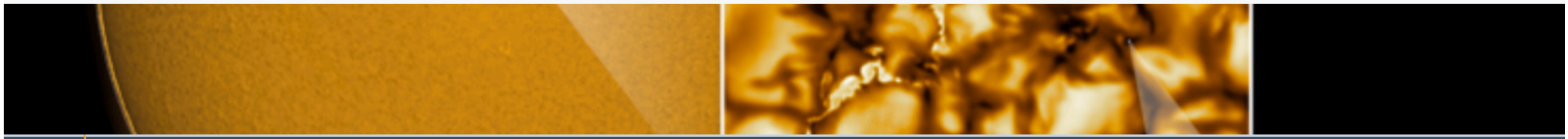
NSF's National Solar Observatory

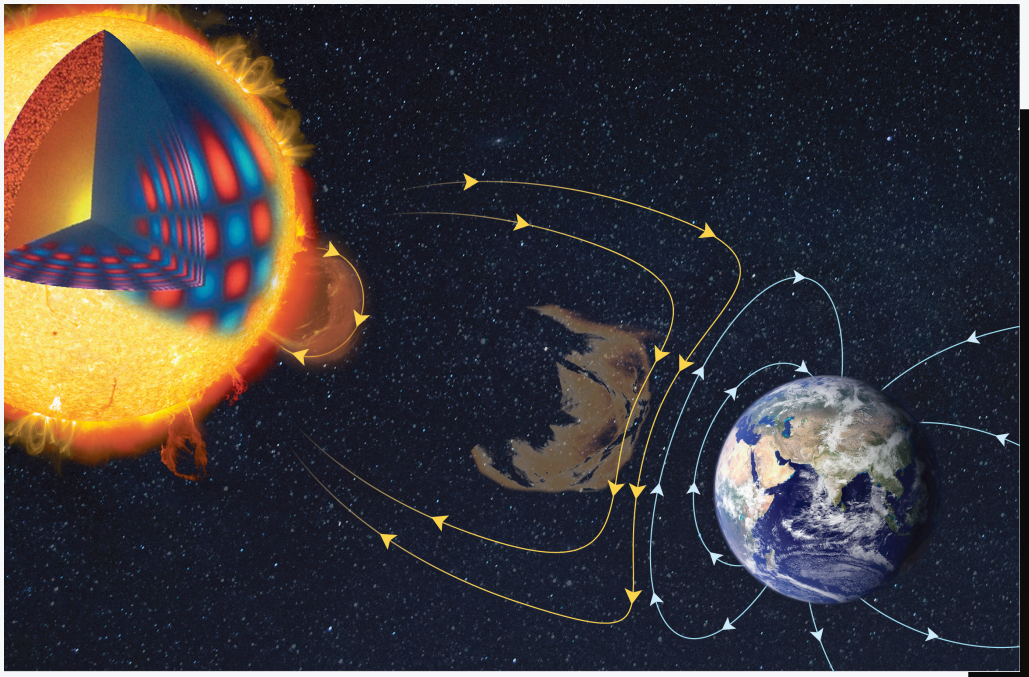
Prospects in Solar Physics for the Next Decade: a Multi-messenger Era

