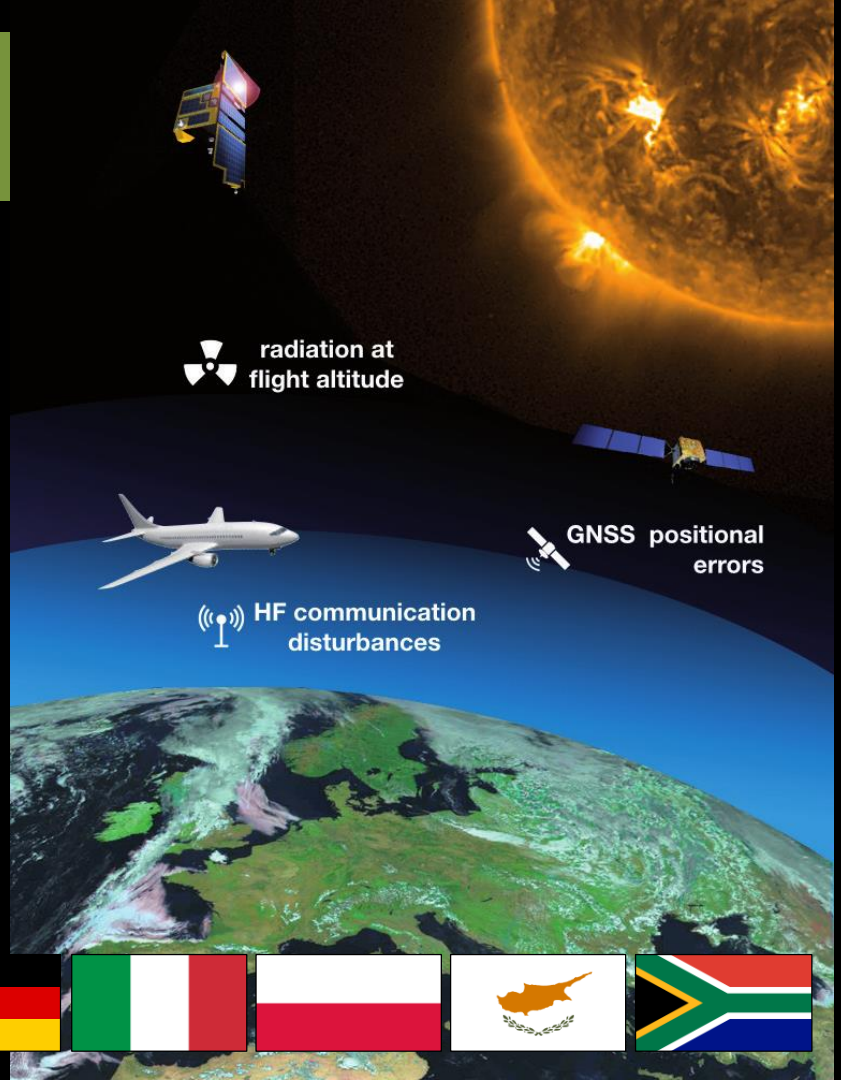
PECASUS
Global Operational Space Weather Forecasting Center for the mitigation of SWX Effects

Prof. Ari-Matti Harri
FMI - Finnish Meteorological Institute
Coordinator of the PECASUS Consortium

