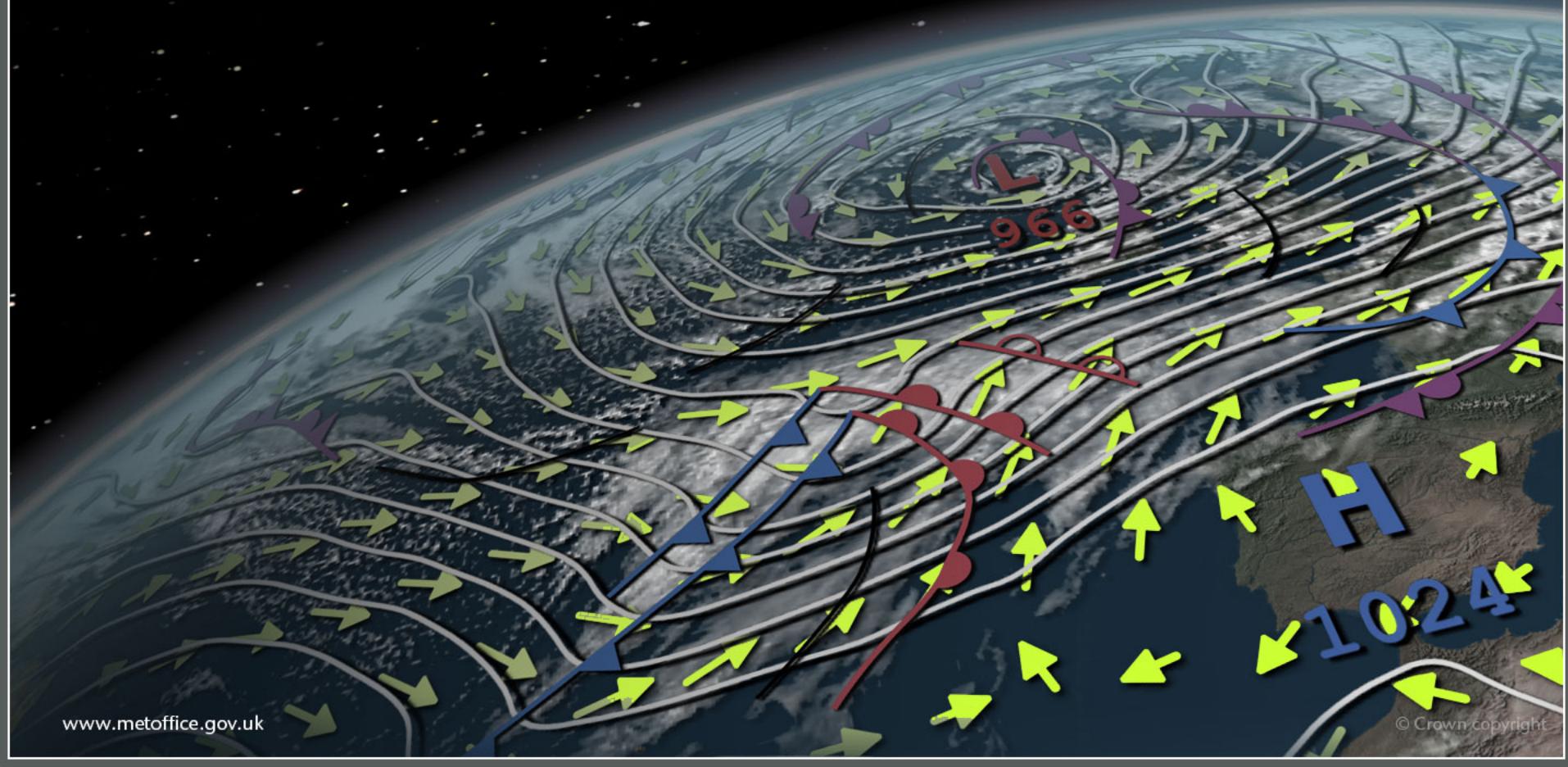


Transitioning space weather models to operations at the Met Office

Sophie Murray

