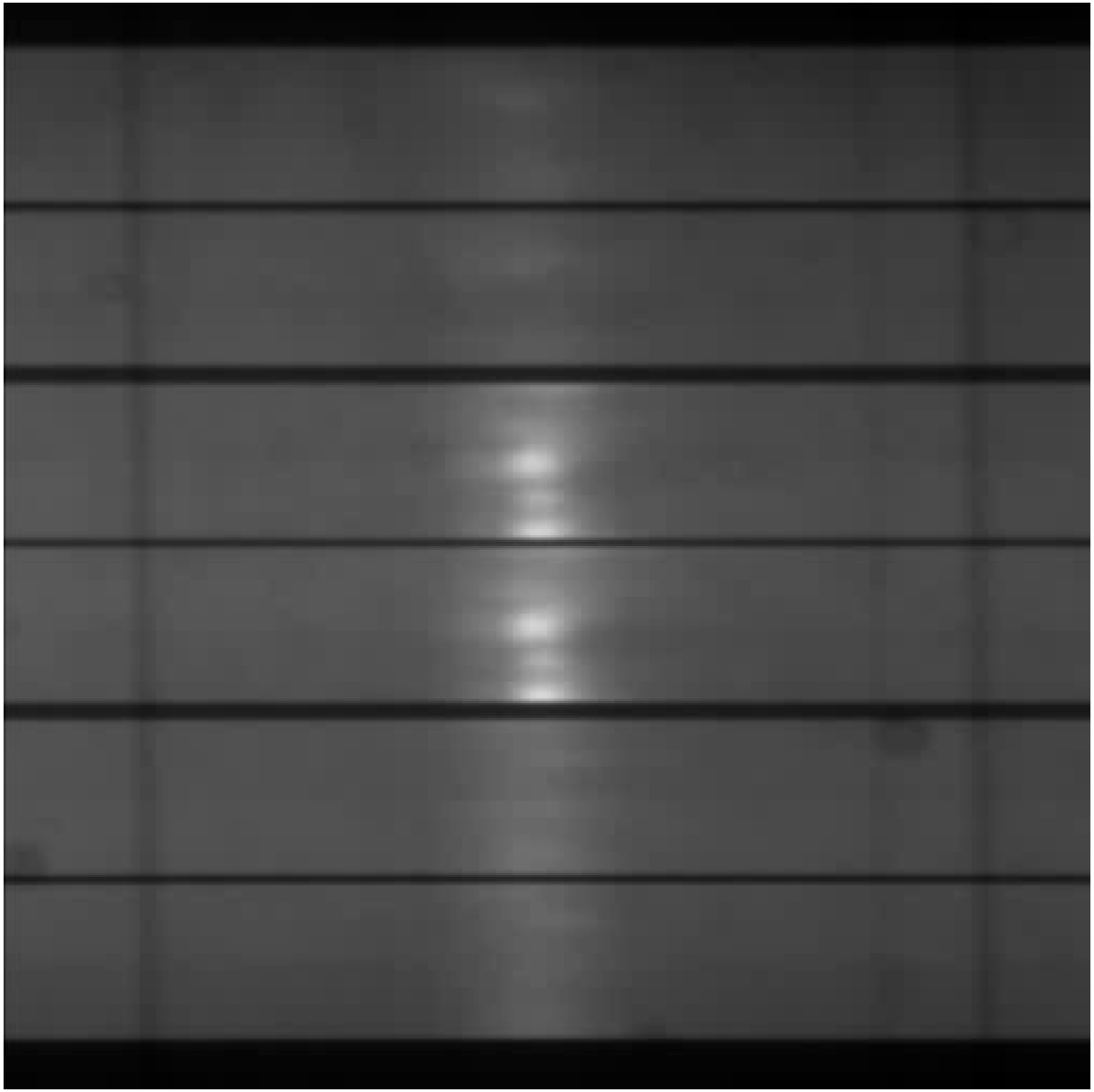
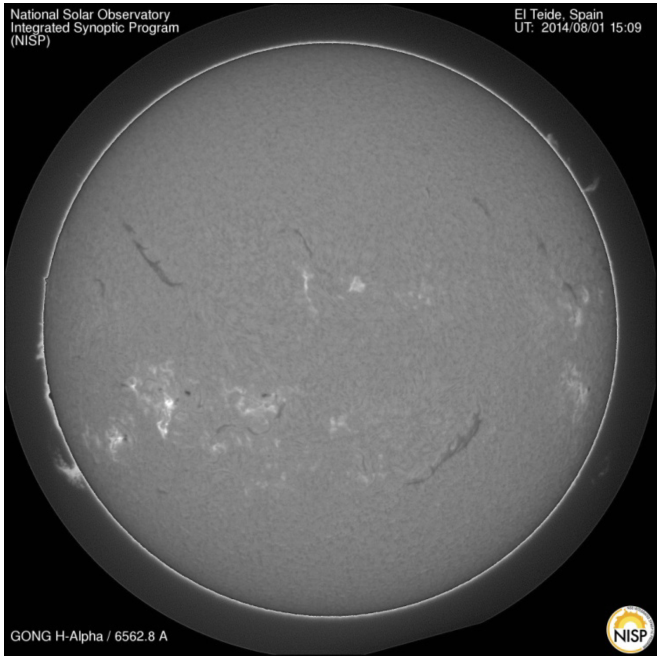
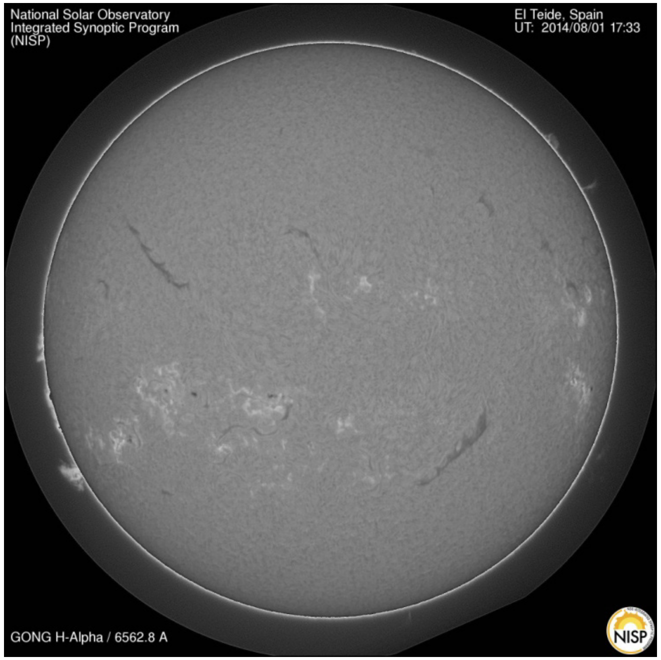
MTR/THEMIS He I 587,6 nm D_3 spectropolarimetry