V. MARTINEZ PILLET
NATIONAL SOLAR OBSERVATORY

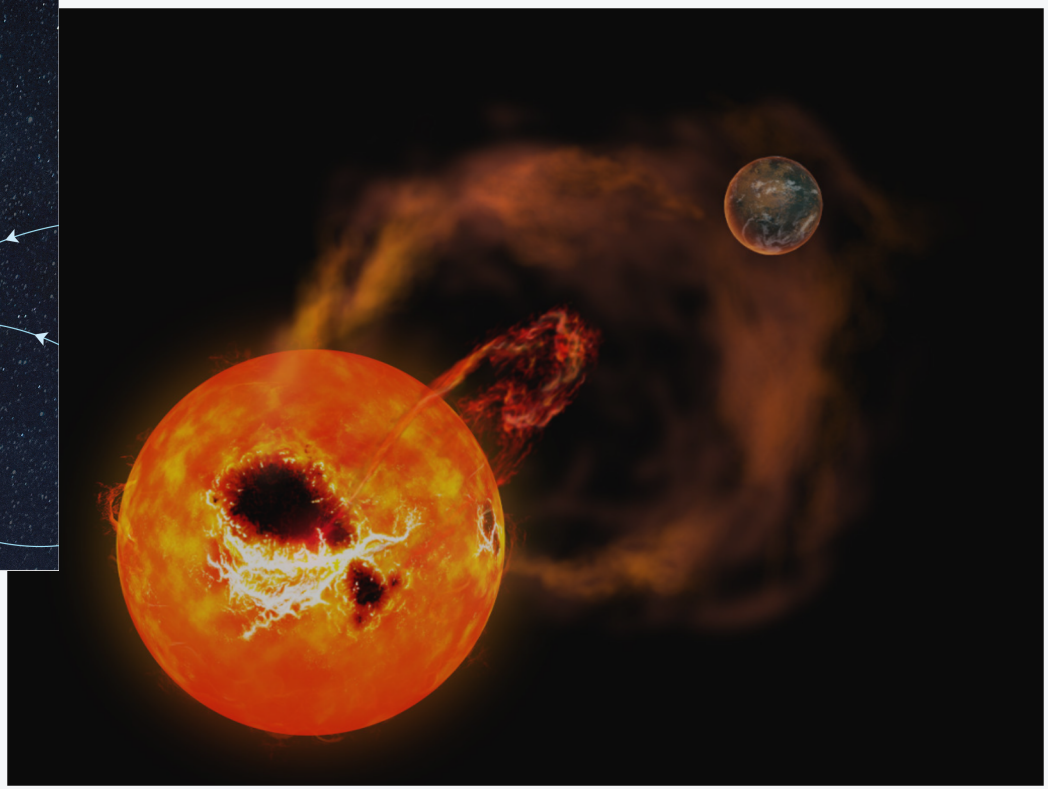


NSO AURA

A multi-messenger era for Solar Physics



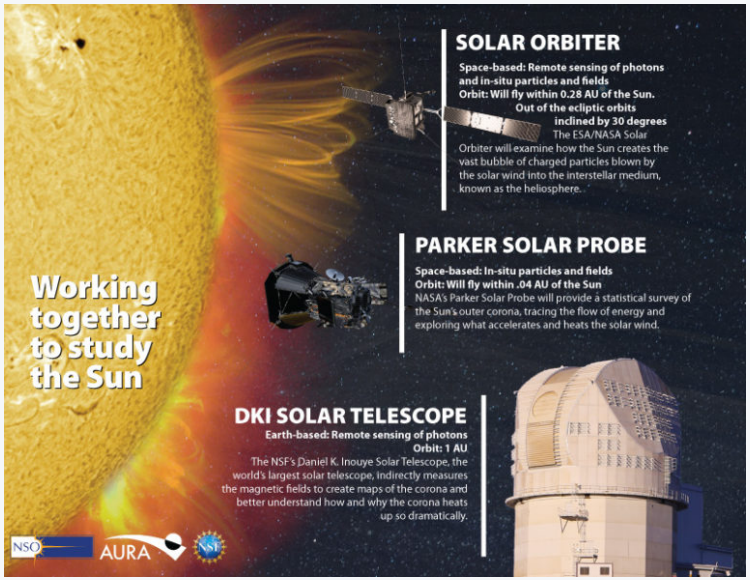
How stars and planets are…



…magnetically connected?

