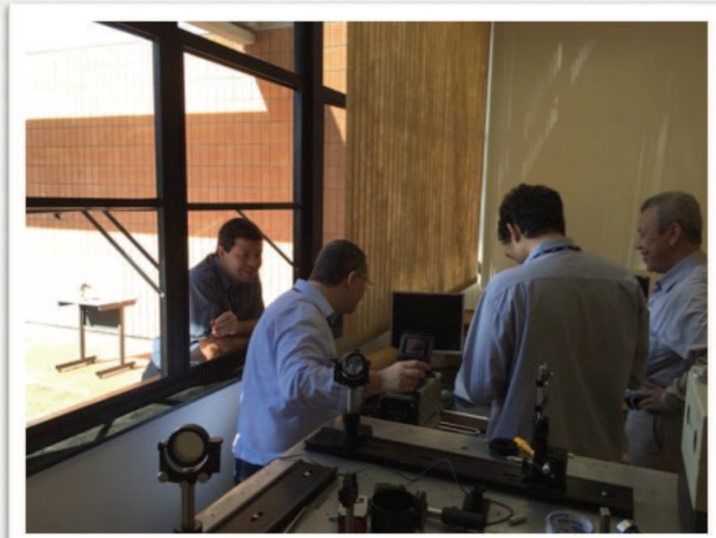
- First instrument of this kind ever built in Brazil, demanding qualification of personnel.



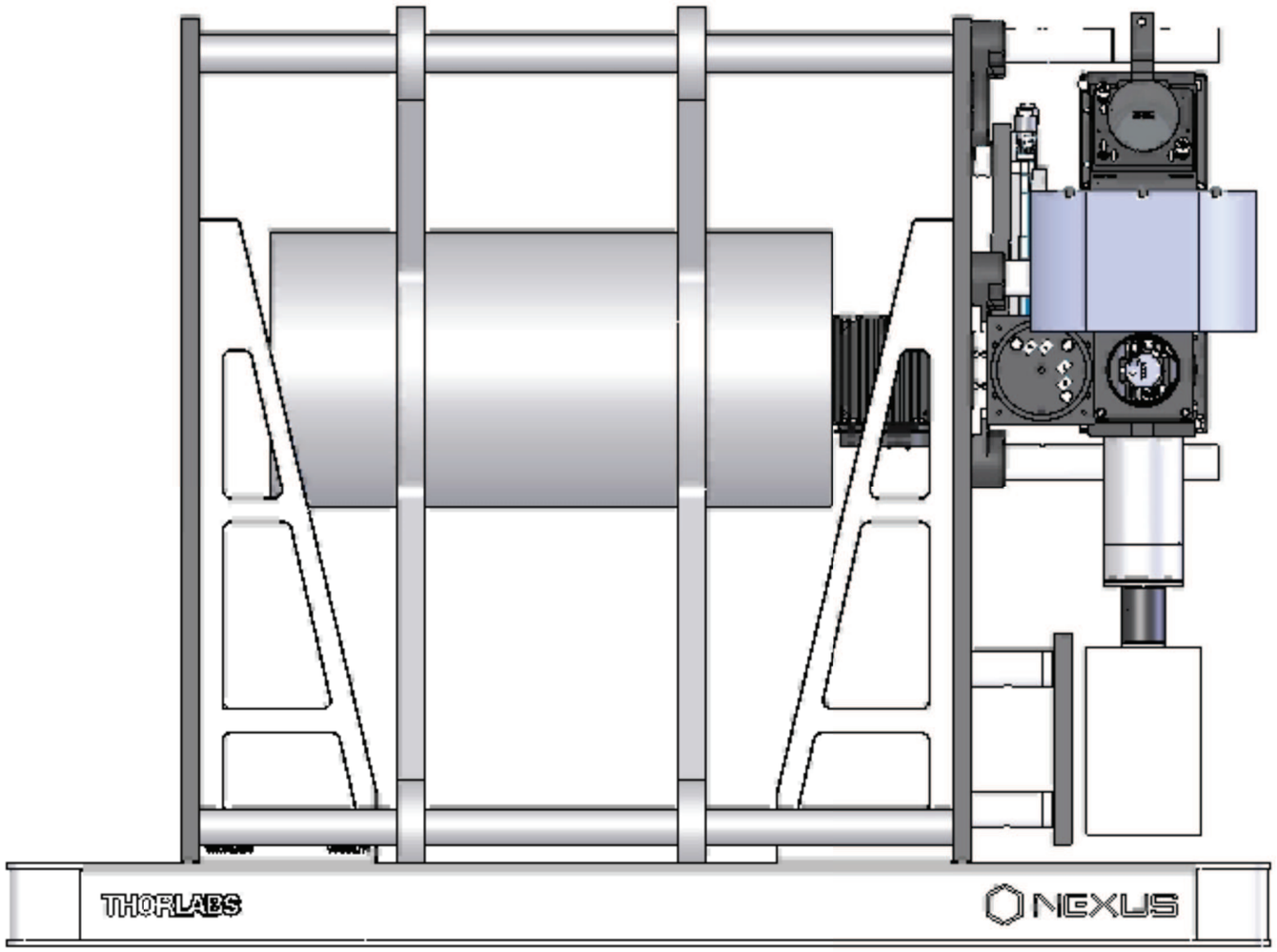
HMI/SDO/NASA Observations – 2016.06.15 23h12