1 August 2014

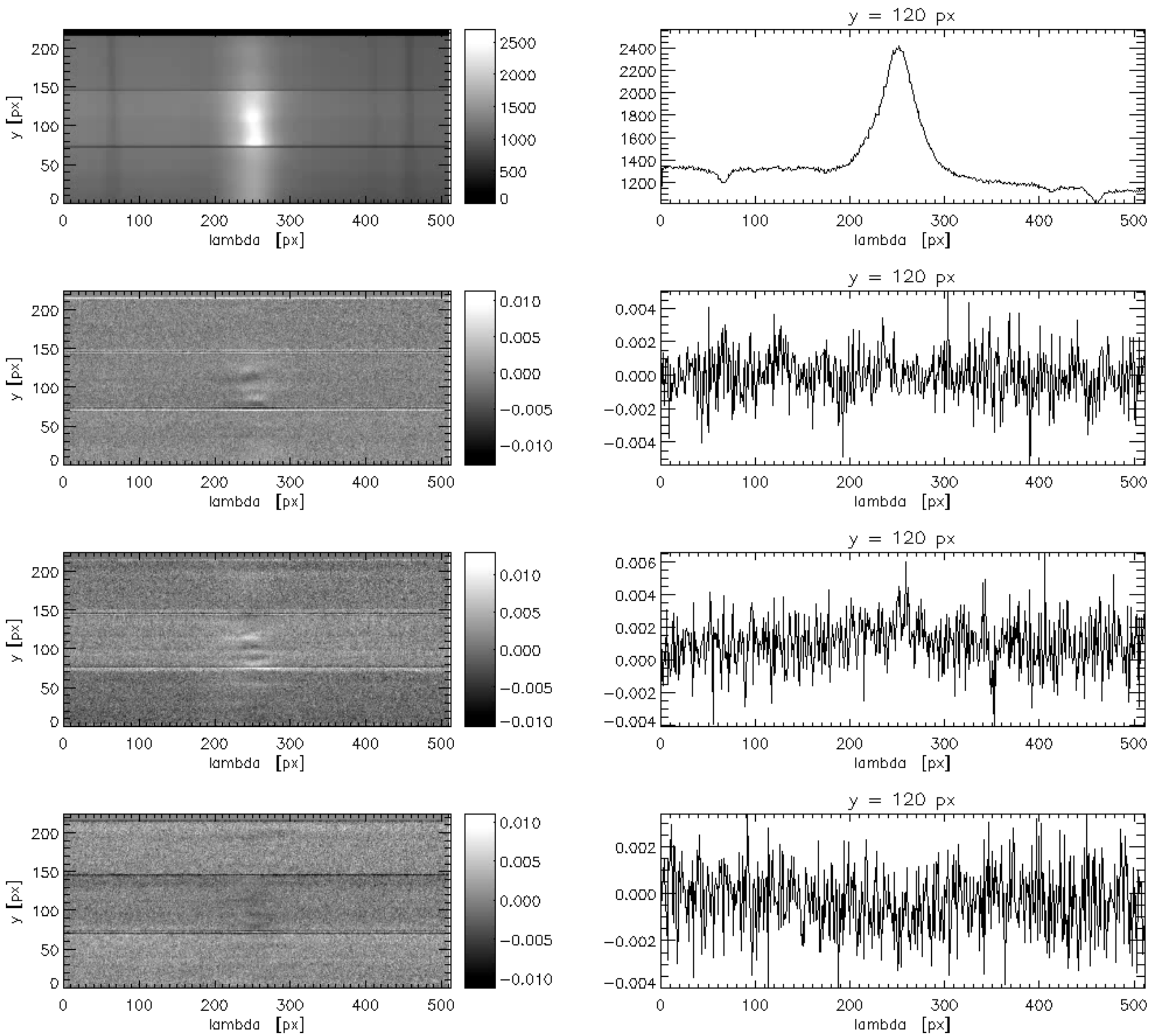


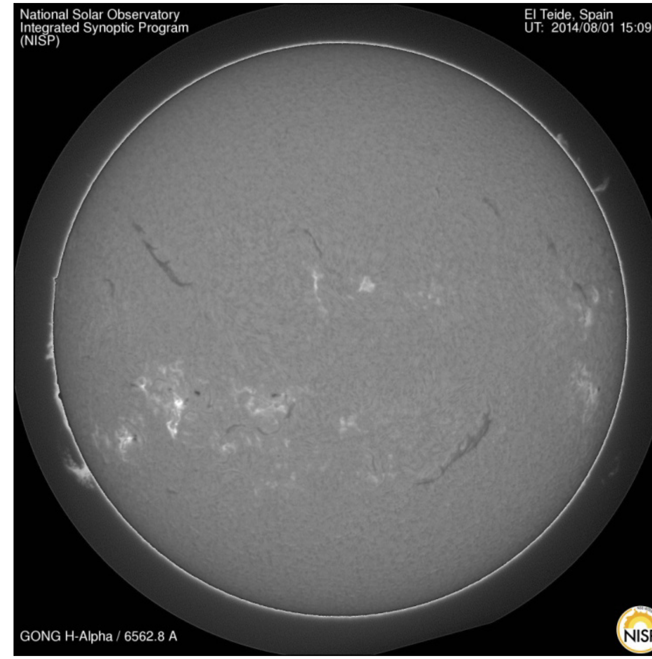


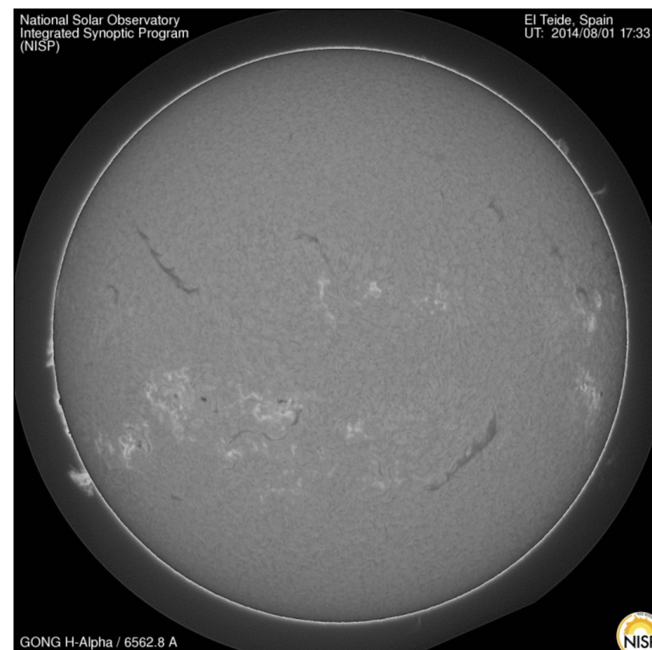


MTR/THEMIS spectropolarimetry reduced by Deep Stokes

1 August 2014

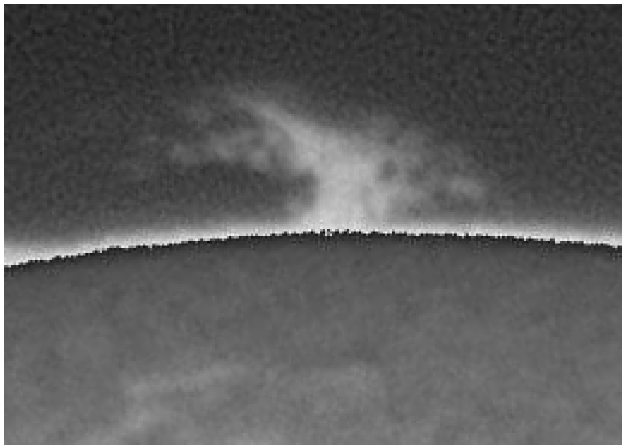


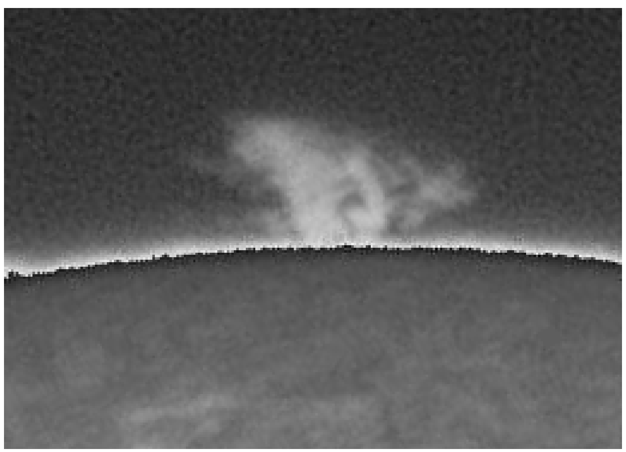