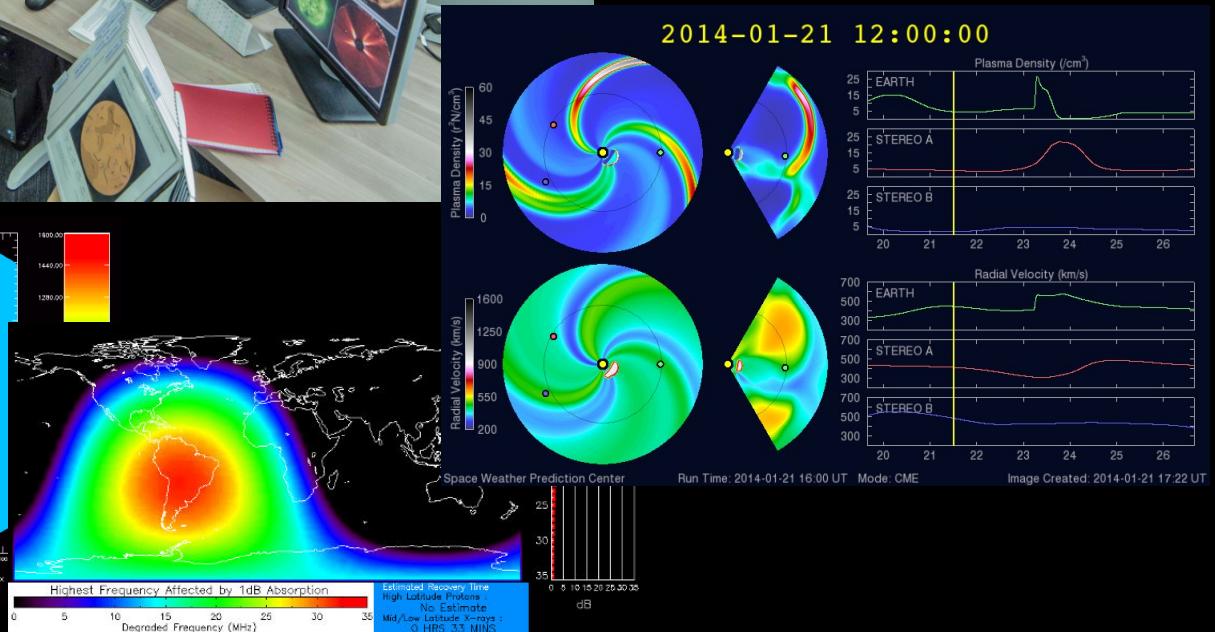
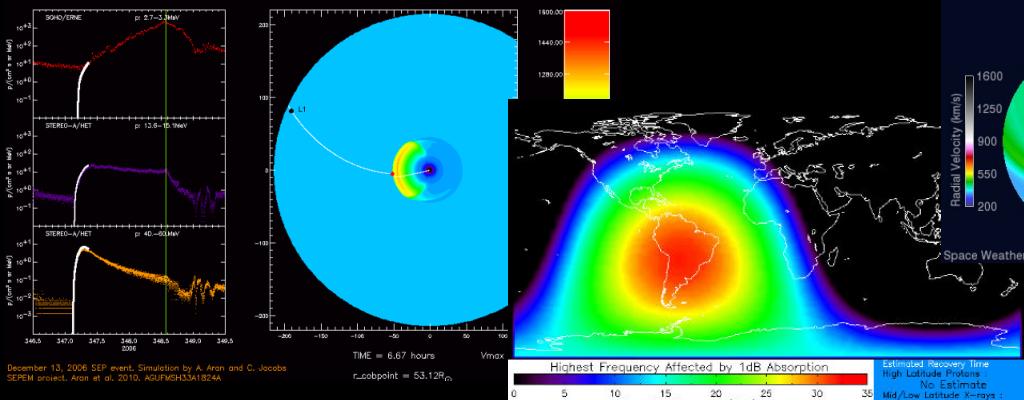
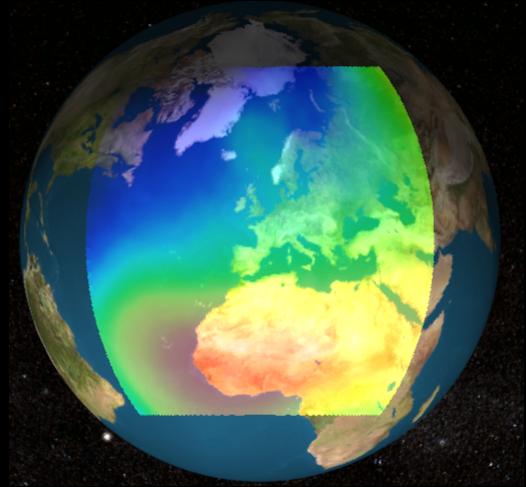
Met Office Space Weather Research Group



