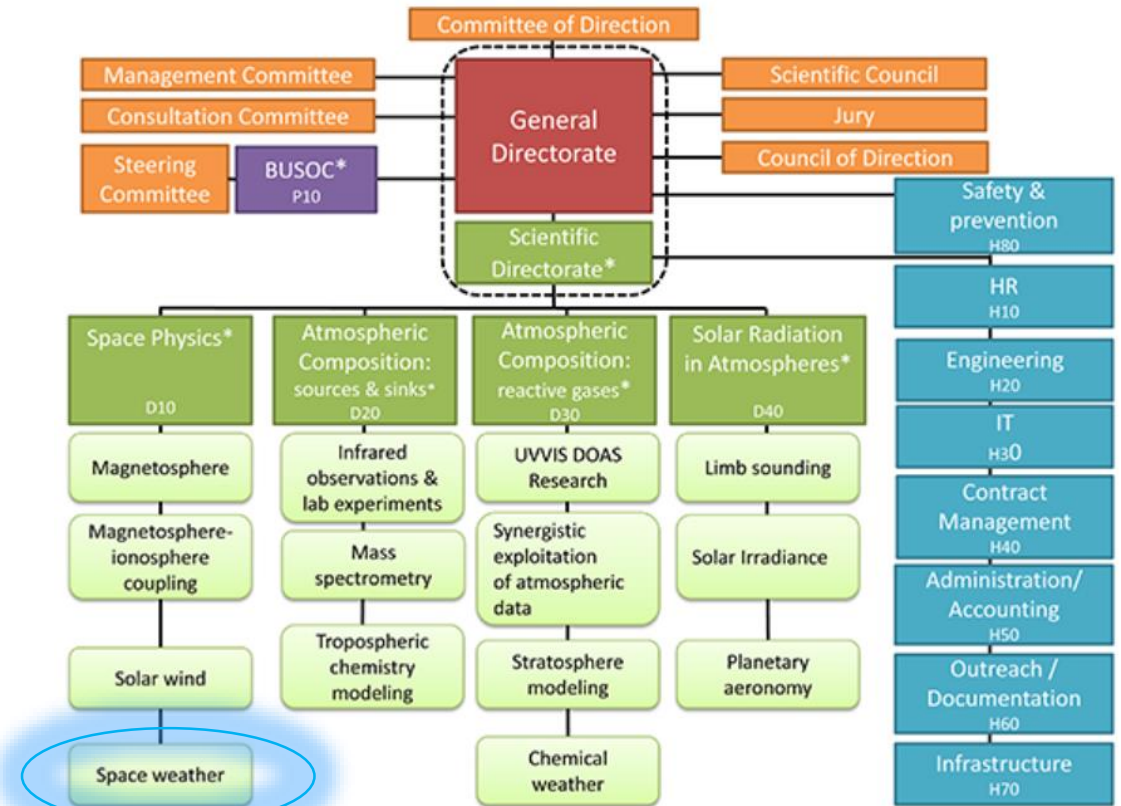
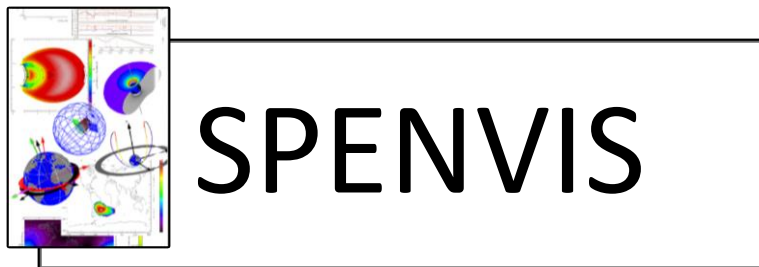