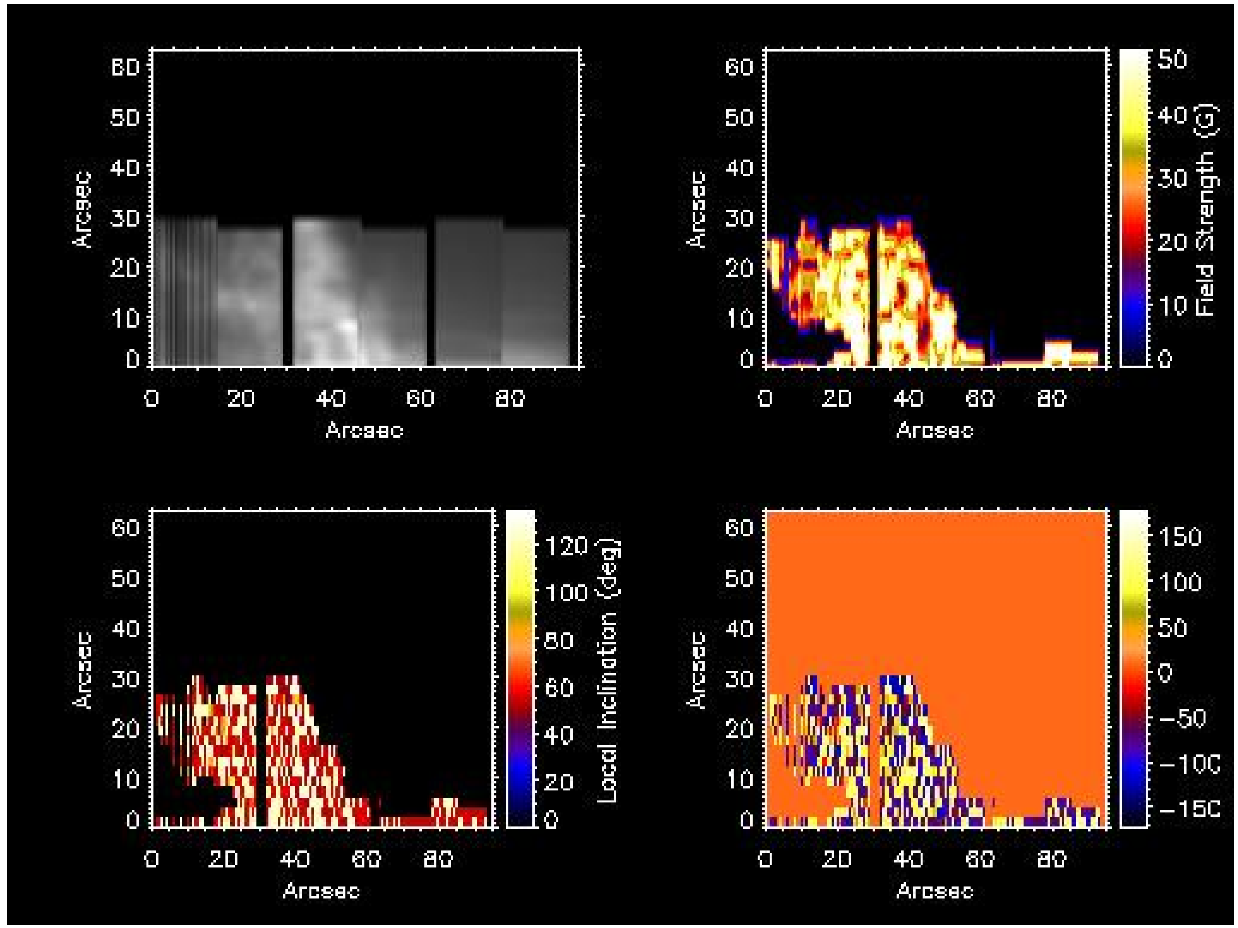
THEMIS 1. august 2014

Hα GONG





He I 587,6 nm D_3 - výsledky PCA inverzie



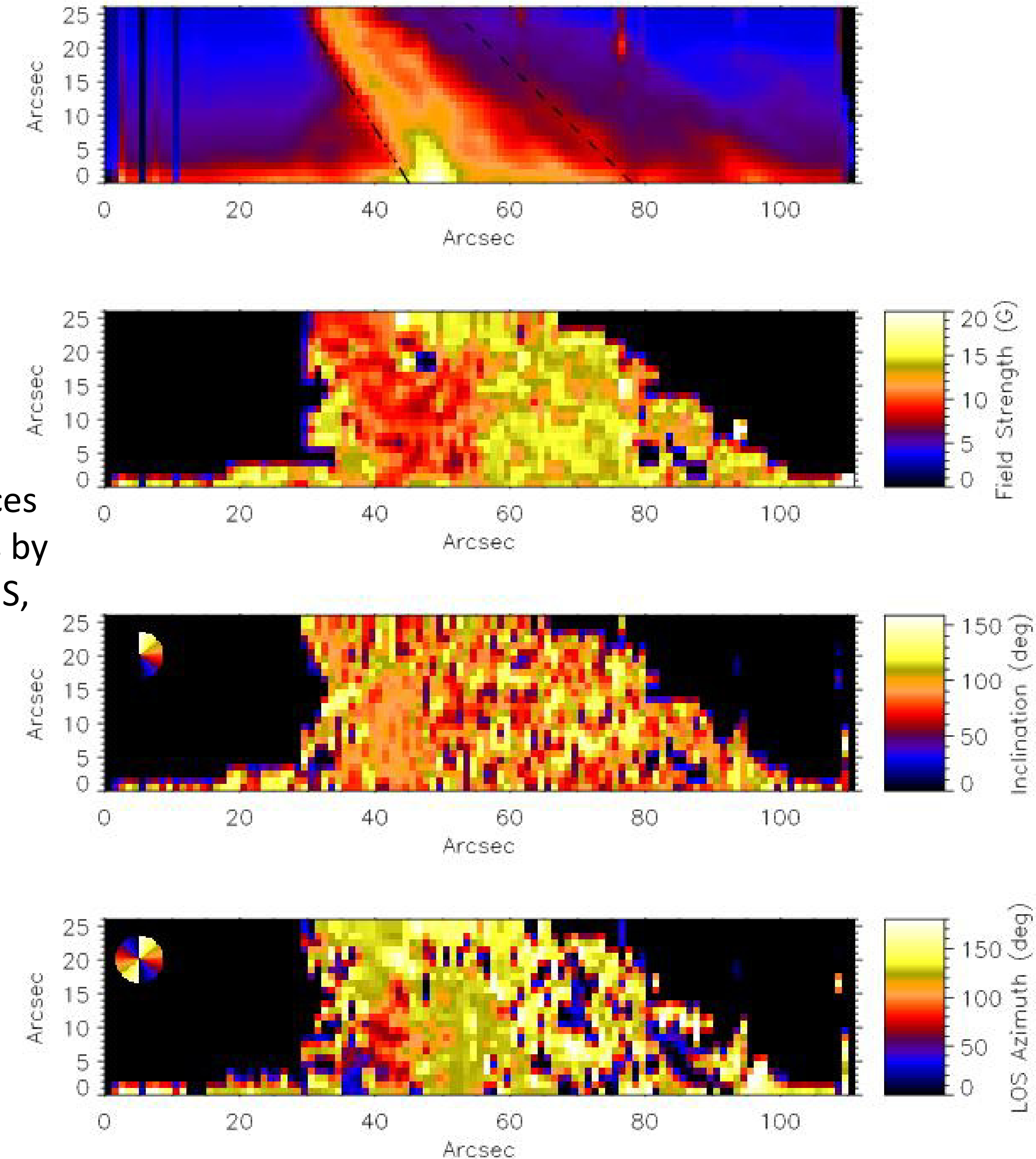
Indukcia magnetického poľa protuberancie: 10 – 50 G

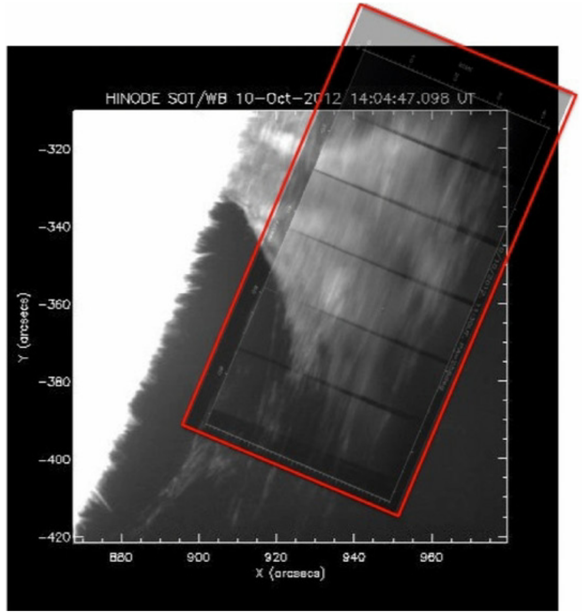
Schmieder et al. (2014)
Astronomy & Astrophysics

