The COSPAR ISWAT Initiative:
Unifying the Validation of Solar Wind Models

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Progress in space weather research and awareness needs community-wide strategies and procedures to evaluate our modeling assets. We present the activities of the Ambient Solar Wind Validation Team embedded in the COSPAR ISWAT initiative. We aim to bridge the gap between model developers and end-users to provide the community with an assessment of the state-of-the-art in solar wind forecasting. To this end, we develop an open online platform for validating solar wind models by comparing their solutions with in situ spacecraft measurements. The online platform will allow the space weather community to test the quality of state-of-the-art solar wind models with unified metrics providing an unbiased assessment of progress over time.

At A Glance

What is the objective?
Develop a web app for the validation of state-of-the-art solar wind models that is developed in a bottom-up approach from the community.

Why does it matter?
Large-scale solar wind models are of pivotal importance in space weather research and forecasting.

What are the problems that we want to address?

1. keeping up with the ever-growing number of models and different versions thereof,
2. no agreement on forecasting goals and metrics,
3. slow iterative process between model developers and end-users (MacNeice et al., 2018),
4. and increasingly versatile user needs. End-users have to rely on metrics selected by authors of validation studies.

A Web App for the Validation of Solar Wind Models

CAMEL

Rastätter et al., 2019

H1-01: Ambient Solar Wind Validation Team

→ Enables a fast illustration of state-of-the-art solar wind models.
(addresses Problem 1)

→ Uses metrics agreed on by the space weather community.
(addresses Problem 2)

→ New model versions can be instantly made available online.
(addresses Problem 3)

→ End-users can select metrics for the science question under scrutiny.
(addresses Problem 4)

Historical Validation

The CAMEL Web App at the CCMC (Rastätter et al., 2019) enables users to compare solar wind model solutions with historical observations and compute a broad spectrum of metrics.

1. Select solar wind model
2. Choose a location
3. Select time interval
4. Select physical property
5. Display the solutions
6. Run validation analysis
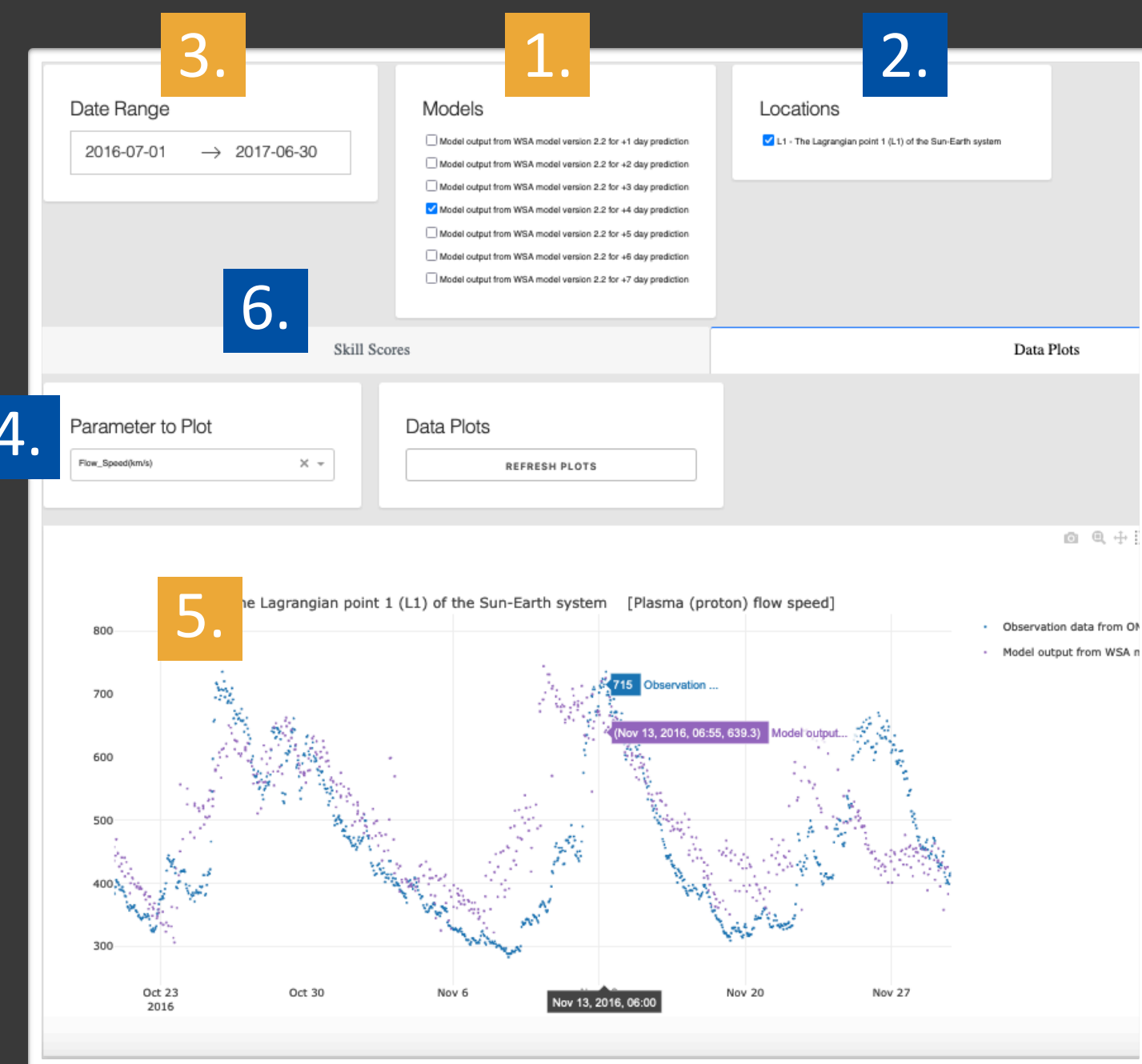
Why contribute?