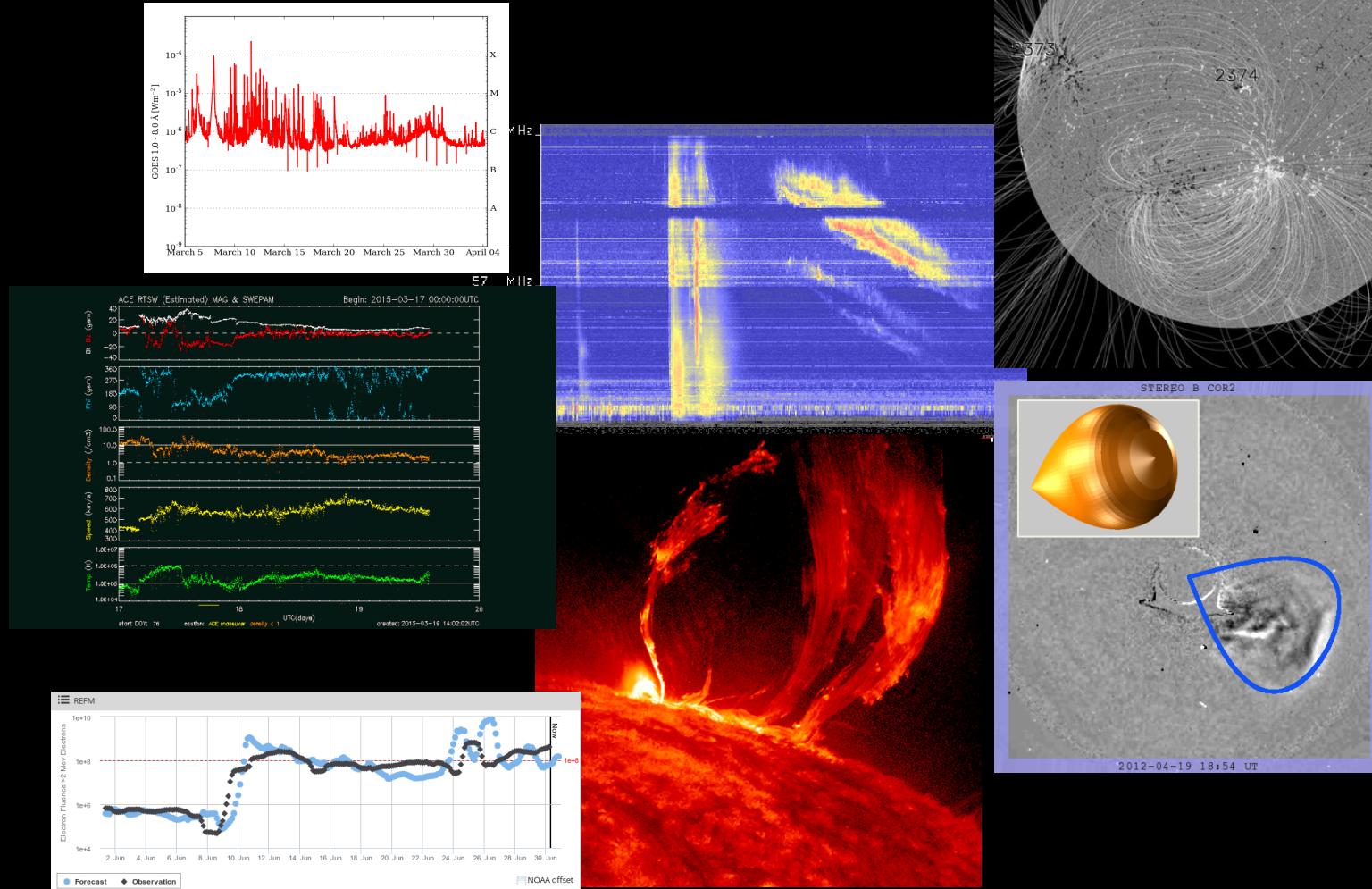
What is operational?

- 24/7/365 staffing of forecasting office
- Observing, processing and dissemination systems
≥99% reliability
- Key web products ≥99.5% reliability, others ≥97.5%
- Redundant power, cooling and networking at all facilities
- Contingency plans for outages of all forecast-critical system elements
 - Alternate processing sites, backup instruments for observations and backup computers for model runs, etc.

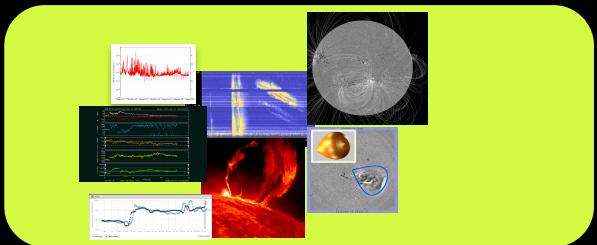
Space Weather Operations Centre



Research to operations: Basic Science



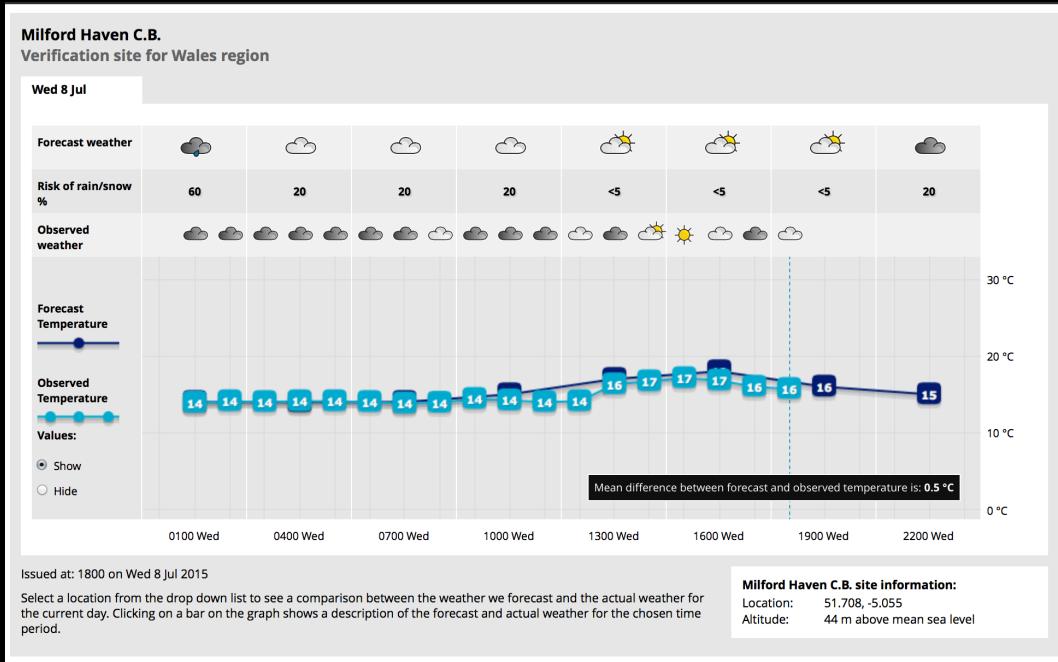
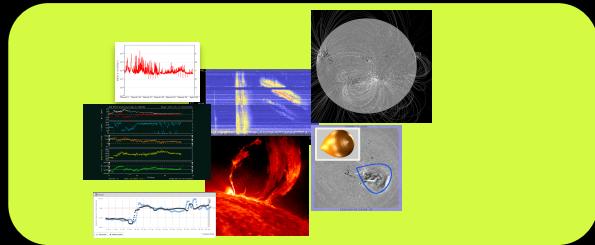
Research to operations: Importing and quality control