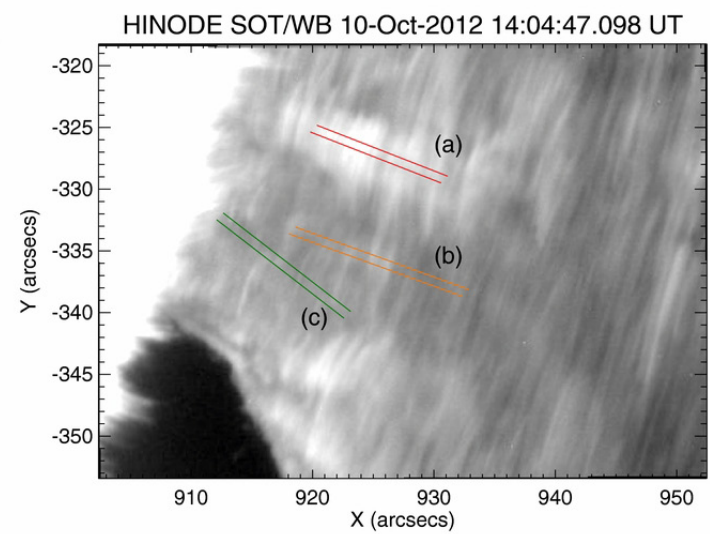
Open questions on prominences from coordinated observations by IRIS, Hinode, SDO/AIA, THEMIS, and the Meudon/MSDP

Figure by A. López Ariste

Indukcia magnetického poľa protuberancie: 0 – 20 G

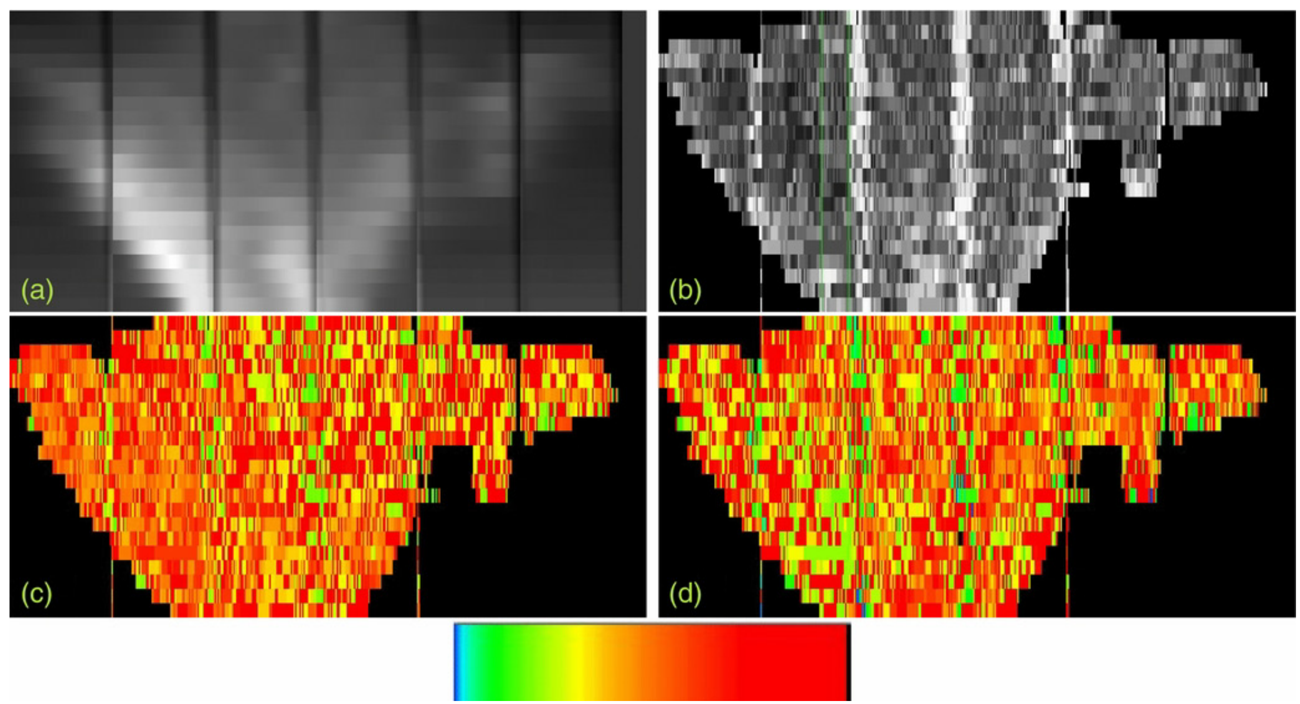






Schmieder et al. (2013)
The Astrophysical Journal

PROPAGATING WAVES TRANSVERSE
TO THE MAGNETIC FIELD
IN A SOLAR PROMINENCE



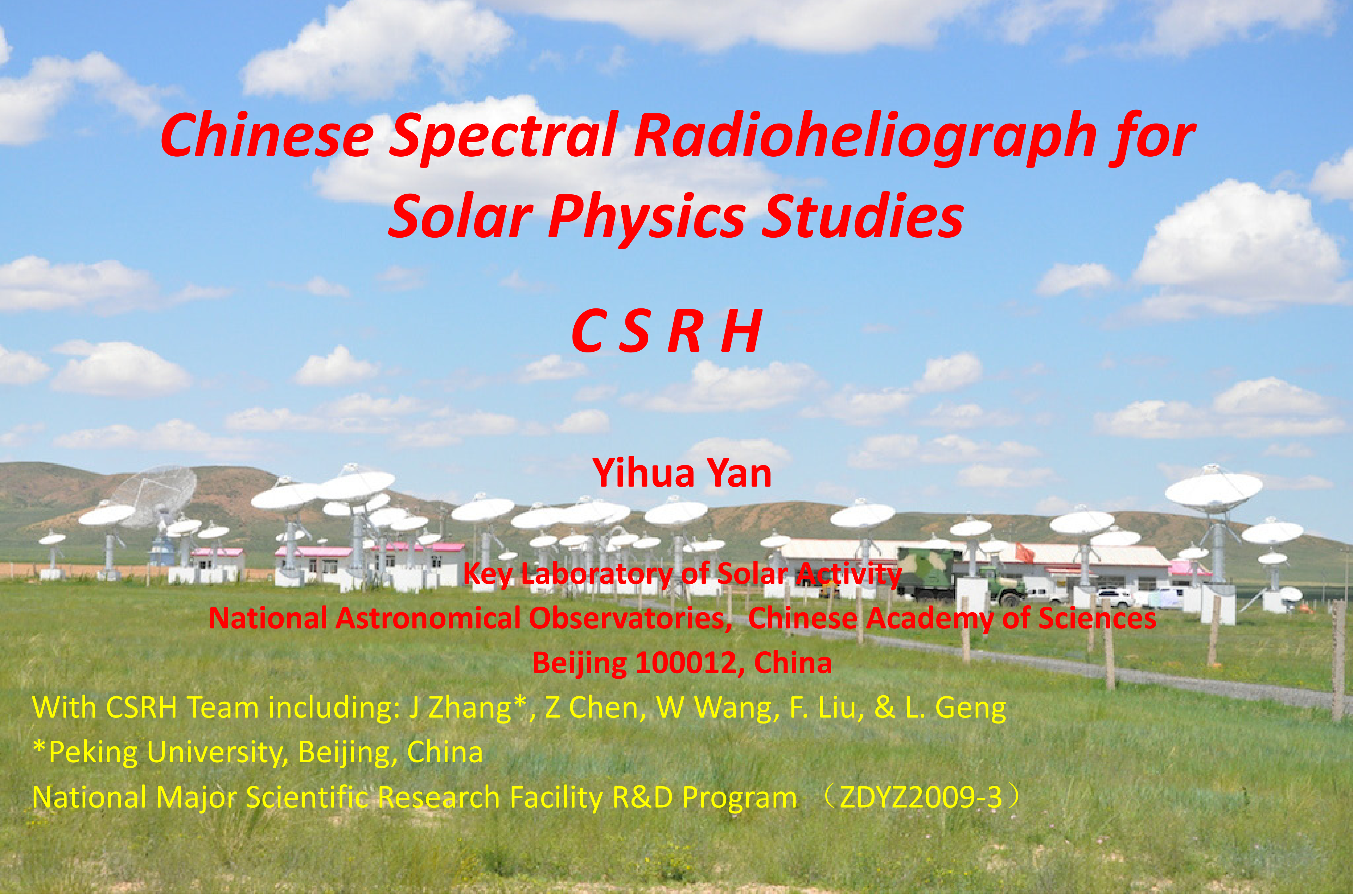
Figures by A. López Ariste

Indukcia magnetického poľa protuberancie: ? G

14th European Solar Physics Meeting

Dublin, 8th – 12th September 2014

- coronal- and coronal magnetometry oriented talks, instruments, projects, missions, ...
- discussions on future collaboration
  - Kiyoshi Ichimoto (Hinode)
  - Kostas Tziotziou