Facilities and Innovation

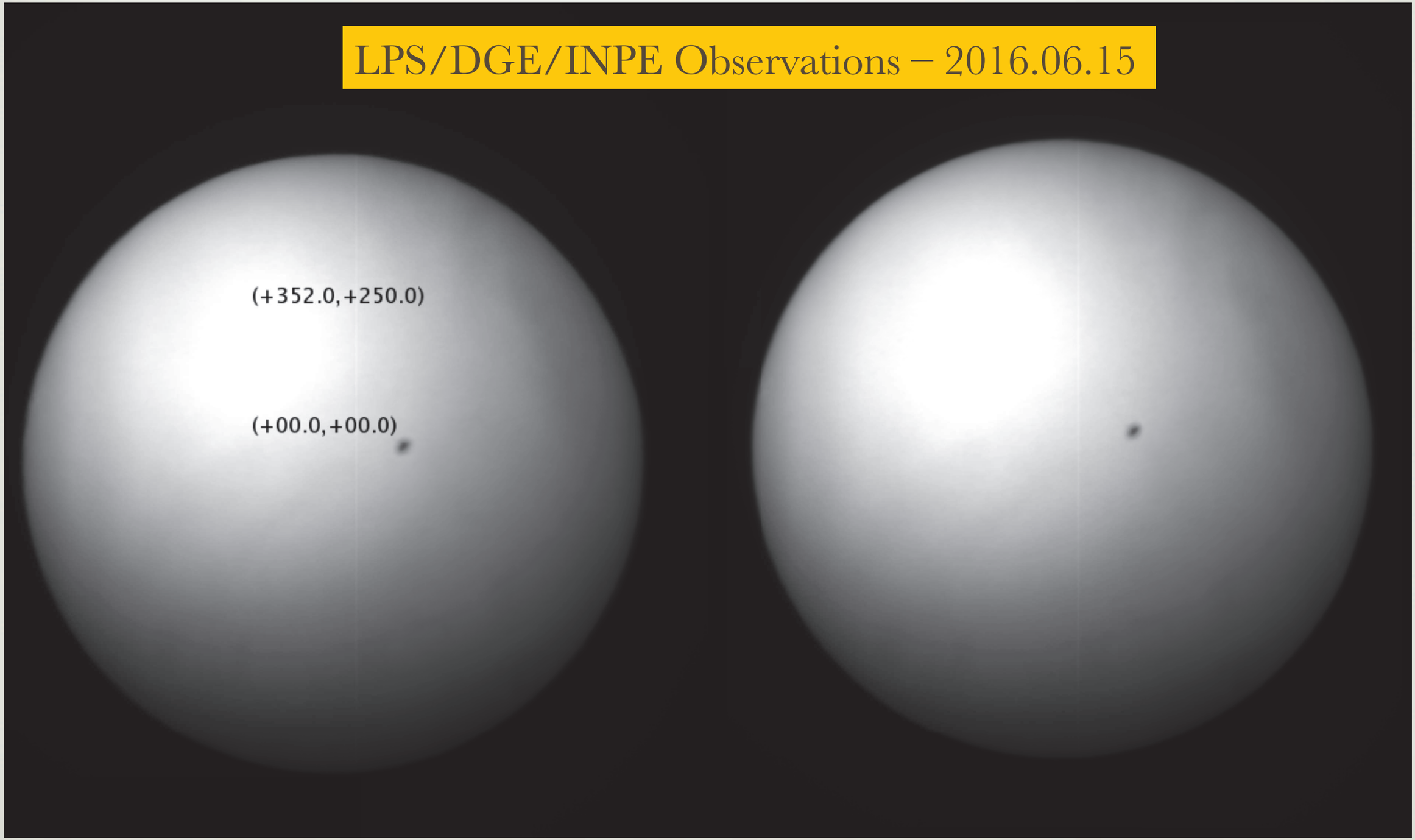
- Laboratory for Solar Polarimetry;
- Coelostat;
- Solar pointing and tracking system;
- Original architecture of the instrument;
- Development of new filter technolog based on holography;
- Development of new polarization analysis technology;