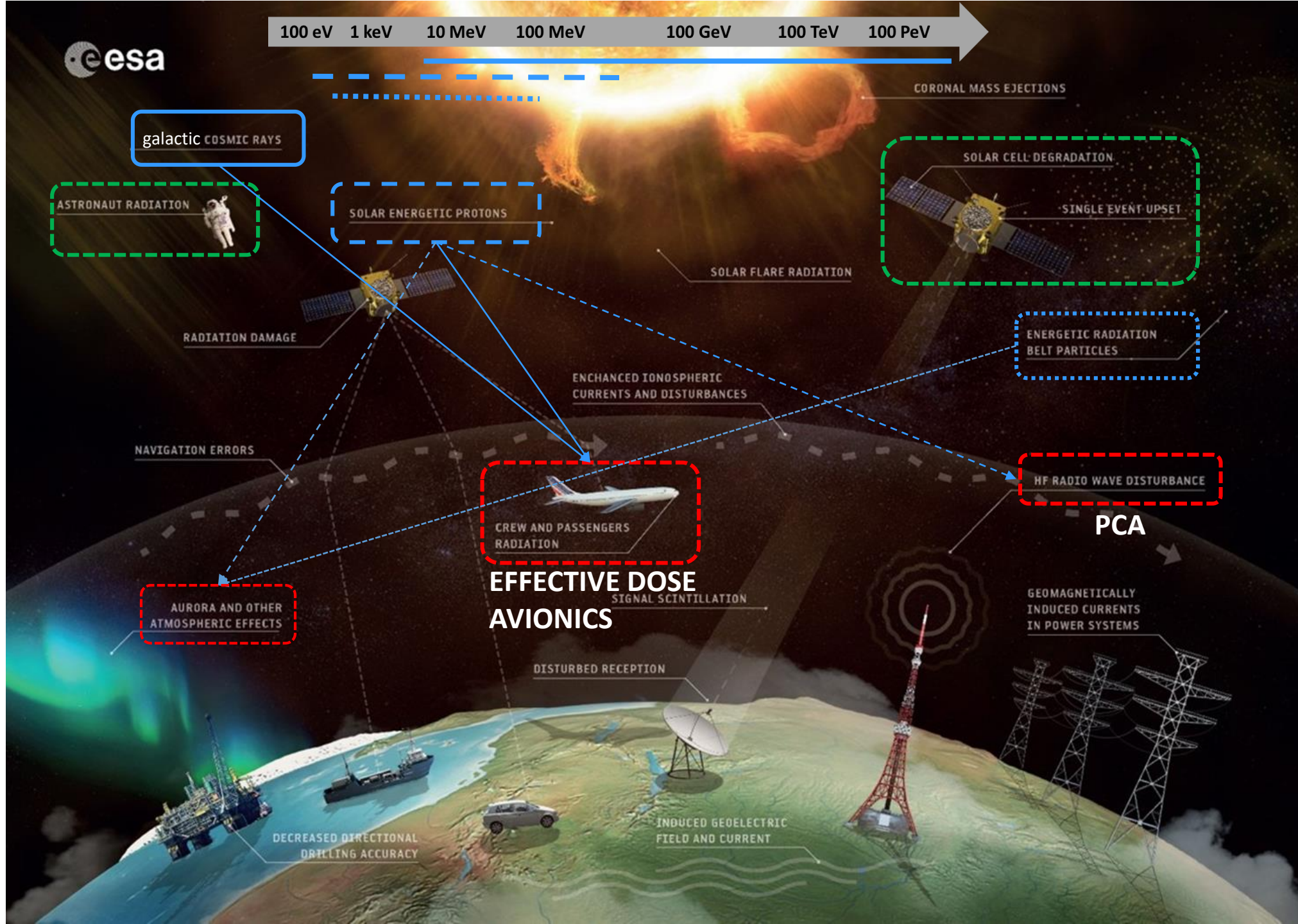