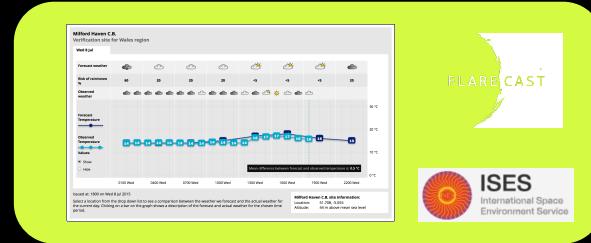
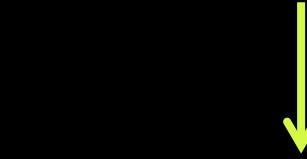
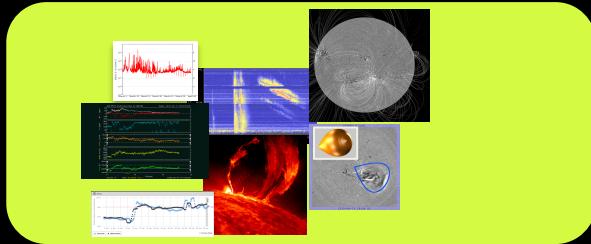
```
! Program
!
! Description:
!   [Say what this program does]
!
! Method:
!   [Say how it does it; include references to external documentation]
!   [If this routine is divided into sections, be brief here
!     and put Method comments at the start of each section]
!
! Input files:
!   [Describe these, and say in which routine they are read]
!
! Output files:
!   [Describe these, and say in which routine they are written]
!
! Current Code Owner: [Name of person responsible for this code]
!
! History:
! Version    Date      Comment
! -----    -----
! [version] [date]  Original code. [Your name]
!
! Code Description:
!   Language:          Fortran 90.
!   Software Standards: "European Standards for Writing and
!                         Documenting Exchangeable Fortran 90 Code".
!
! Declarations:
!
! Modules used:
```



