The COSPAR ISWAT Cluster: Ambient Solar Magnetic Field, Heating and Spectral Irradiance

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Global Solar Magnetic Field

Leads: Carl Henney, Nick Arge

What is the science question?
Currently global solar magnetic maps are observationally constrained for only approximately a third of the total solar surface at any given time. So the primary science question is to figure out how best to account for the remaining two thirds of the solar surface.

Why does it matter?
Global magnetic maps are the primary driver to nearly all coronal, solar wind, and irradiance prediction models, plus they provide key context for in situ spacecraft such as Parker Solar Probe and Solar Orbiter. Coronal and solar wind model results and products are greatly dependent on the uncertainty and methods used to estimate the solar polar and far-side magnetic flux distribution at any given time.

What is our future objective?
Short-term goal is to create a community global map dashboard, with real-time global and polar mean comparisons of publicly available maps, for initial evaluation.

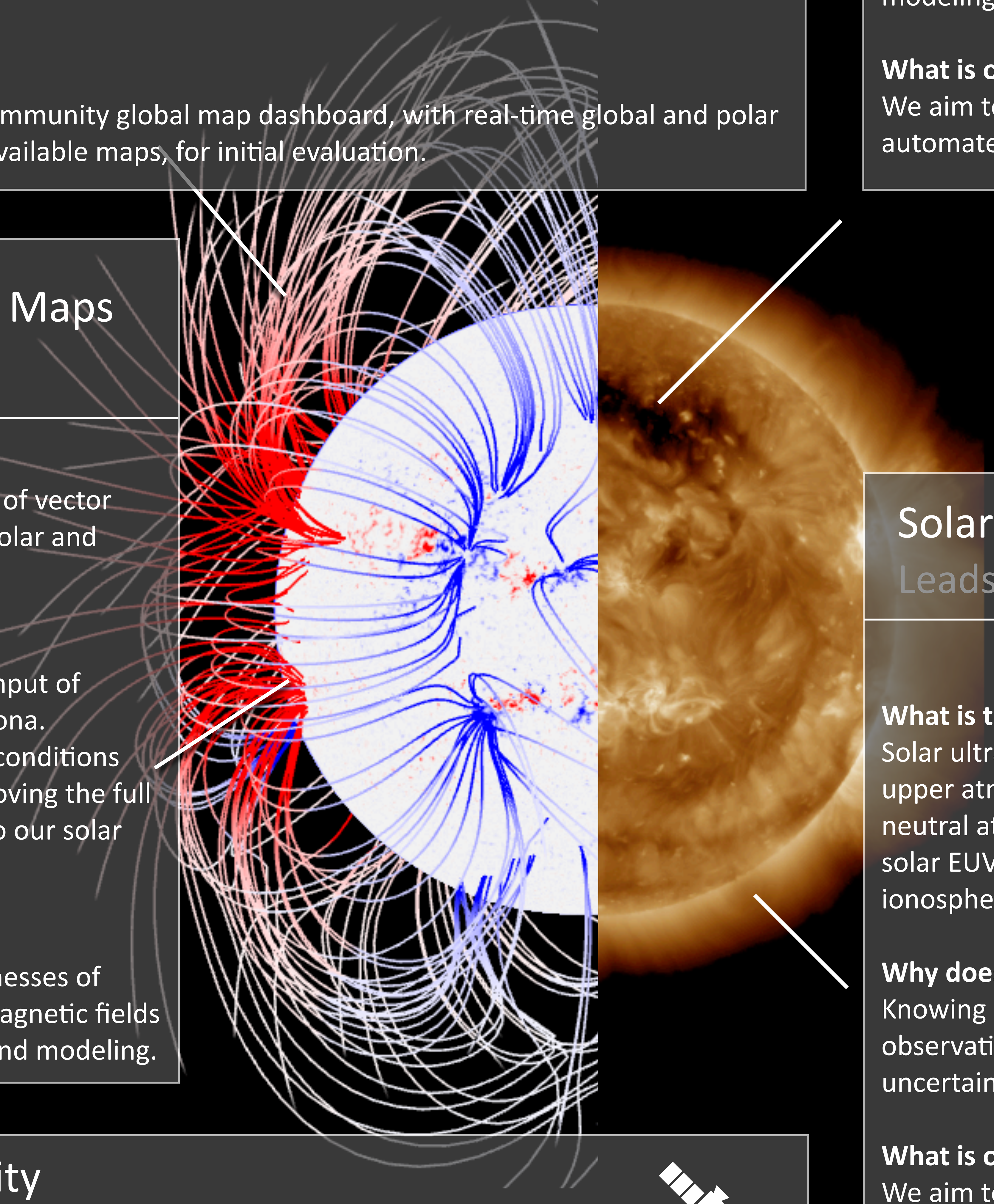
Coronal Hole Boundaries

Leads: Martin Reiss, Karin Muglach

What is the science question?
Coronal holes are the part of the solar magnetic field that is open to the heliosphere. We want to learn more about the uncertainties of their boundaries when observed in SDO AIA images of the Sun.

Why does it matter?
The observational uncertainties of coronal hole boundaries are valuable constraints in solar research, solar wind modeling, and space weather prediction.

What is our future objective?
We aim to understand the strengths and weaknesses of automated coronal hole detection schemes.



Vector Field Synoptic Maps

Lead: Alexei Pevtsov

What is the science question?
We want to explore the potential of vector field synoptic maps in modeling solar and heliospheric phenomena.

Why does it matter?
Synoptic maps are the standard input of magnetic models of the solar corona. Improving these inner boundary conditions therefore holds promise for improving the full chain of models from the Sun into our solar system.

What is our future objective?
Evaluate the strengths and weaknesses of modern observations of vector magnetic fields and promote their use in solar wind modeling.

Solar Indices and Irradiance

Leads: Carl Henney, Karin Muglach

What is the science question?
Solar ultraviolet (UV) radiation is absorbed in the Earth's upper atmosphere, driving ionization and heating of the neutral atmosphere. We focus on how best to forecast the solar EUV variability of input parameters required of ionospheric and thermospheric (I/T) models.

Why does it matter?
Knowing how well I/T models perform using EUV observations or EUV proxies will reveal forecast uncertainties and instrumentation requirements.

What is our future objective?
We aim to create an F10.7 scoreboard with 24h time resolution and a 3-day lead time. The scoreboard will include F10.7 flux forecasts from publicly available sources and compare the predictions with observations. We will develop an ensemble of solutions, with estimates of uncertainty, for the community to evaluate and use in near real-time.

Magnetic Connectivity

Leads: Rui Pinto, Jon Linker

What is the science question?
Determining the effects of Solar phenomena on Earth or on spacecraft requires understanding the propagation of the various perturbations they generate across the heliosphere. Wind flows, shocks and energetic particles follow paths that are strongly tied to the geometry of the magnetic field. Establishing magnetic connectivity from the solar surface to any point in space remains a key challenge in space physics.

Why does it matter?
Relating remote observations to in-situ data from one or more spacecraft requires tools and methods that establish connectivity systematically. Solar Orbiter operations (as well as synergies with Parker Solar Probe) require a priori knowledge of the regions of the observed solar disk and corona that will either be connected magnetically to the spacecraft within at least few-days lead time, or be the source of solar wind flows and particles that are likely to be detected in-situ.

What is our future objective?
Define and implement robust connectivity metrics; propose future improvements and/or the integration of new methods (models, datasets).

Find out more at
www.iswat-cospar.org/s2

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