- Stay up-to-date with the progress in large-scale solar wind modeling.
- Expose your model to the wider community.
- Benefit from the synergy between developers and users that the team activity enables.
- Engage with experts in other teams and clusters.
- Actively shape the direction the team is developing.
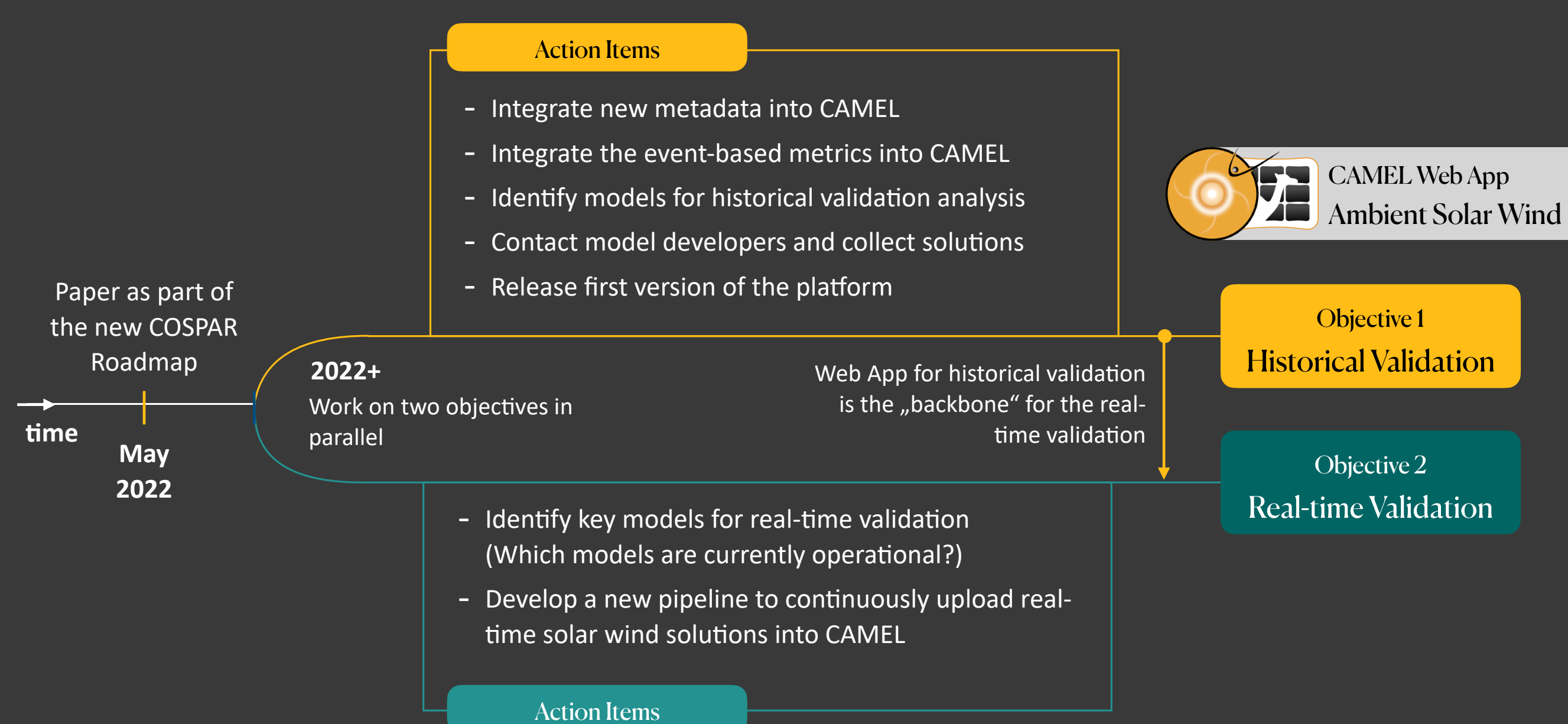
How to add your model?

Three steps to follow:

1. Request metadata form*

    ↓

2. Submit metadata form

    ↓

3. Submit model solutions

    ↓

Display your model solutions in CAMEL

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Future Objectives and Action Items

The team uses the CCMC CAMEL system for achieving two main objectives, namely historical and real-time validation of large-scale solar wind models. A detailed work approach is shown below.