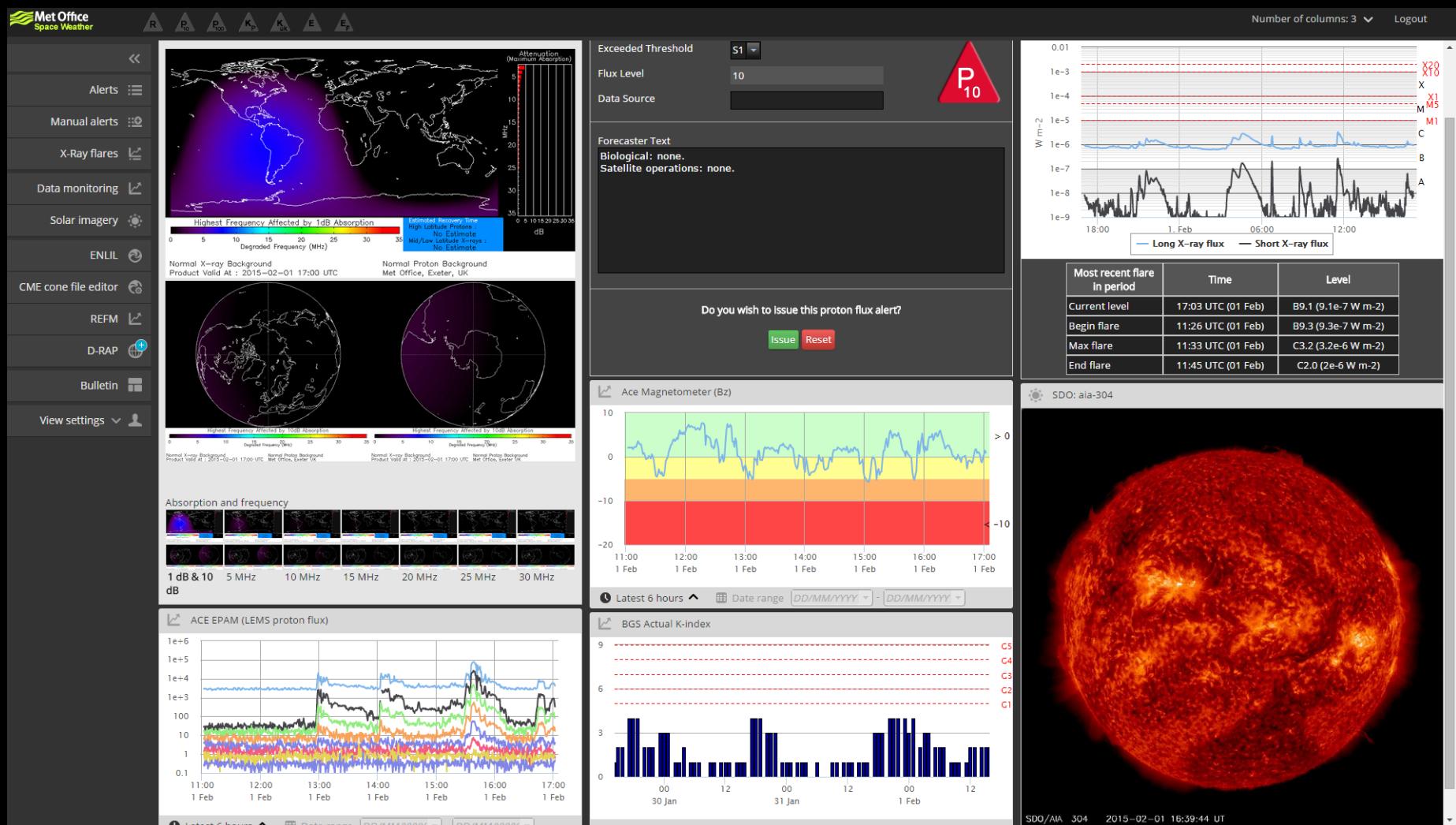
Research to operations: Verification



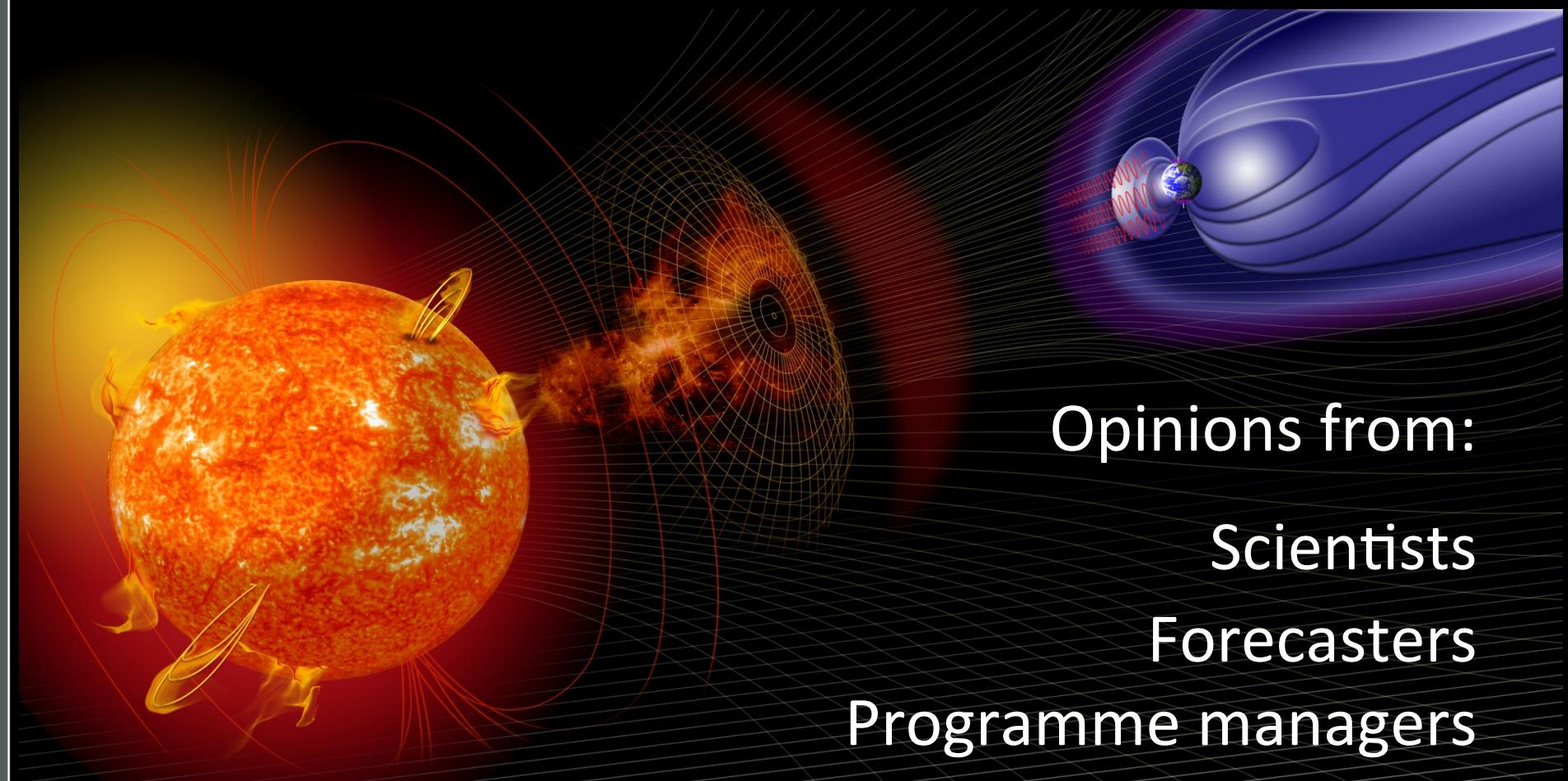
Research to operations: Porting



Research to operations: Forecasting



What's missing?



Opinions from:
Scientists
Forecasters
Programme managers

What's missing?