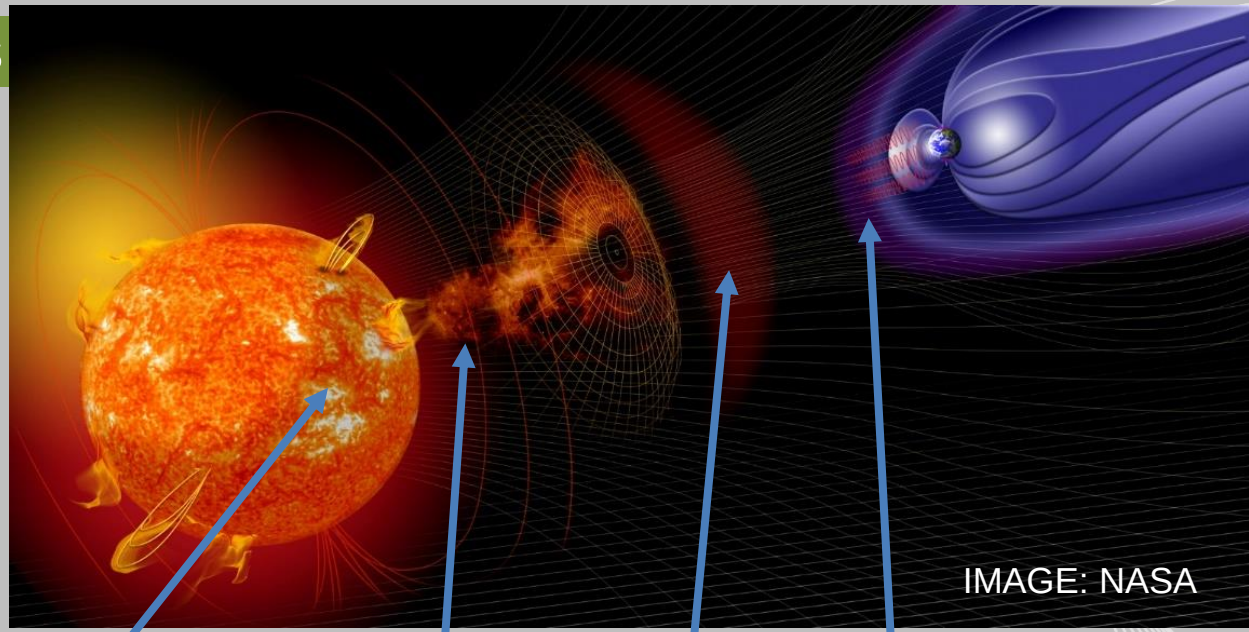
IMAGE by NASA

(2) PECASUS: ICAO-designated Global Aviation Space Weather Center

- Ten ICAO member countries (European & South Africa)
- Consortium Lead Finland (FMI)
- ICAO SWXC to improve aviation safety and efficiency
- Global SWXC services
  - ✓ HF communication
  - ✓ Radiation levels at flight altitudes
  - ✓ GNSS & SatCOM



(3)Space Weather Effects



Propagation times:

- X-rays & EUV: 8 min
- Energetic particles: Some hours
- Coronal Mass ejections: 1-2 days

Geoeffectivity can be confirmed by satellite measurements of solar wind at L1-point.

From L1 measurement it takes ~1 hour to see the impact by ground-based measurements

Which of the sunspot groups can cause a flare?

Are there coronal holes which are associated with high speed solar wind?

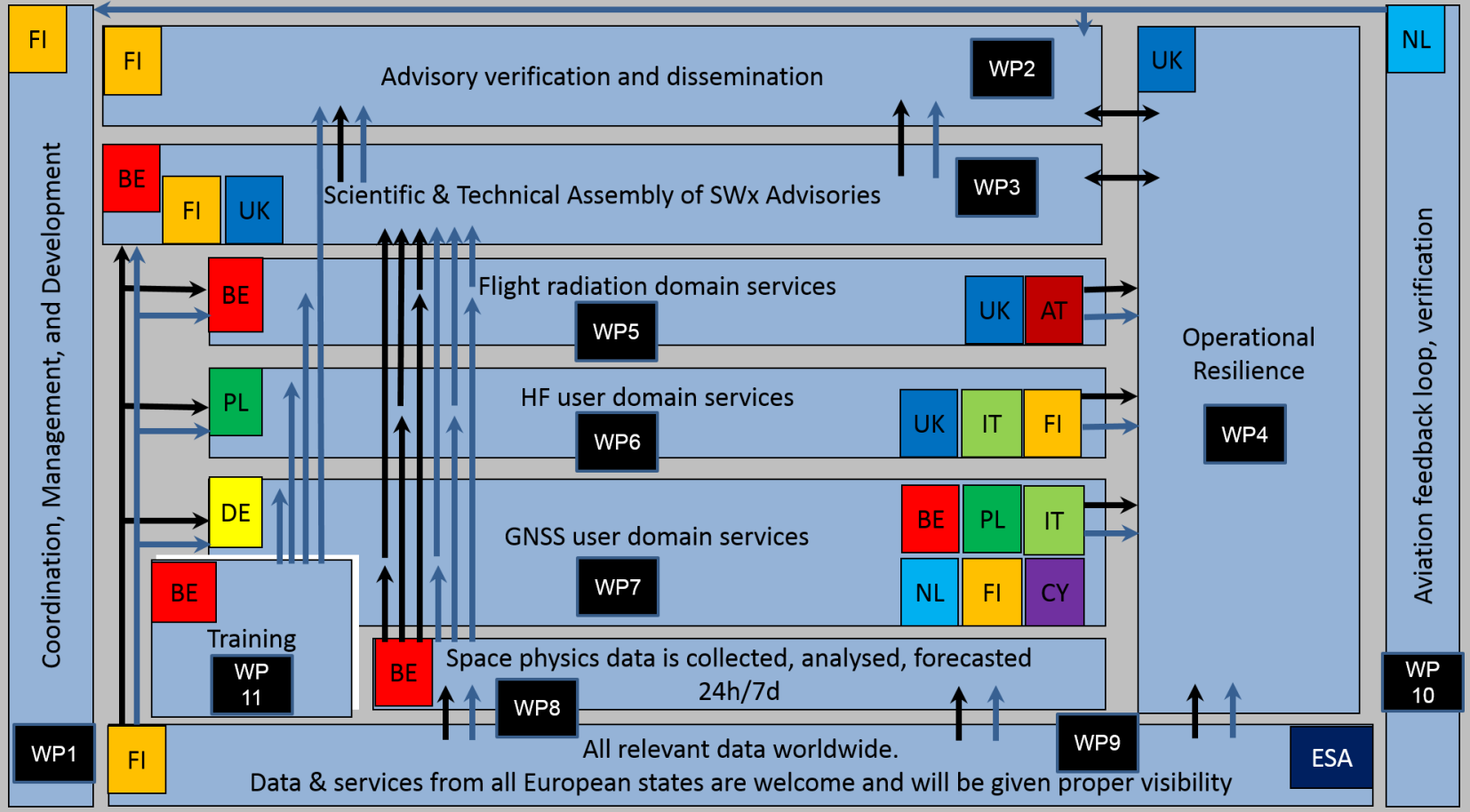
Is the coronal mass ejection directed towards Earth?