Action Items
- Integrate new metadata into CAMEL
- Integrate the event-based metrics into CAMEL
- Identify models for historical validation analysis
- Contact model developers and collect solutions
- Release first version of the platform

CAMEL Web App
Ambient Solar Wind

Paper as part of the new COSPAR Roadmap

time

May 2022

2022+
Work on two objectives in parallel

Web App for historical validation is the „backbone" for the real-time validation

Objective 1
Historical Validation

Objective 2
Real-time Validation

- Identify key models for real-time validation (Which models are currently operational?)
- Develop a new pipeline to continuously upload real-time solar wind solutions into CAMEL

Action Items

„Unifying the validation of ambient solar wind models"
Reiss et al., 2022 (Advances in Space Research)

Questions addressed so far:

- What is the state-of-the-art in predicting the large-scale solar wind?
- What are the key gaps in assessing solar wind model abilities?
- How can we track progress in space weather modeling over time?
- What advantages does the solar wind validation web app bring to the space weather community?
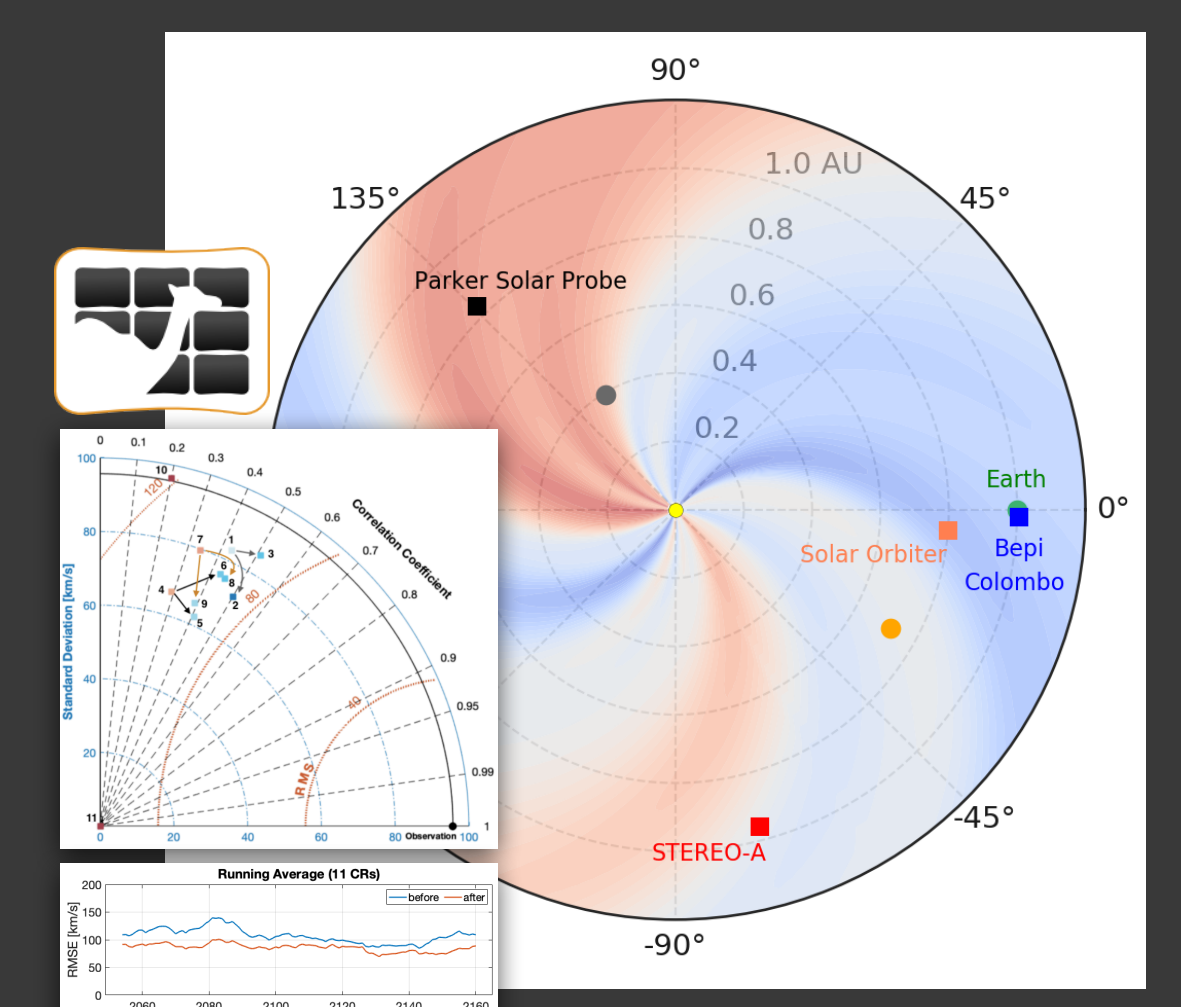
Find out more at
www.iswat-cospar.org/h1-01