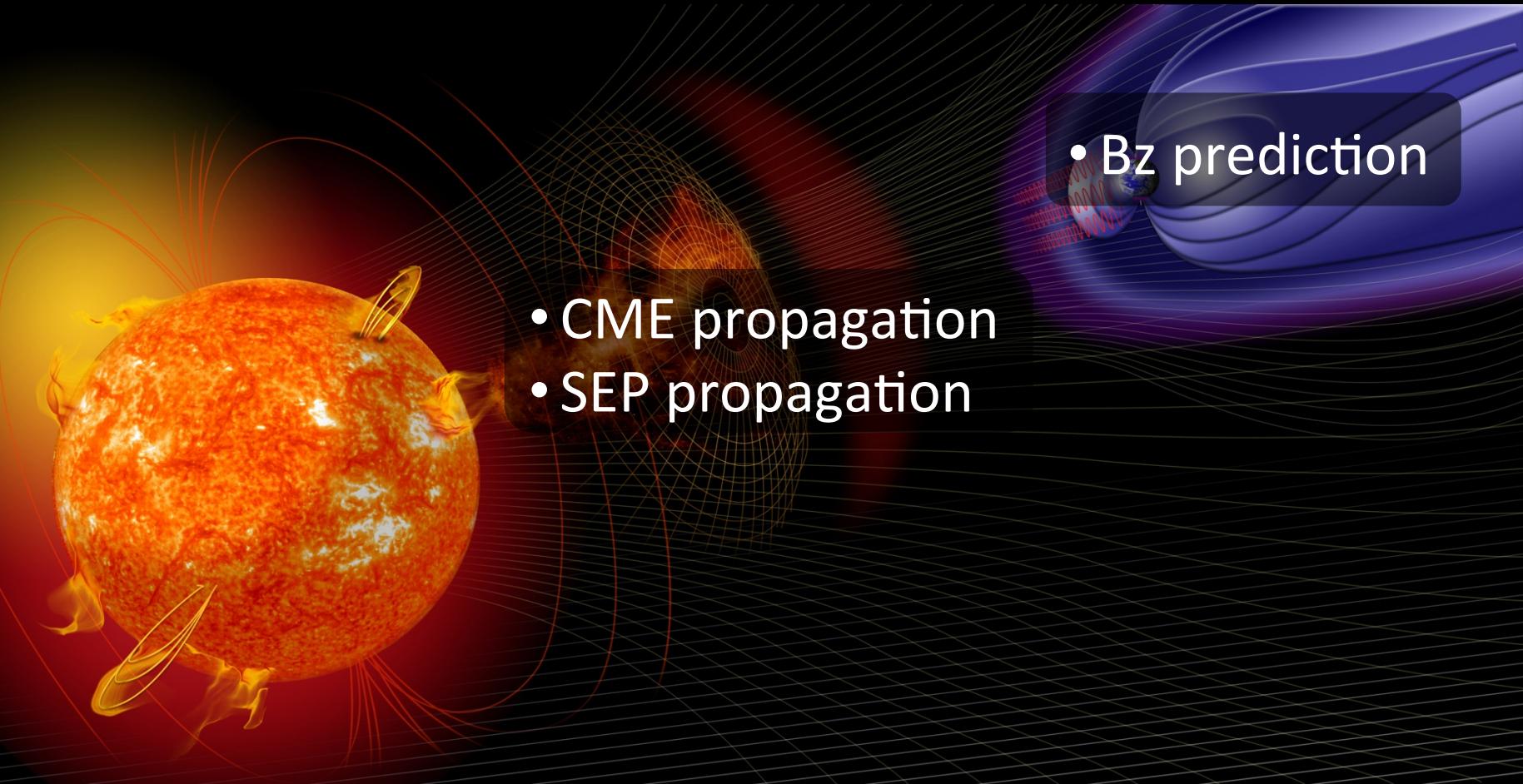
Sun

- What ARs will be eruptive?
CME prediction.
- Intensity of eruption.