Does the solar wind structure have correct magnetic structure?

What is the previous state of magnetosphere?

(4) PECASUS –Global Aviation SWX Center

(5) PECASUS – Operations Mngmnt



(6) The Three ICAO Global Space Weather Centers

PECASUS consortium

NOAA Space Weather Prediction Service

ACFJ consortium

- Two week shifts in the responsiblity of advisory generation and dissemination
- All centers will monitor space weather continuously.

(7) PECASUS HF service

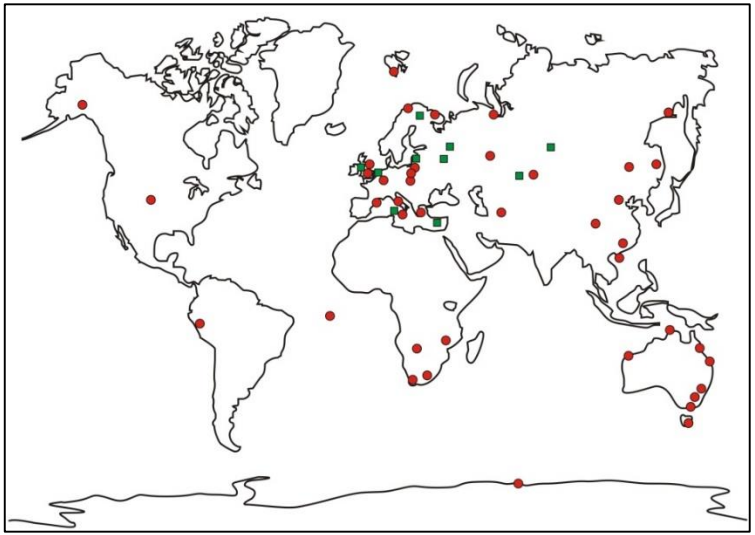
HF	Moderate	Severe
Kp-index	8	9
dB from 30 MHz riometer data	2	5
X-ray flux (0.1-0.8 nm) (W/m^2)	$1x10^{-4}$ (X1)	$1x10^{-3}$ (X10)
MUF depression	30%	50%

GFZ Potsdam & UKMO

Riometers in Finland and Sweden

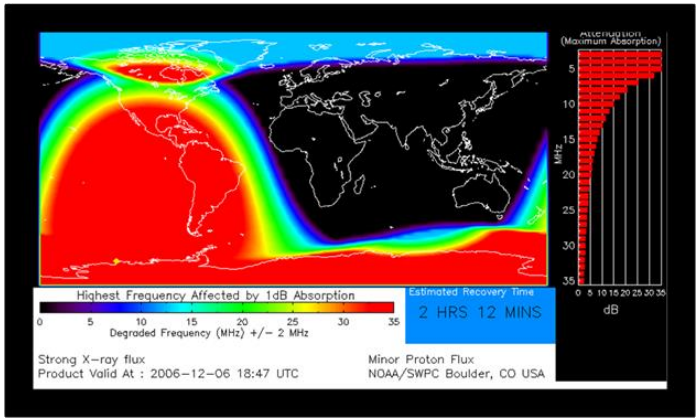
GOES from NOAA

D-RAP model



Network of ionosonde stations:

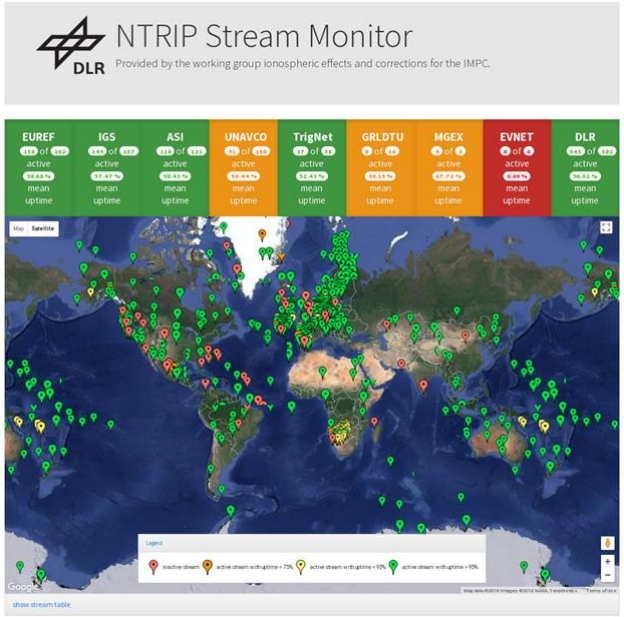
- Owned by PECASUS partners
- Available through collaboration
- Open access



(8) PECASUS GNSS service

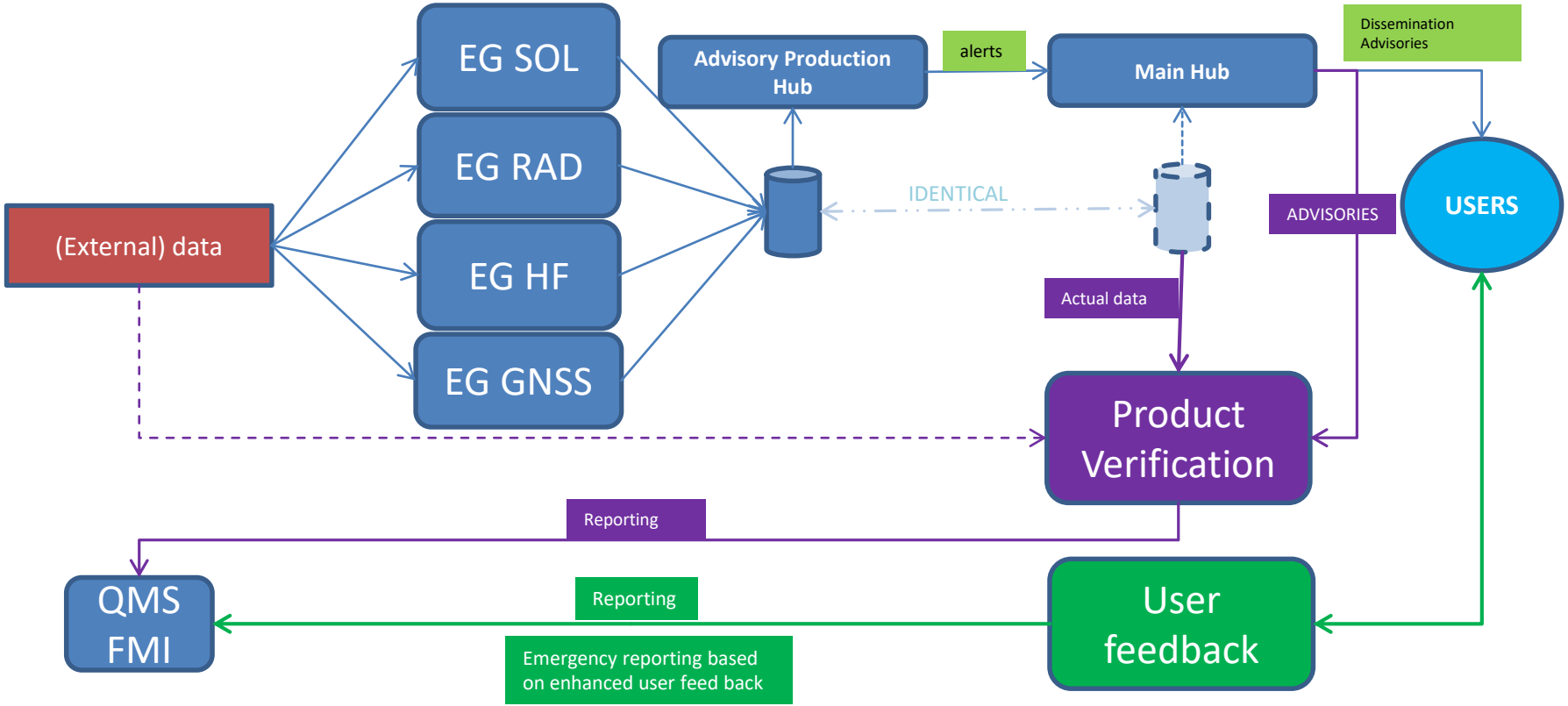
GNSS	Moderate	Severe
Amplitude Scintillation (S4) (dimensionless)	0.5	0.8
Phase Scintillation (Sigma-Phi) (radian)	0.4	0.7
Total Electron Content (TEC) (TEC Units)	125	175

Scintillation measurement stations



GNSS receivers (1Hz)

(9) Product verification and User Feedback



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Thank You !

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