A multi-messenger era for Solar Physics

Particles & fields vs. electromagnetic counterpart



PARKER SOLAR PROBE — A MISSION TO TOUCH THE SUN

NASA

solar orbiter

esa

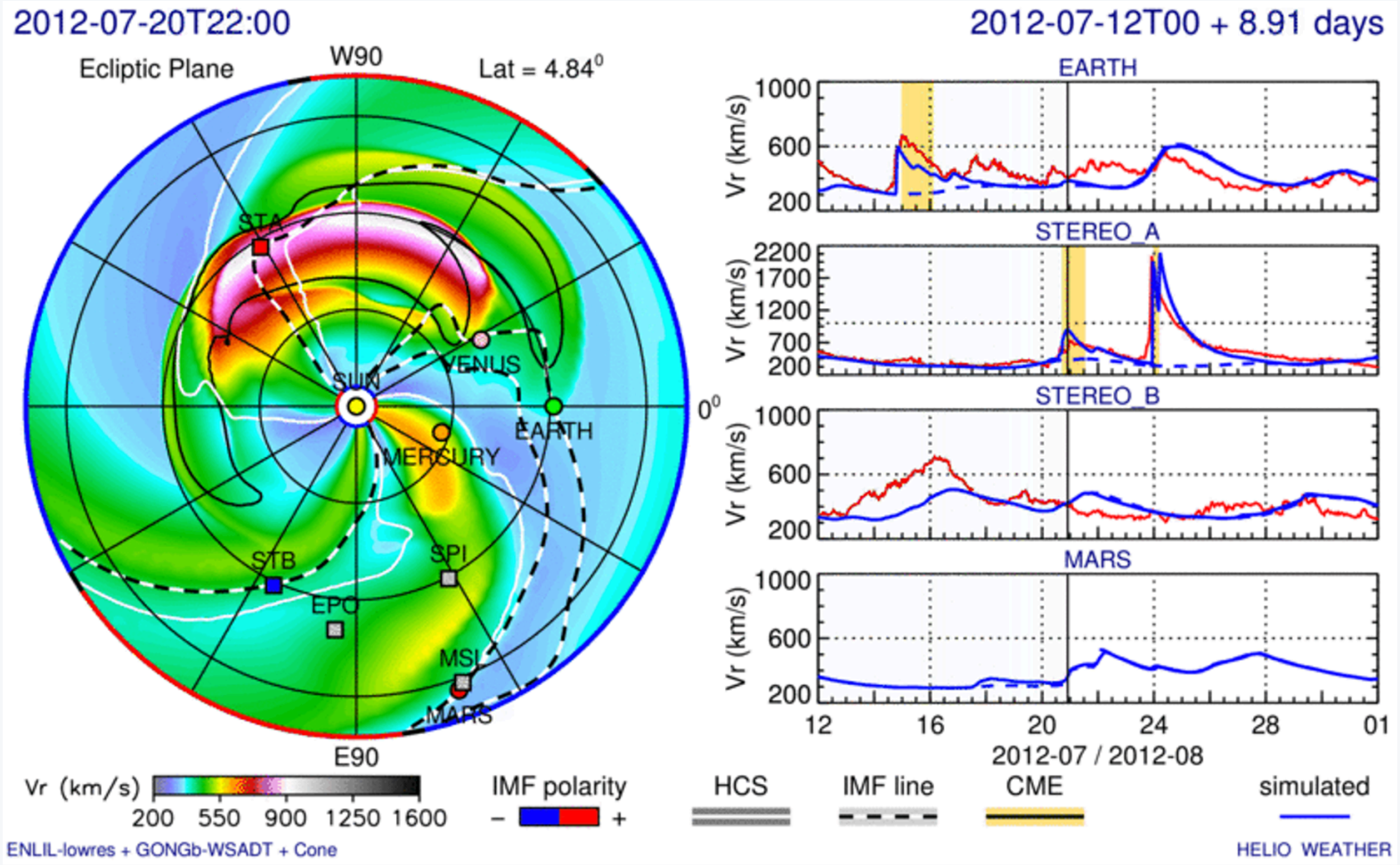
NSF

DKIST
DANIEL K. INOUYE SOLAR TELESCOPE

NSO

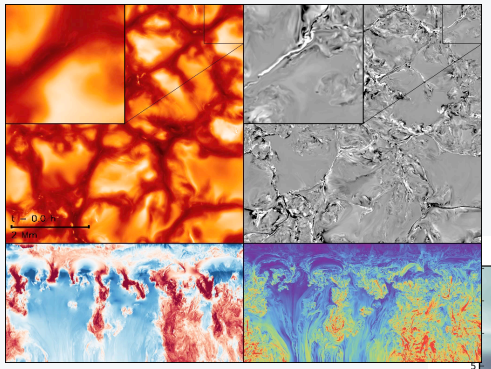
AURA

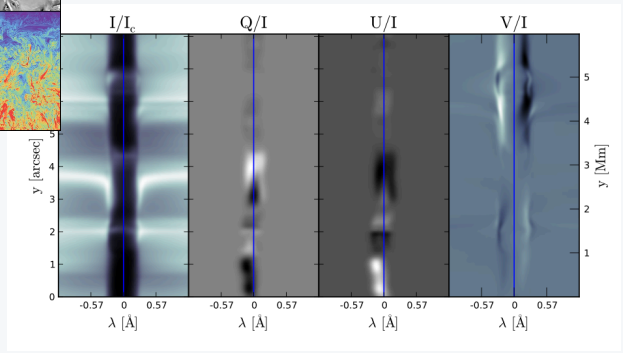
A multi-messenger era for Solar Physics



July 7th, 2012 Space Weather Prediction from NOAA (WSA/ENLIL)

DKIST (& EST!): 4m pointing to the Sun





$$SNR \sim 10^4$$

$$\phi_{px} \sim 0.1 \text{arcsec}$$

$$t_{\text{exp}} \sim 10s$$

$$D = \frac{SNR}{\sqrt{0.7 N 10^{-0.4 m_\circ} \tau \Delta\lambda Q \phi_{px}^2 t_{\text{exp}}}}$$

The Daniel K Inouye Solar Telescope

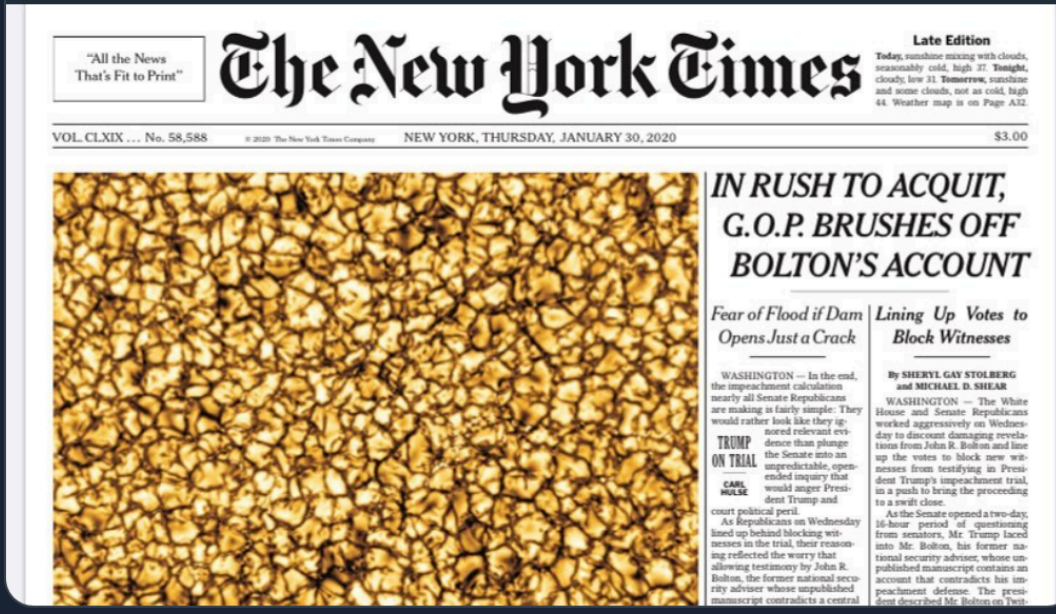
You Retweeted

Didier Queloz @DidierQueloz · Jan 31

I like anglo-saxon press for this reason ! They are not shy at making front page about great scientific result!

Valentin M Pillet @vmpillet · Jan 30

Front page of the NYT today @NatSolarObs #NSF



"All the News That's Fit to Print"

The New York Times

Late Edition

Today, sunshine mixing with clouds, seasonably cold, high 37. Tonight, cloudy, low 31. Tomorrow, sunshine and some clouds, not as cold, high 44. Weather map is on Page A32.

VOL. CLXIX ... No. 58,588 © 2020 The New York Times Company NEW YORK, THURSDAY, JANUARY 30, 2020 $3.00

IN RUSH TO ACQUIT, G.O.P. BRUSHES OFF BOLTON'S ACCOUNT

Fear of Flood if Dam Opens Just a Crack

Lining Up Votes to Block Witnesses

TRUMP ON TRIAL

CARL HULSE

By SHERYL GAY STOLBERG and MICHAEL D. SHEAR

WASHINGTON — In the end, the impeachment calculation nearly all Senate Republicans are making is fairly simple: They would rather look like they ignored relevant evidence than plunge the Senate into an unpredictable, open-ended inquiry that would anger President Trump and court political peril.