What's missing? Heliosphere

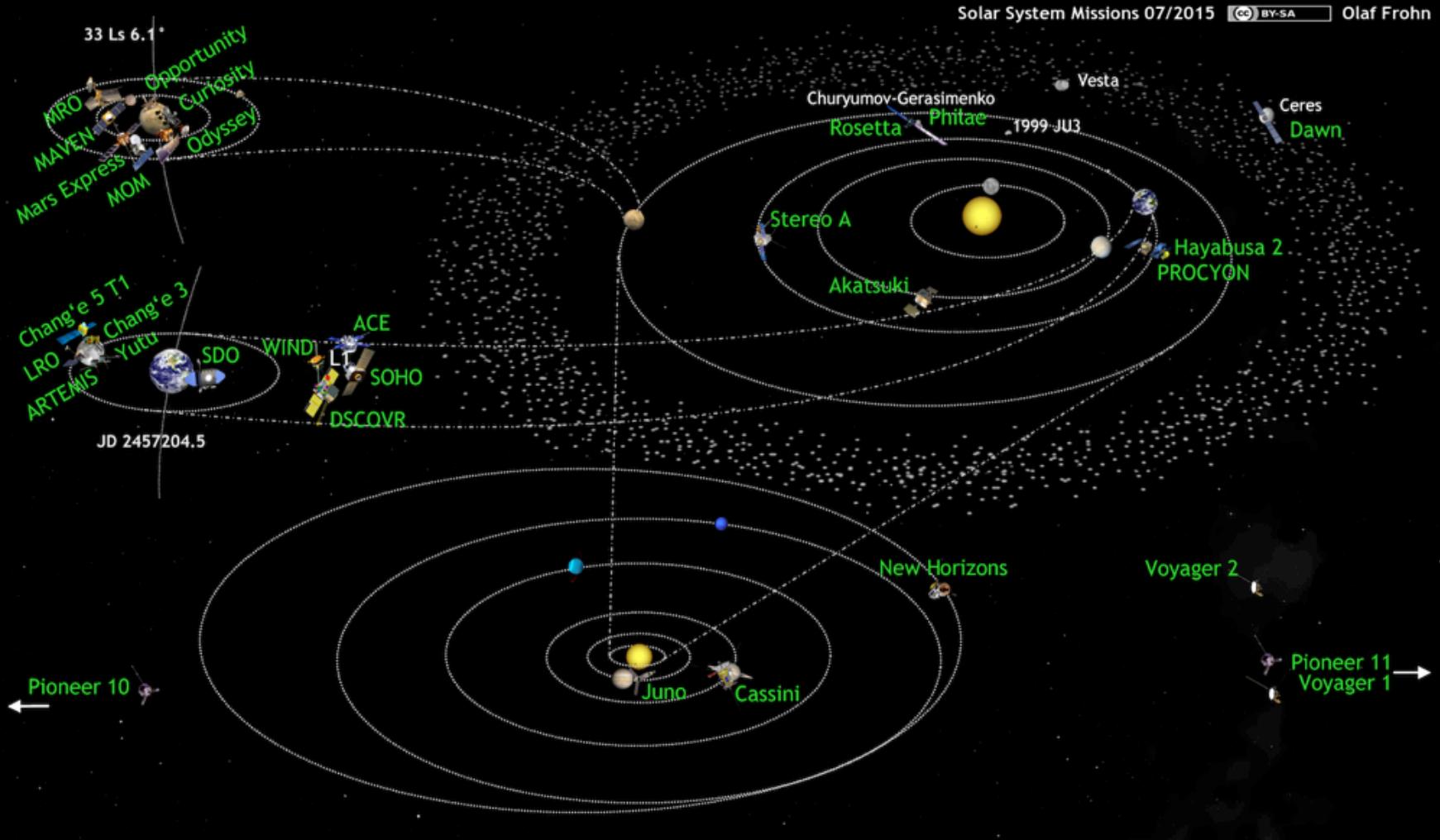
- CME propagation
- SEP propagation

- Bz prediction



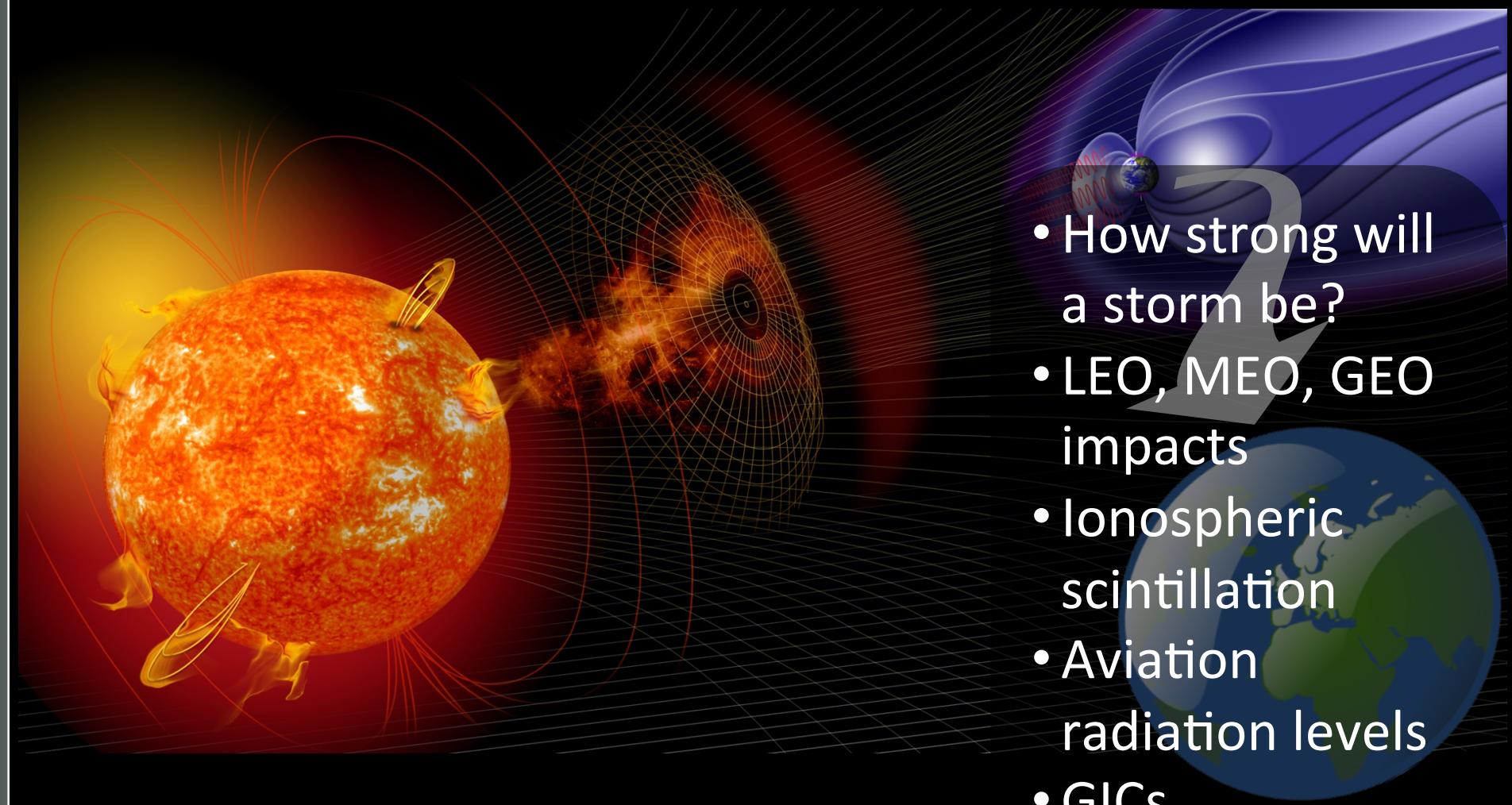
What's missing? Heliosphere

- Impact on other spacecraft in solar system



What's missing? Earth

- How strong will a storm be?
- LEO, MEO, GEO impacts
- Ionospheric scintillation
- Aviation radiation levels
- GICs



What's missing? Coupled system?

- Active region tracking
- Flare prediction
- CME observations
- Coronal magnetic field modelling
- Coronal hole identification
- Filament identification

- CME propagation modelling