Chinese Spectral Radioheliograph for Solar Physics Studies

C S R H

Yihua Yan

Key Laboratory of Solar Activity
National Astronomical Observatories, Chinese Academy of Sciences
Beijing 100012, China

With CSRH Team including: J Zhang*, Z Chen, W Wang, F. Liu, & L. Geng
*Peking University, Beijing, China

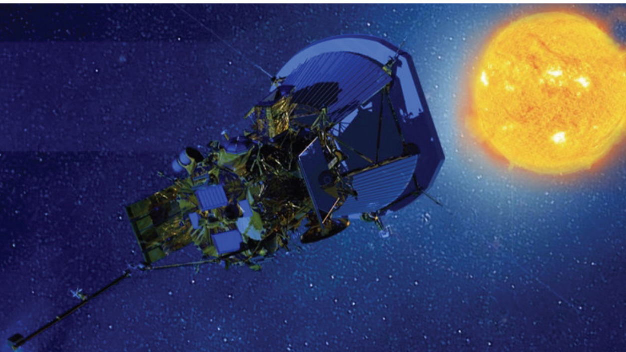
National Major Scientific Research Facility R&D Program （ZDYZ2009-3）

Scientific Motivations:

- **The available radio facilities are either with high time and spectral resolution but without spatial resolution, or with high time and spatial resolution but at only one or a few frequencies.**
- **It is needed to have high spectral resolution over wide band as well** (Gary 2013).
- **Imaging spectroscopy over cm-λ & dm-λ is important for addressing the problems of primary energy release, particle acceleration, and transportation processes, and the coronal magnetic fields** (Bastian, et al., ARAA, 1998; Gary & Keller 2004; Aschwanden 2004; Pick & Vilmer 2008, Klein et al. 2008; Tomczyk et al. 2013).
- **But now WMA, LOFAR, etc., at metric and lower frequencies, and ALMA at mm, THz.**

Solar Probe Plus

A NASA Mission to Touch the Sun



Solar Probe Plus – A Mission to Touch the Sun

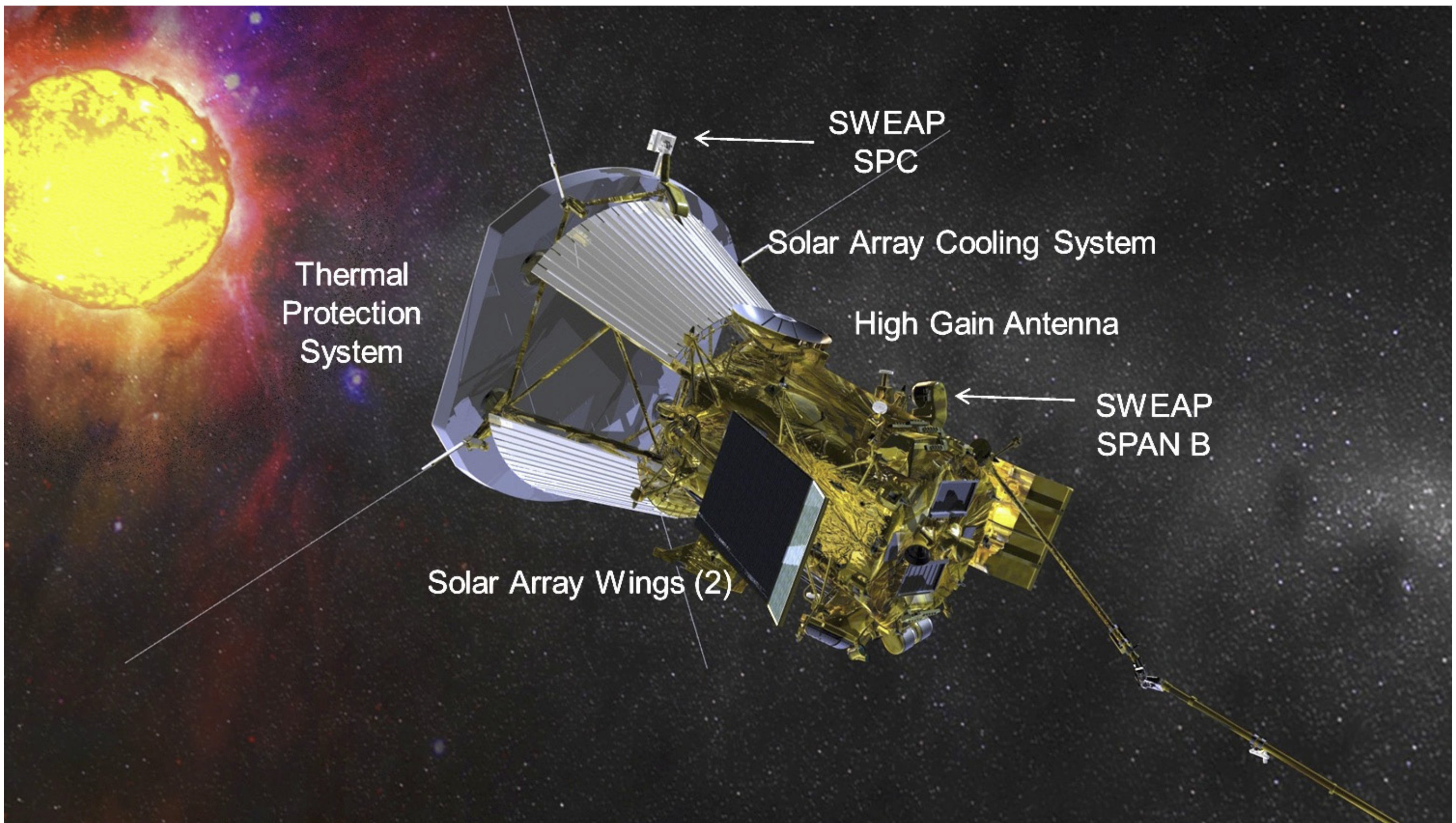
Rob Decker and Nicky Fox
Johns Hopkins Applied Physics Laboratory
Laurel, Maryland, USA

Representing SPP Project and Science Investigation Teams

The Johns Hopkins University
APPLIED PHYSICS LABORATORY

NASA: Solar Probe Plus (SPP)

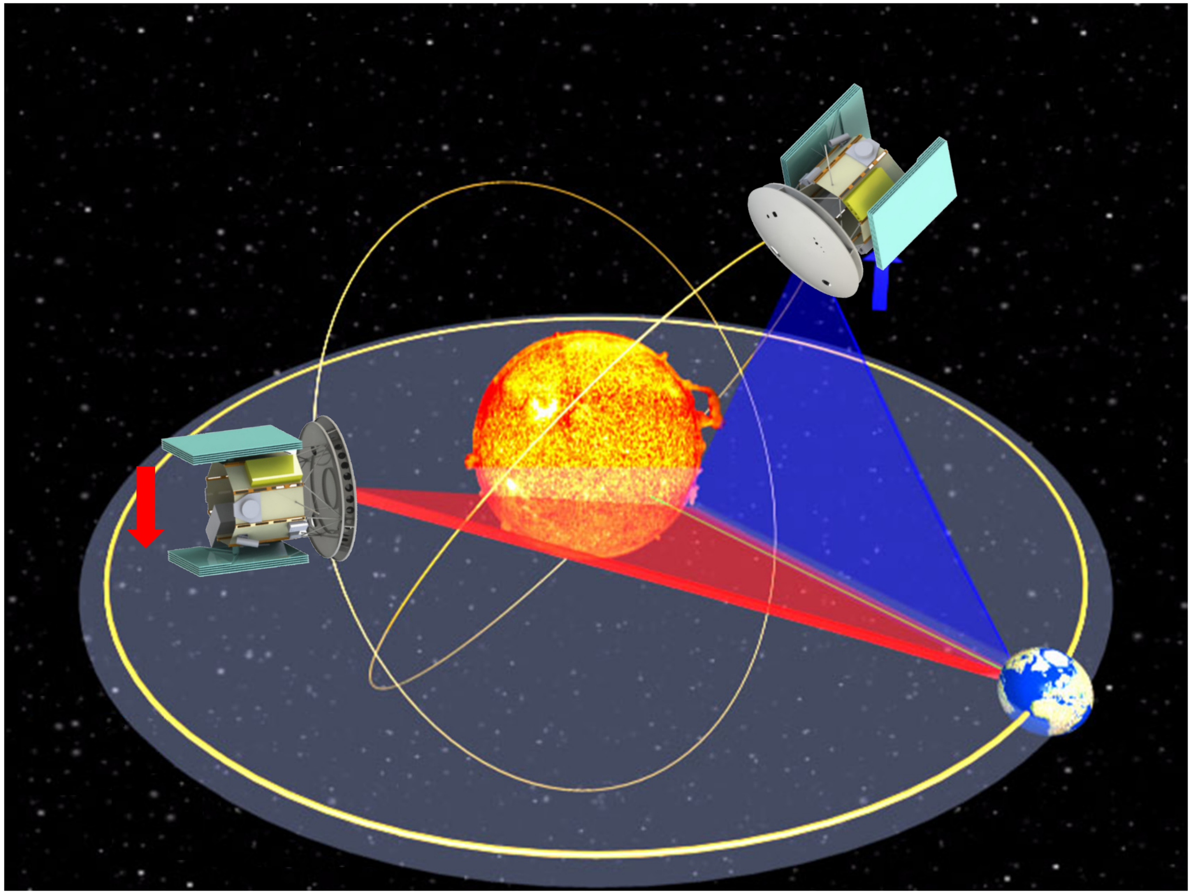
- launch 2018
- lifetime 7 years
- perihelion 10 – 20 Solar Radius
- aphelion 0.73 AU