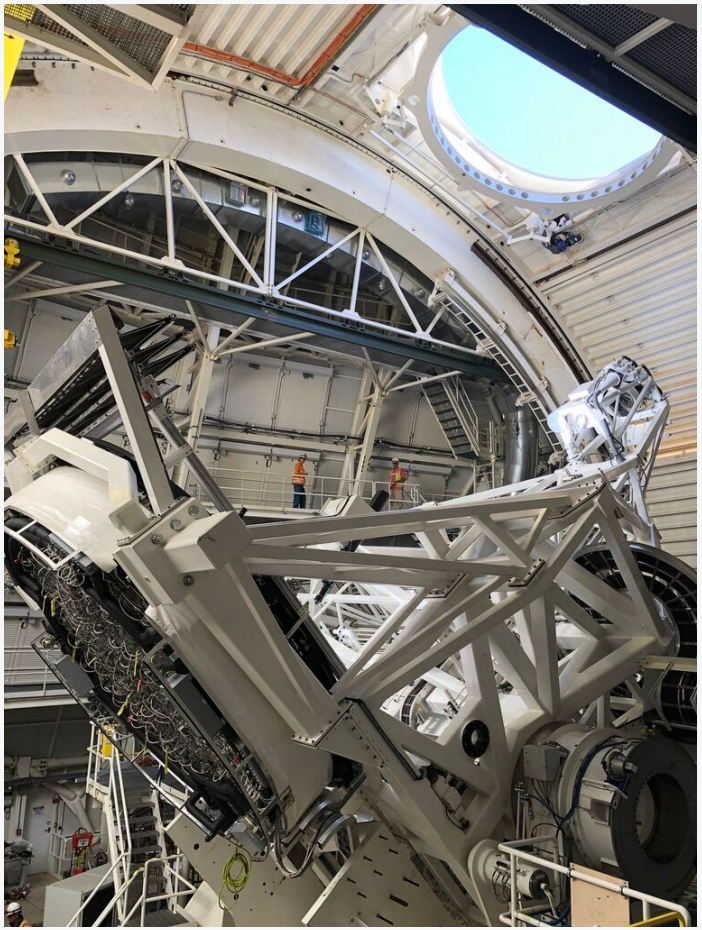
As Republicans on Wednesday lined up behind blocking witnesses in the trial, their reasoning reflected the worry that allowing testimony by John R. Bolton, the former national security adviser whose unpublished manuscript contradicts a central

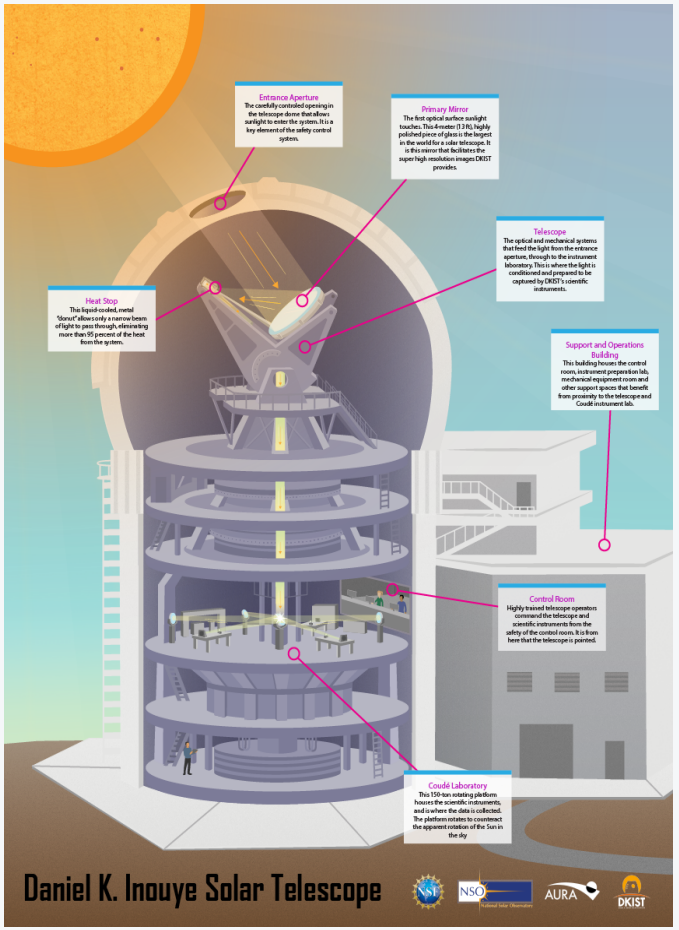
WASHINGTON — The White House and Senate Republicans worked aggressively on Wednesday to discount damaging revelations from John R. Bolton and line up the votes to block new witnesses from testifying in President Trump's impeachment trial, in a push to bring the proceeding to a swift close.

As the Senate opened a two-day, 16-hour period of questioning from senators, Mr. Trump laced into Mr. Bolton, his former national security adviser, whose unpublished manuscript contains an account that contradicts his impeachment defense. The president described Mr. Bolton on Twit-