BIRA-IASB Space Weather Group (D14)

Scientific Service Development and Operation



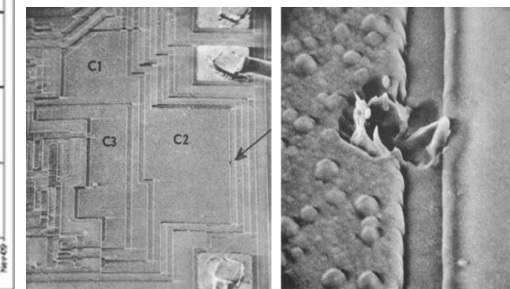
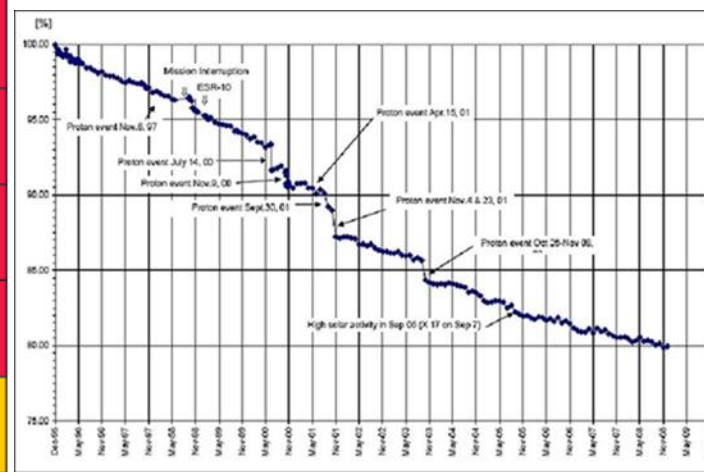
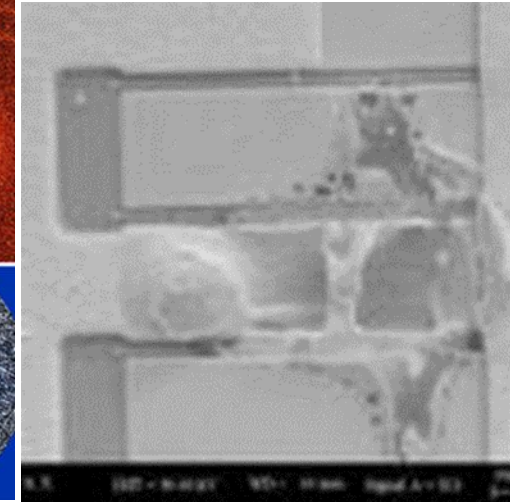
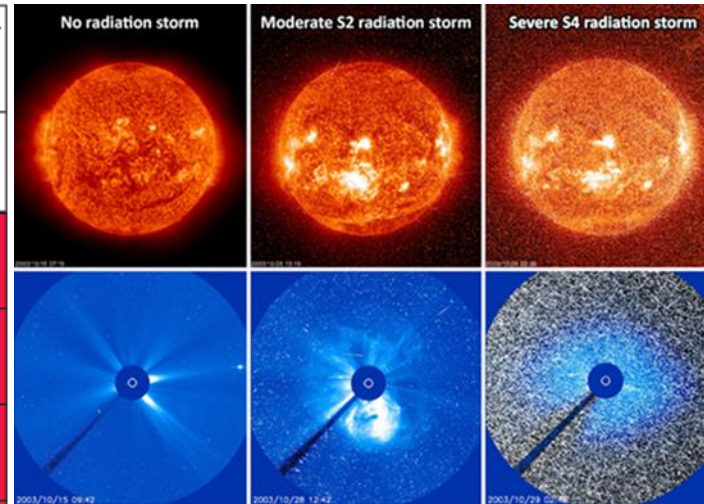