SPP Investigations to Answer the Science Questions

Investigation	Instruments	Principle Investigator
Fields Experiment (**FIELDS**)	4 x Electric Antennas (+ 1 probe on mag boom) 2 x Fluxgate Magnetometer (MAG) 1 x Search Coil Magnetometer (SCM)	Prof. Stuart D. Bale, University of California Space Sciences Laboratory, Berkeley, CA
Integrated Science Investigation of the Sun (**ISIS**)	High energy Energetic Particle Instrument (EPI-Hi) Low energy Energetic Particle Instrument (EPI-Lo)	Dr. David J. McComas, Southwest Research Institute, San Antonio, TX
Solar Wind Electrons Alphas and Protons (**SWEAP**)	Solar Probe Faraday Cup (SPC) 2 Solar Probe ANalyzers (SPAN; ESAs)	Dr. Justin Kasper, University of Michigan, Ann Arbor, MI & Smithsonian Astrophysical Observatory, Cambridge, MA
Wide-field Imager for Solar PRobe (**WISPR**)	White light imager	Dr. Russ Howard, Naval Research Laboratory, Washington, DC
Heliospheric Origins with Solar Probe Plus (**HeliOSPP**)	Observatory Scientist: Addresses SPP science objectives via multi-instrument data analysis to optimize the scientific productivity of the mission	Dr. Marco Velli, Jet Propulsion Laboratory, Pasadena, CA

Current state of the Interhelioprobe mission



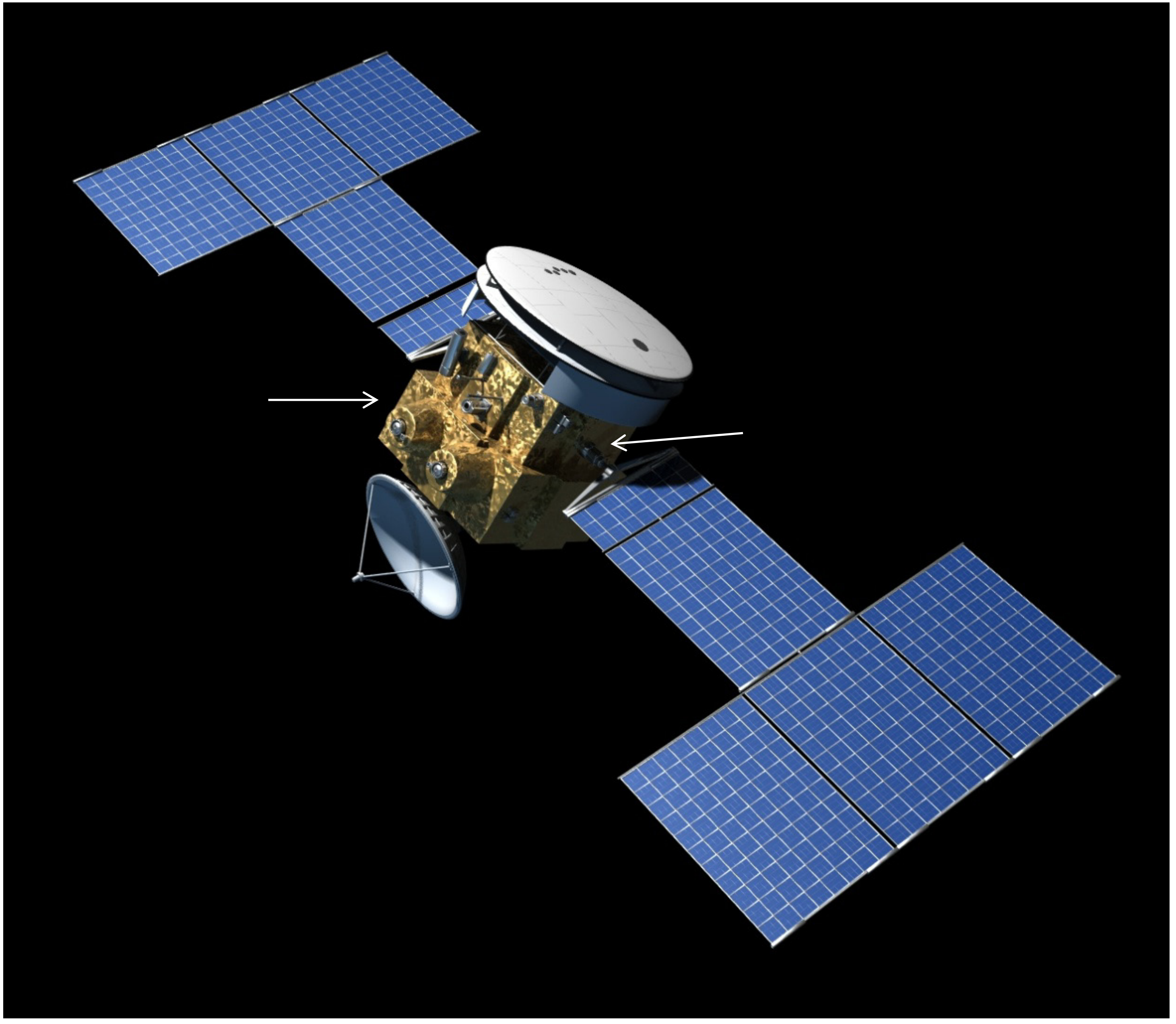
I. Zimovets[1], L. Zelenyi[1], V. Kuznetsov[2] & the IHP Team[1,2,…]

[1] Space Research Institute (IKI), Russian Academy of Sciences, Moscow, Russia

[2] Institute of Earth magnetism, ionosphere and radiowaves propagation (IZMIRAN), Troitsk, Russia

ESPM-14, Trinity College Dublin, Ireland (11:20-11:40, 08-Sep-2014)

Interhelioprobe spacecraft raw model



Instruments for remote observations of the Sun

№	Instrument	Measurements	Characteristics	Mass [kg]	Power [W]
1	Multi-functional optical telescope **TAHOMAG**	Stokes parameters Vectors of magnetic and velocity fields at the photosphere Intensity of white-light radiation	FOV=600"; dα=0.16"-0.40"; λ=3000, 6301, 6302, 6528 Å; dλ=15 mÅ; B=±10 kGs; dB=2-3 Gs (line-of-sight);	36	40
2	Multi-channel solar photometer **PHOTOSKOP**	Solar constant Global oscillations of the Sun	FOV=10°; λ=3000-16000 Å; dλ=100 Å; dI=0.3%; dI/dt=0.1%/year	6.5	12
3	Imaging EUV and SXR telescope **TREK**	Images of the Sun Localization of active regions	FOV=0.7°-2°; dα=1.2"-3.5"; λ=131, 171, 304, 8.42 Å	15	15
4	Solar HXR telescope-spectrometer **SORENTO**	Images of solar HXR sources and their spectra	FOV=1.5°; E=5-100 keV; dα=7"; dt=0.1 s	8	6
5	Solar coronagraph **OKA**	Images of the solar corona, eruptive events, transients	FOV=8°; dα=30"; λ=4000-6500 Å	5	7
6	Heliosphereic Imager **HELIOSPHERA**	Images of the outer corona and inner heliosphere	FOV=20°; dα=70"; λ=4000-6500 Å	5	7
7	X-ray spectrometer **CHEMIX**	Spectra of solar X-ray emission; Chemical composition of solar corona plasma Plasma temperature and velocity diagnostics	FOV=10°; dα=5'; λ=1.5-12.0 Å; dλ=0.01 Å dT=1 MK; dv=10 km/s	6	12