4 17 121

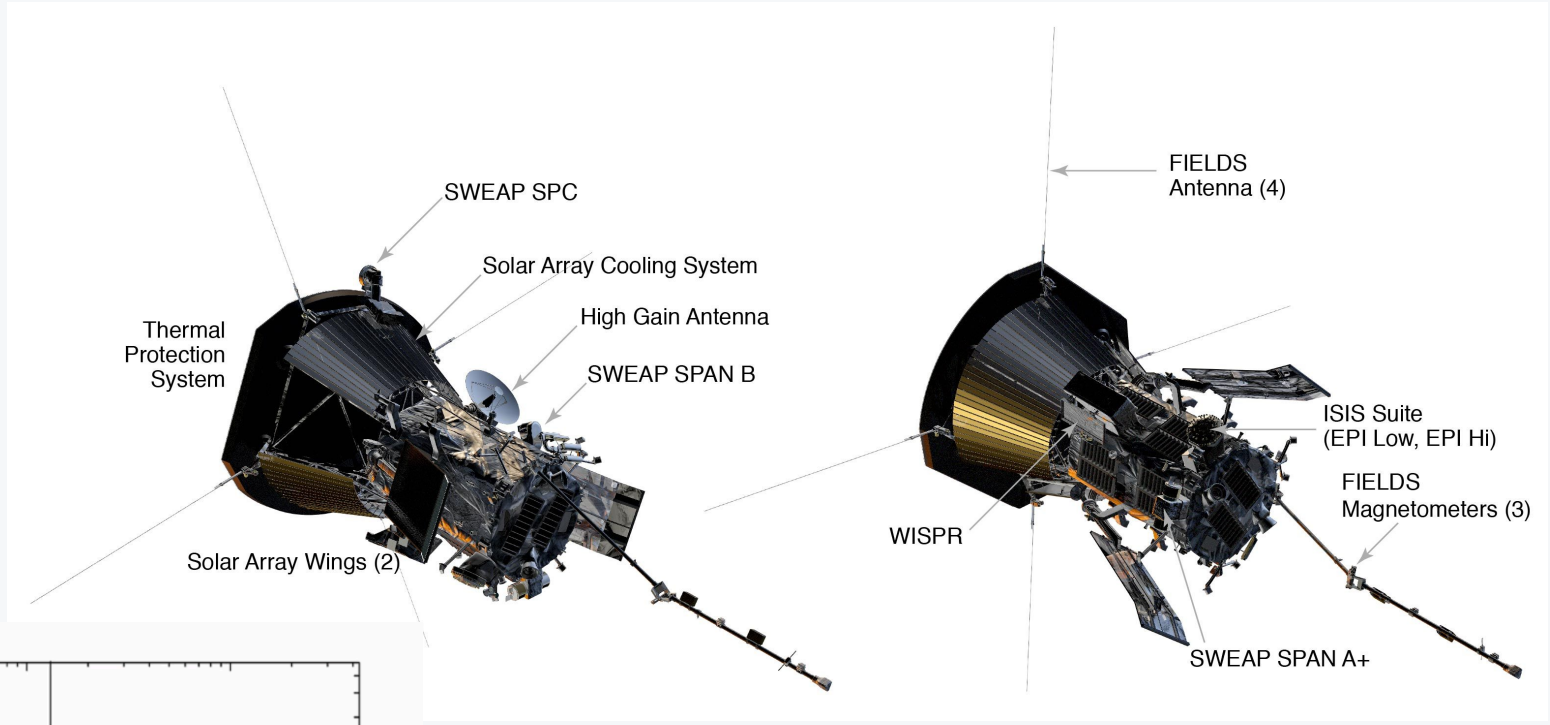
The Daniel K Inouye Solar Telescope

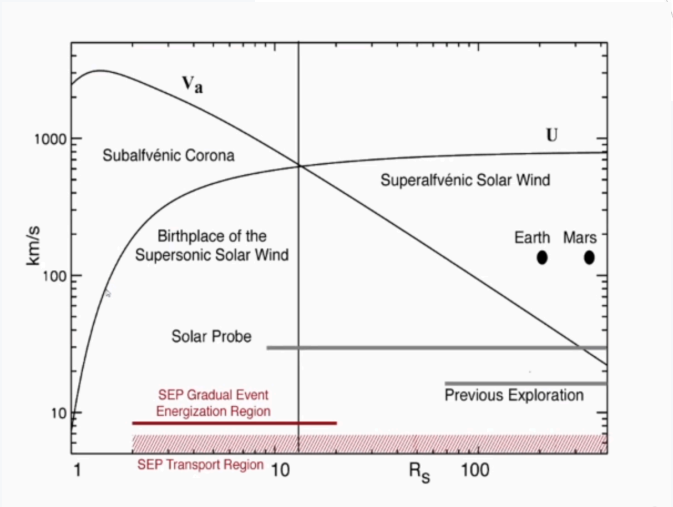




4m, off axis (no central obscuration)

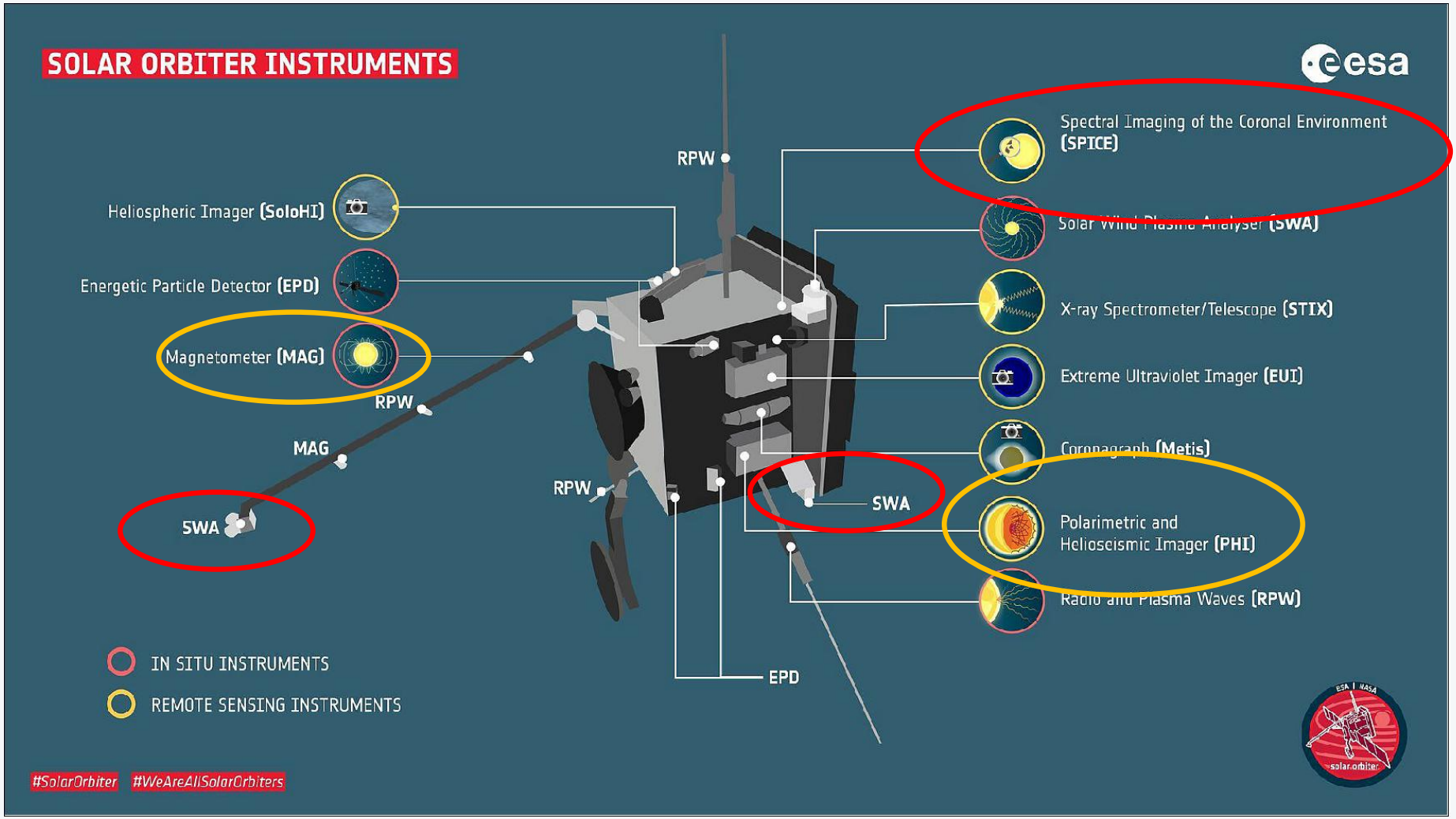
Parker Solar Probe (PSP): Entering the Solar Corona