First version of the opto-mechanical project for the concept demonstration instrument

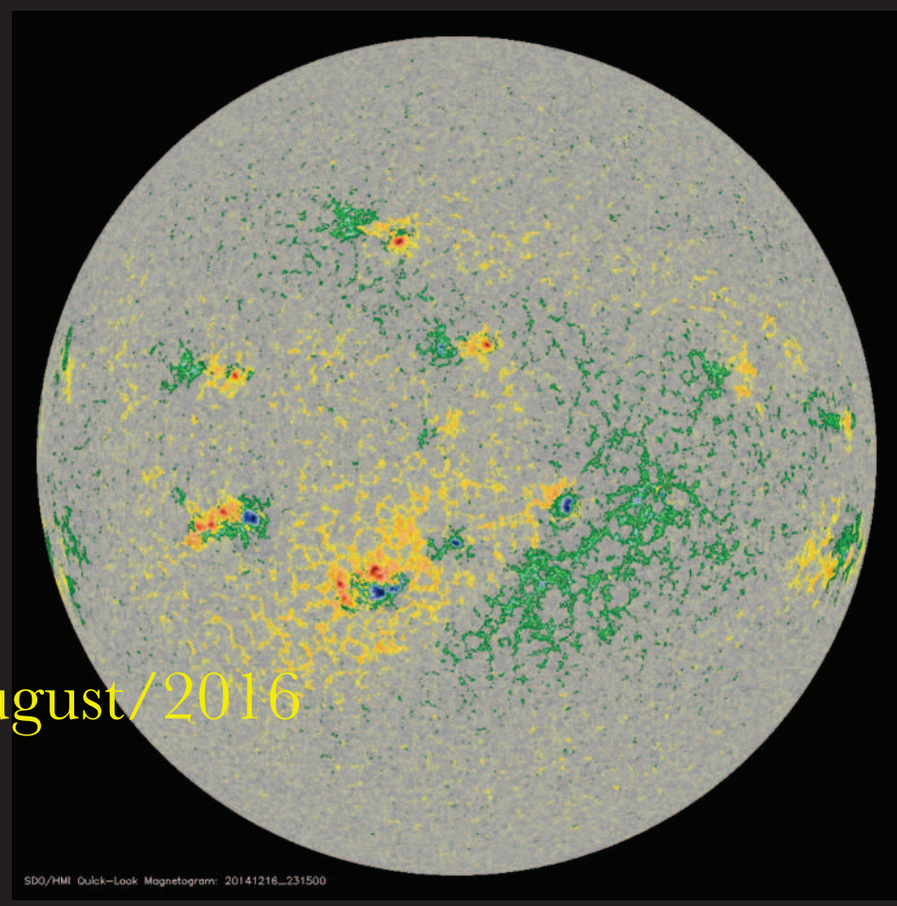


Methodology and workplan
Spectropolarimetry: First Steps



Brazilian Experimental Solar Telescope

1º WIN - INPE



INPE, São José dos Campos, August/2016