8	Hard X-ray polarimeter **PING-M**	Fluxes, spectra, polarization of solar hard X-ray emission	Epol=30-150 keV;
			Ex,γ=1.5-150 keV;
			dE=200 eV (E=1.5-25 keV);
			dE/E=15% (E=60 keV);
				12.5	19.5

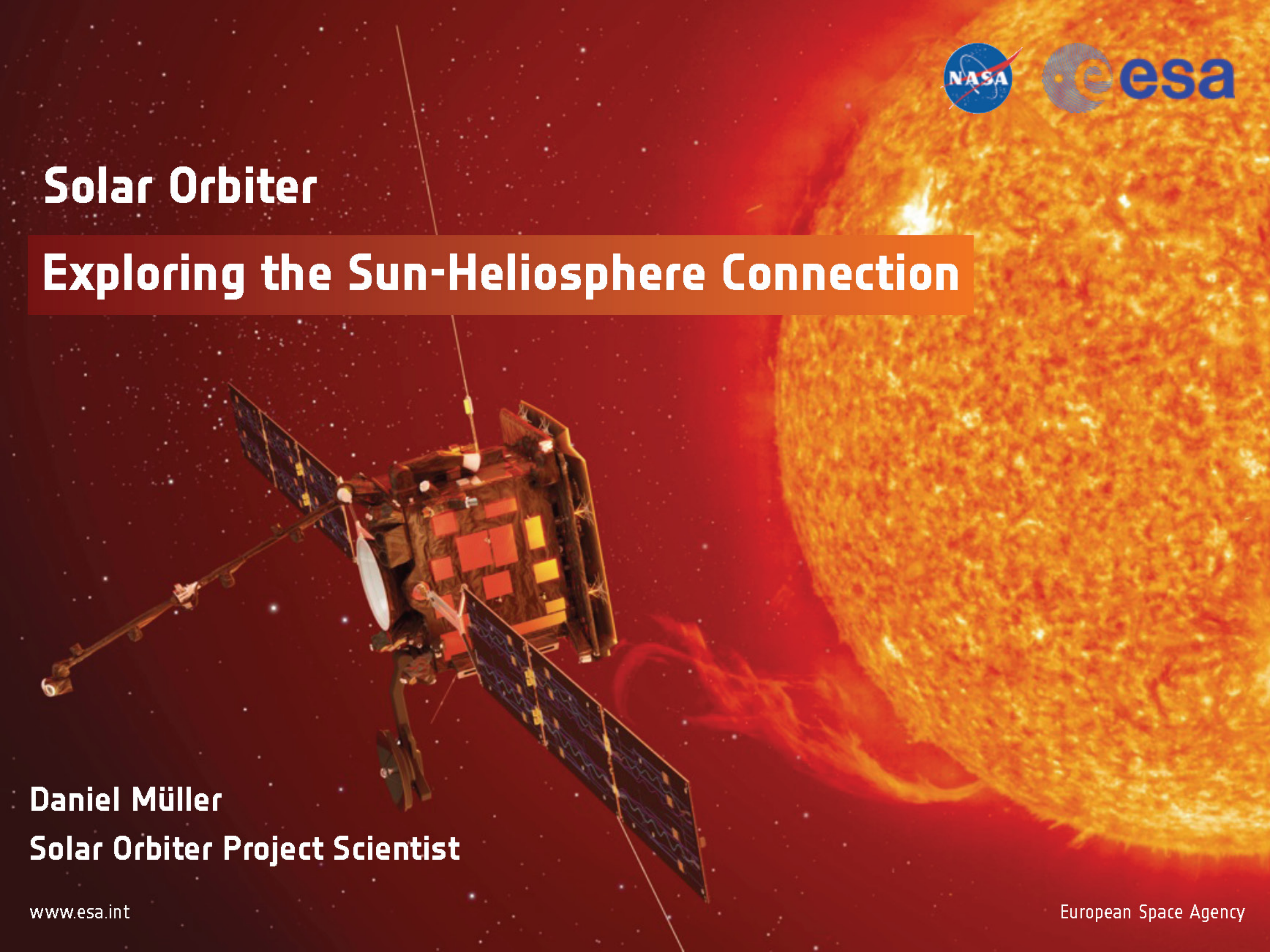
9	Scintillation gamma-spectrometer **HELIKON-I**	Fluxes and spectra of hard X-rays and gamma-rays (of not only solar origin)	E=0.01-15 MeV; dE/E=8% (E=660 keV); dt=0.001-8 s	13	12
10	Gas gamma-ray spectrometer **SIGNAL**	Fluxes and spectra of solar (not only) gamma-rays	Eγ=0.05-5 MeV; dE/E=3% (E=660 keV); dt=0.1-60 s	5	20
				112.0	**150.5**

Cartoon of the Interhelioprobe Ground Segment

Max Scientific traffic **~1 GB/day** at rates up to 1 Mbit/s (distance dependant)

Flight Operation Center – NPO Lavochkin, Khimki, Moscow Region
Ballistic Operation Center – Keldysh Institute of Applied Mathematics, Moscow
Science Operation Center – IKI, Moscow

FOC
BOC
SOC

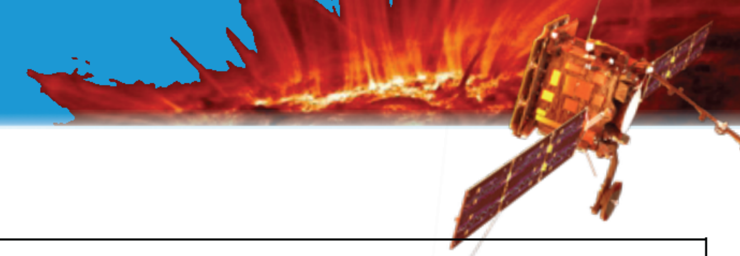


Solar Orbiter

Exploring the Sun-Heliosphere Connection

Daniel Müller

Solar Orbiter Project Scientist



Payload

In-Situ Instruments			
EPD	Energetic Particle Detector	J. Rodríguez-Pacheco	Composition, timing and distribution functions of energetic particles
MAG	Magnetometer	T. Horbury	High-precision measurements of the heliospheric magnetic field
RPW	Radio & Plasma Waves	M. Maksimovic	Electromagnetic and electrostatic waves, magnetic and electric fields at high time resolution
SWA	Solar Wind Analyser	C. Owen	Sampling protons, electrons and heavy ions in the solar wind
Remote-Sensing Instruments			
EUI	Extreme Ultraviolet Imager	P. Rochus	High-resolution and full-disk EUV imaging of the on-disk corona
METIS	Coronagraph	E. Antonucci	Visible and (E)UV Imaging of the off-disk corona
PHI	Polarimetric & Helioseismic Imager	S. Solanki	High-resolution vector magnetic field, line-of-sight velocity in photosphere, visible imaging
SoloHI	Heliospheric Imager	R. Howard	Wide-field visible imaging of the solar off-disk corona
SPICE	Spectral Imaging of the Coronal Environment	European-led facility instrument	EUV spectroscopy of the solar disk and near-Sun corona
STIX	Spectrometer/Telescope for Imaging X-rays	S. Krucker	Imaging spectroscopy of solar X-ray emission