- Solar wind persistence benchmarking
- SEP modelling

- Electron fluence modelling
- Radiation belt prediction
- Inner/outer magnetosphere

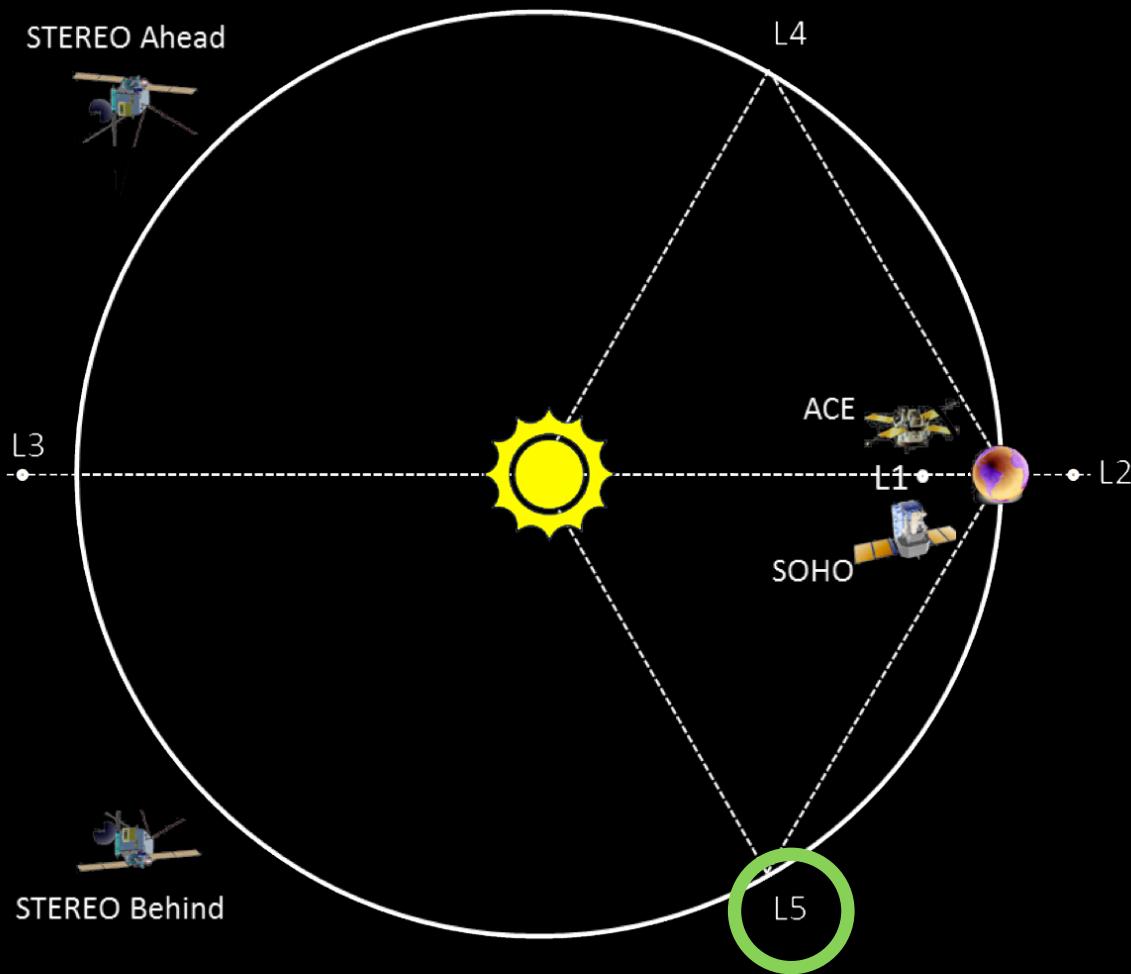
- Ionosphere monitoring
- Thermosphere modelling
- Lower atmosphere
- Lithosphere
- E field

<----- near-real-time forecast verification ----->

How do we do this? Observations

Operational missions:

- Robust real-time observations at variety of locations
 - Better forewarning of events
 - Data assimilation



Space weather
forecasting is where
terrestrial weather
forecasting was 20
years ago...