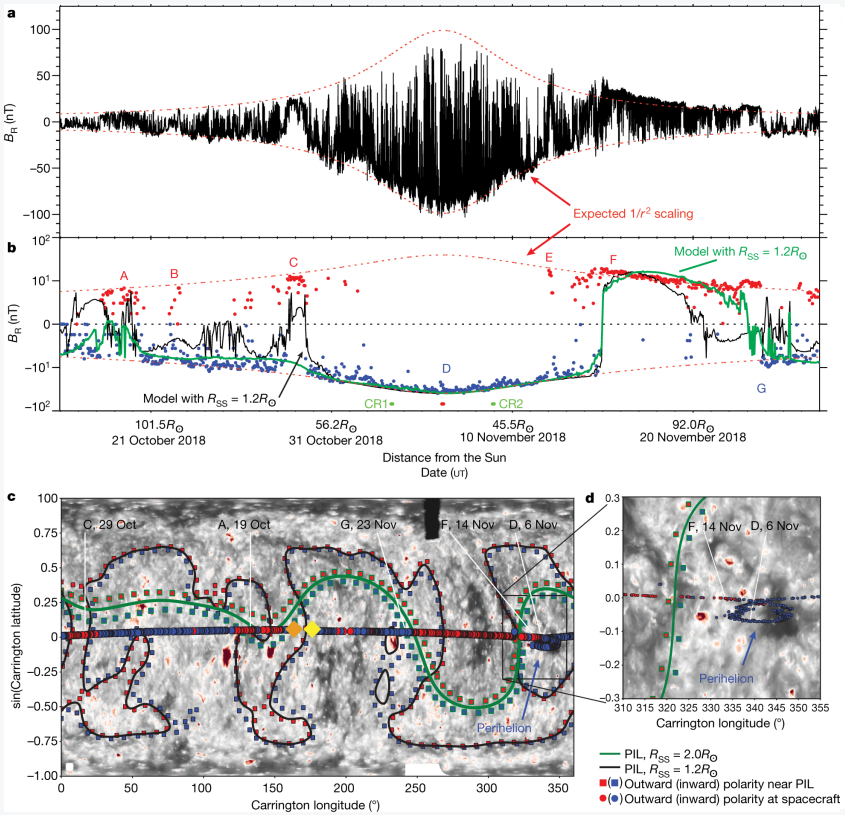
In-situ particles (SW & EP) and fields

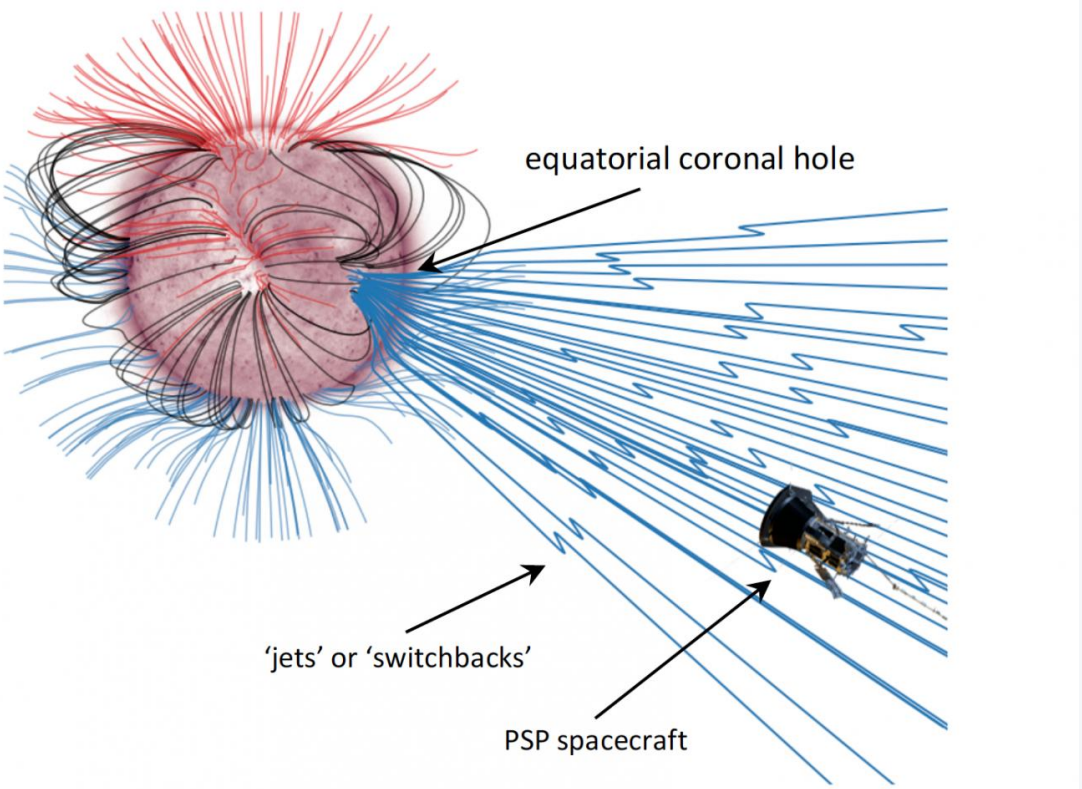
Solar Orbiter: Magnetic Connectivity



SO/PHI (co-PI Prof. del Toro Iniesta, IAA) & SO/EPD: PI Dr. Rodriguez Pacheco (UAH)