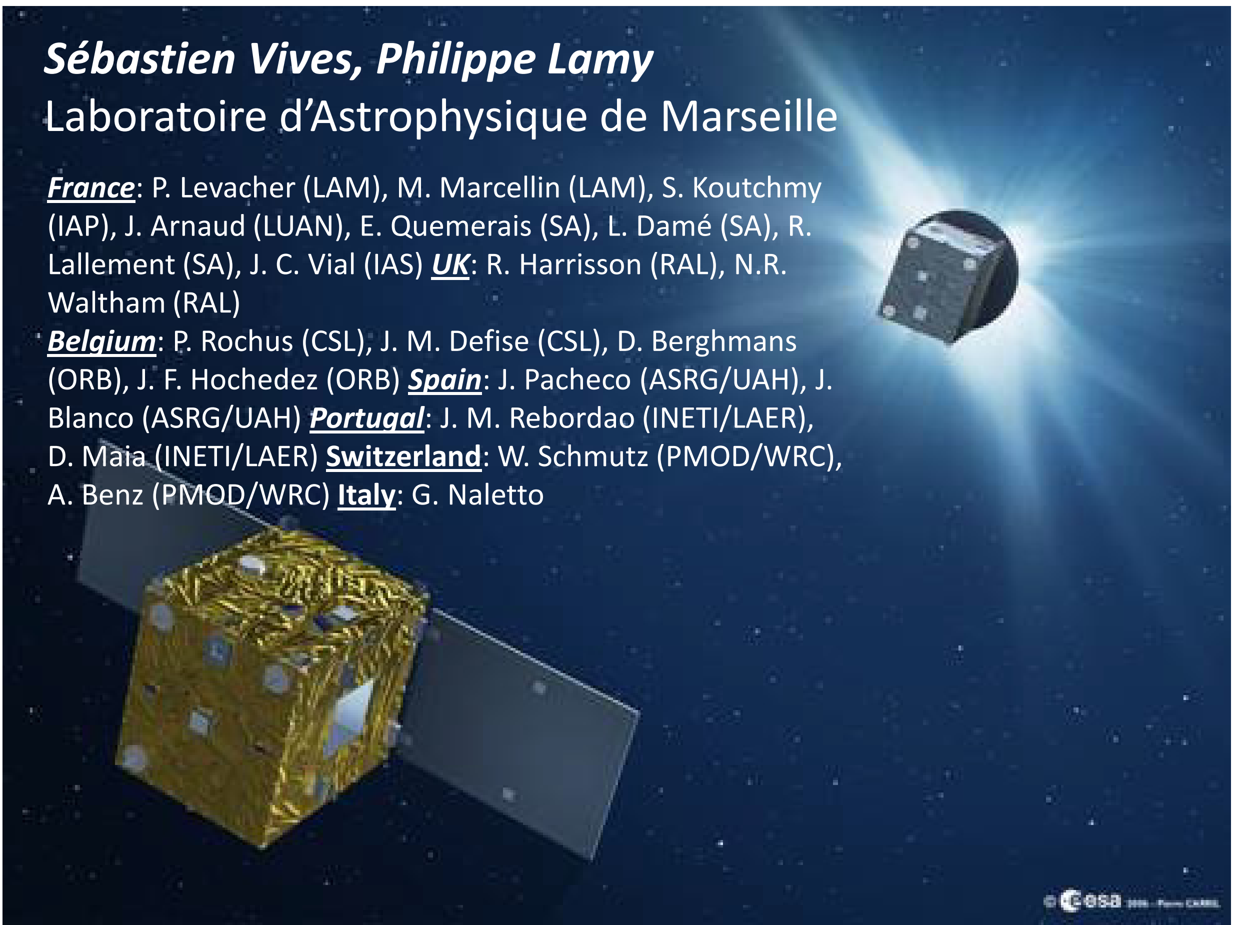
ASPIICS on PROBA-3

Association de Satellites Pour l'Imagerie et l'Interférométrie de la Couronne Solaire

Sébastien Vives, Philippe Lamy

Laboratoire d'Astrophysique de Marseille

France: P. Levacher (LAM), M. Marcellin (LAM), S. Koutchmy (IAP), J. Arnaud (LUAN), E. Quemerais (SA), L. Damé (SA), R. Lallement (SA), J. C. Vial (IAS) ***UK***: R. Harrisson (RAL), N.R. Waltham (RAL)
Belgium: P. Rochus (CSL), J. M. Defise (CSL), D. Berghmans (ORB), J. F. Hochedez (ORB) ***Spain***: J. Pacheco (ASRG/UAH), J. Blanco (ASRG/UAH) ***Portugal***: J. M. Rebordao (INETI/LAER), D. Maia (INETI/LAER) **Switzerland**: W. Schmutz (PMOD/WRC), A. Benz (PMOD/WRC) **Italy**: G. Naletto

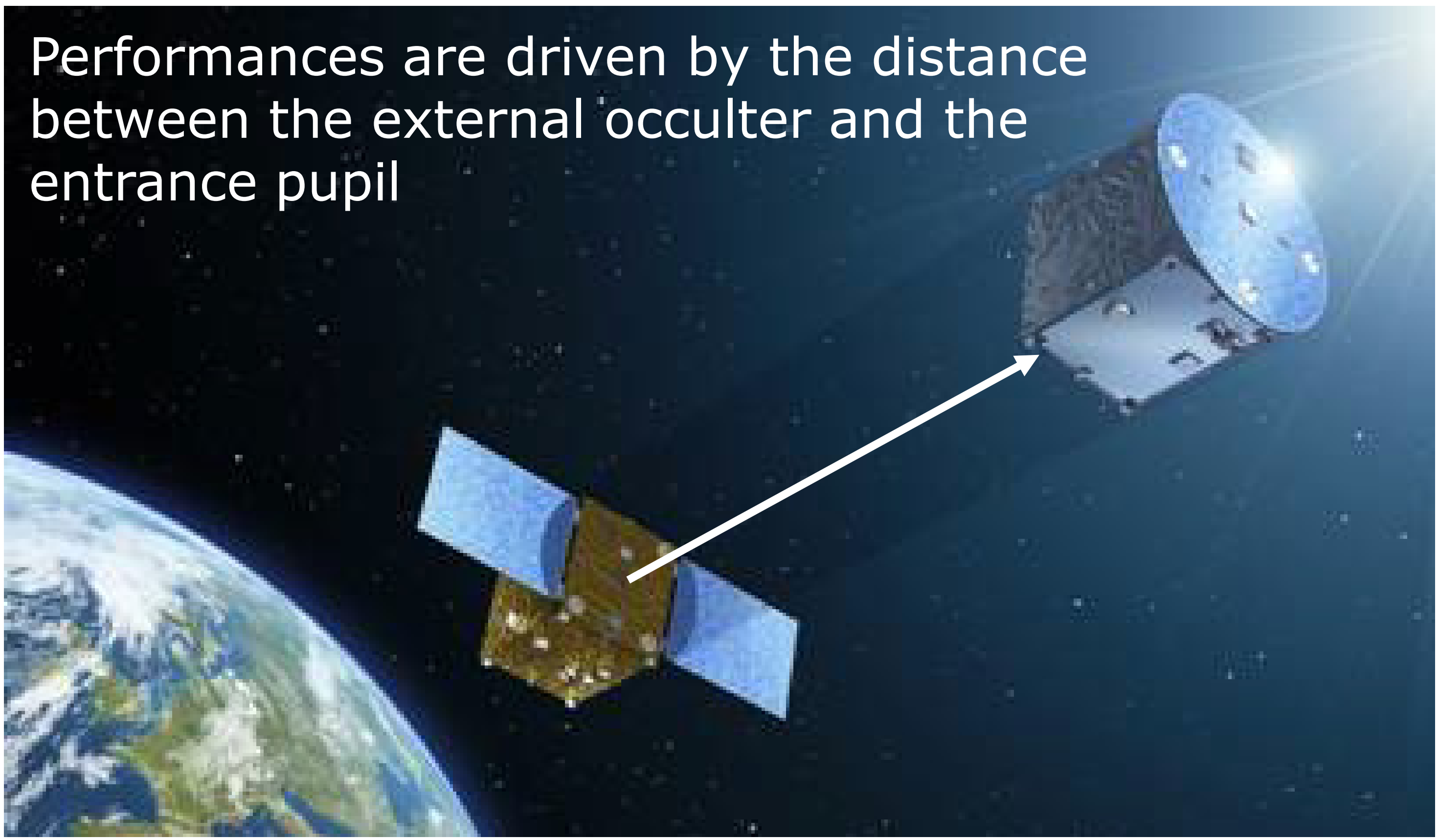


San Diego, SPIE

August, 26th 2007

What is ASPIICS ?

- 2 S/C separated by 150 m realize a giant coronagraph and will achieve conditions close to a total solar eclipse



proba www.esa.int/proba

Summary

China:	CSRH (RadioHeliograph)
NASA:	Solar Probe Plus (in situ)
Russia:	Interhelioprobe
ESA	Solar Orbiter
ESA	Praba – 3 ASPIICS