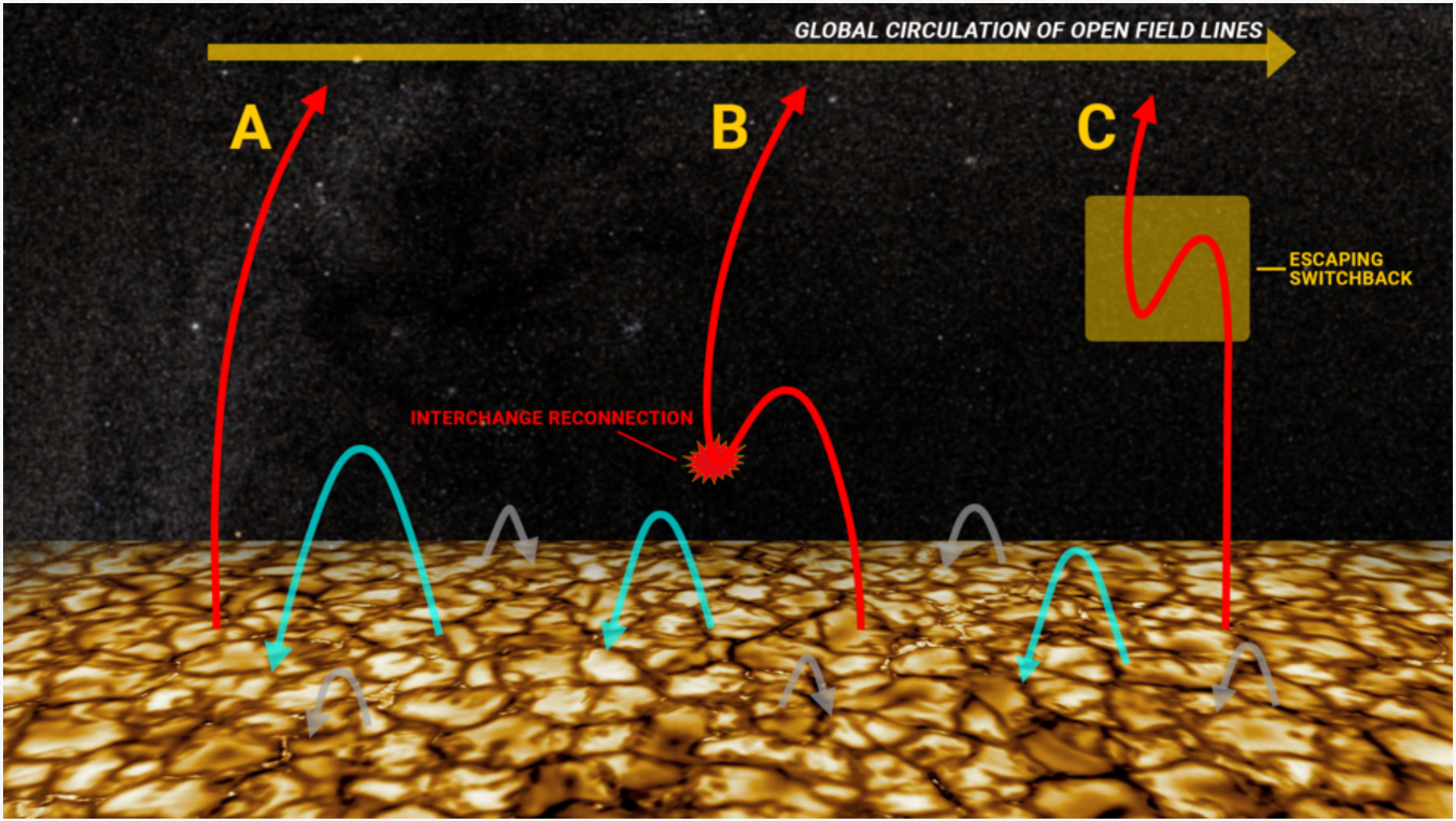
PSP Switchbacks (¿latigazos?)





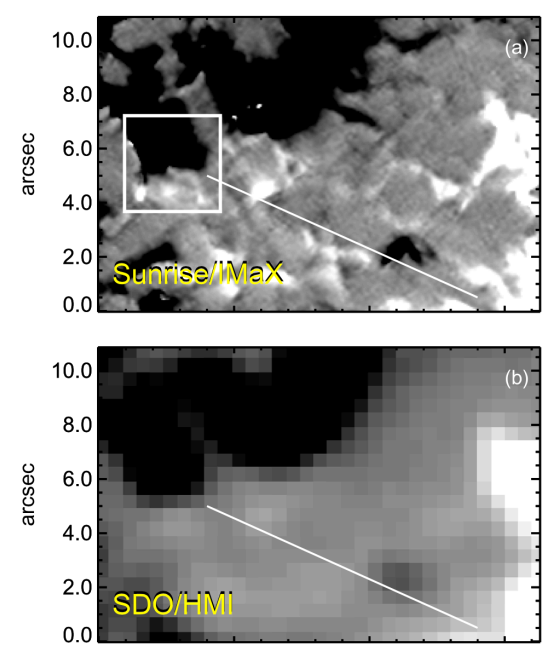
Bale et al. 2019

PSP Switchbacks

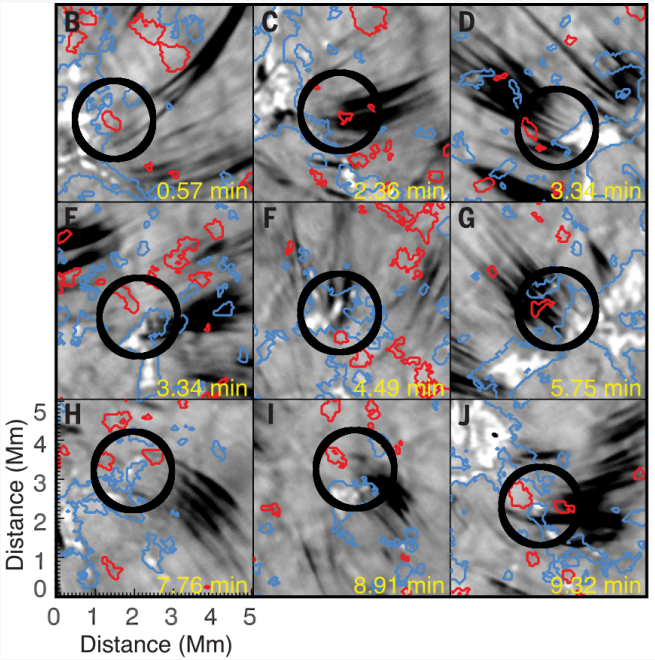


PSP Switchbacks

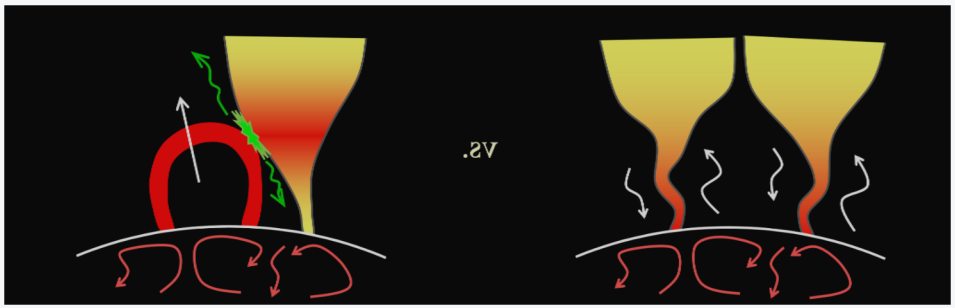
IMaX/
SUNRISE



Chitta et al., 2017

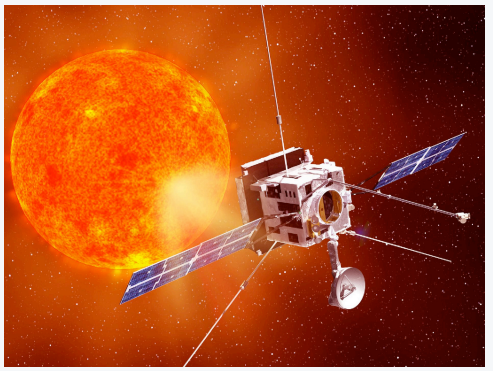


Samanta et al., 2019



PSP Switchbacks

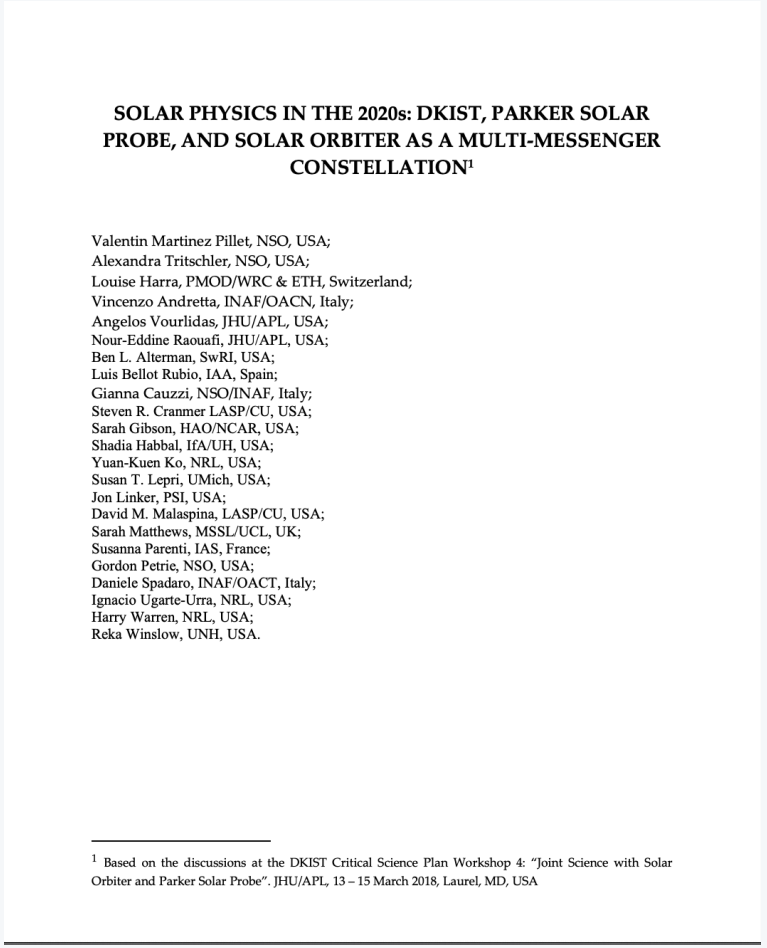
A multi-messenger era for Solar Physics



A multi-messenger constellation

A multi-messenger era for Solar Physics

- Unprecedented **solar corona and inner heliospheric campaign** targeted at understanding how stars create and control their magnetic environments.
- Synergistic science enabled by **DKIST off-limb solar corona** capabilities including magnetic field measurements.
- **PSP & Solar Orbiter in-situ** instruments measure the plasma particles' kinetic properties, charges, and composition as well as local electric and magnetic fields.
- DKIST and Solar Orbiter perform **imaging, spectroscopy, and polarimetry** of the solar surface,
- Both PSP and Solar Orbiter image the tenuous corona and heliosphere.



SOLAR PHYSICS IN THE 2020s: DKIST, PARKER SOLAR PROBE, AND SOLAR ORBITER AS A MULTI-MESSENGER CONSTELLATION[1]

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[1] Based on the discussions at the DKIST Critical Science Plan Workshop 4: "Joint Science with Solar Orbiter and Parker Solar Probe". JHU/APL, 13 – 15 March 2018, Laurel, MD, USA

https://ui.adsabs.harvard.edu/abs/2020arXiv200408632M/abstract

¡Gracias!