Space Radiation Impacts on s/c

→ s/c + magnetic shielding inside magnetosphere

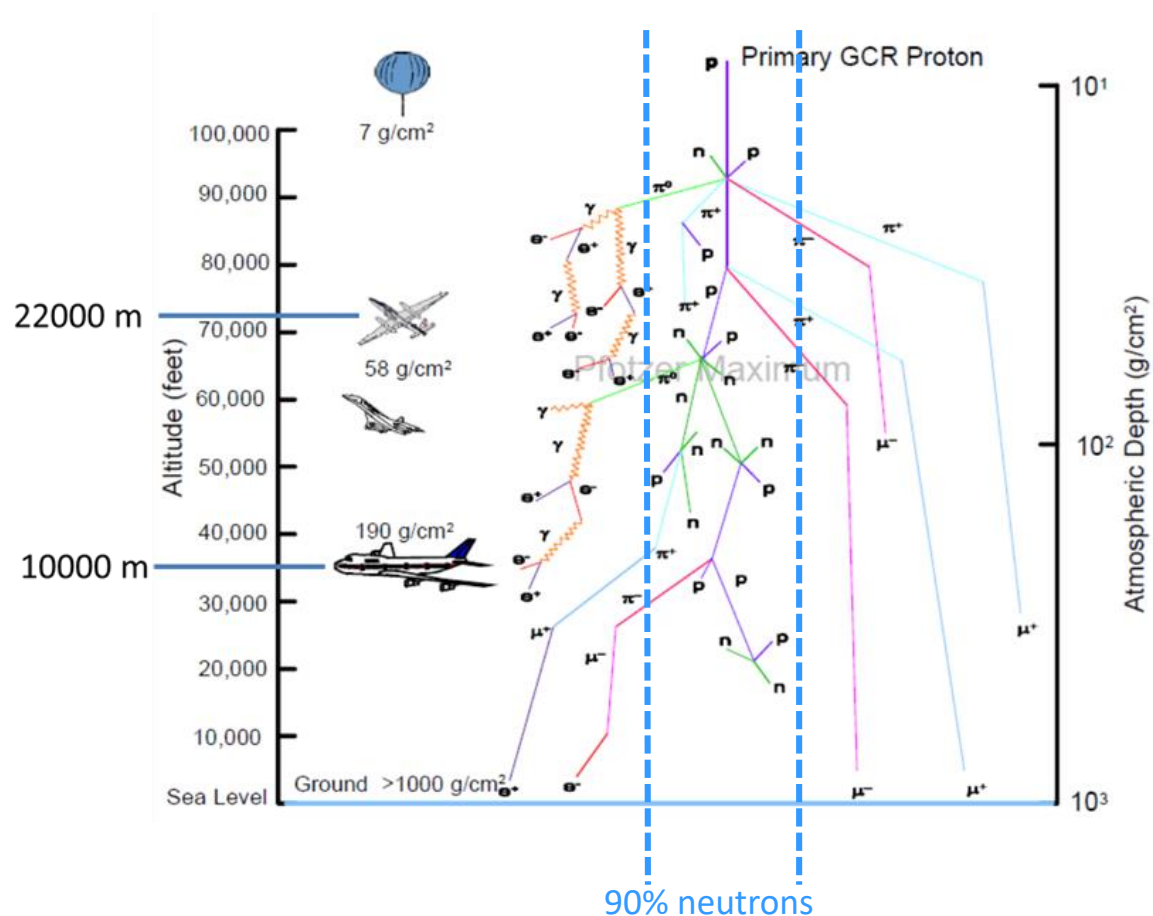
Space hazard	Spacecraft charging		Single-event effects			Total radiation dose		Surface degradation		Plasma interference with communications	
	Surface	Internal	Cosmic rays	Trapped radiation	Solar particle	Trapped radiation	Solar particle	Ion sputtering	O ⁺ erosion	Scintillation	Wave refraction
LEO <60°	Not applicable	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
LEO >60°	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
MEO	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
GPS	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
GTO	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
GEO	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
HEO	Important	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important
Inter-planetary	Not applicable	Not applicable	Important	Important	Not applicable	Important	Important	Important	Not applicable	Important	Important

Important
 Relevant
 Not applicable



Space Radiation Impacts on air/ground

→ atmospheric shielding



PCA

- > 10 MeV
- ~30 km
- ionization D-layer → absorption radio waves (HF)
- riometer

SEE in avionics

- mitigation software (EDAC)
- redundancy
- smaller components!!

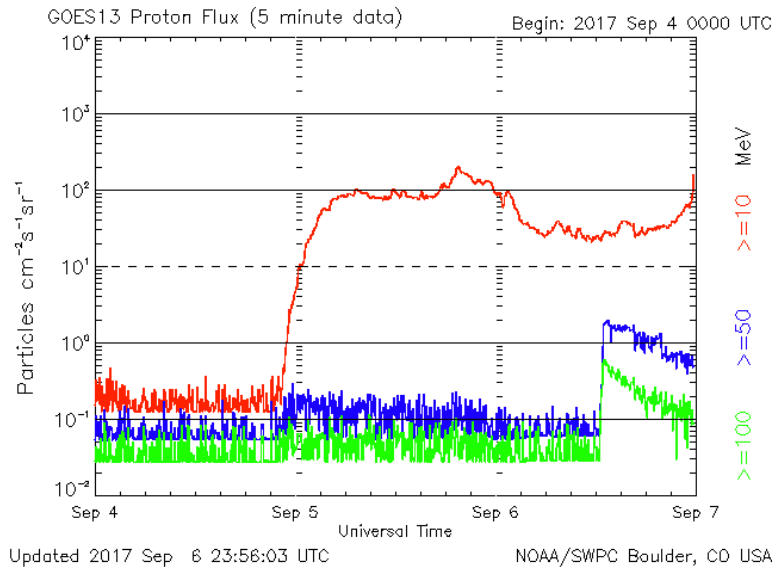
Increase Effective Dose

- ~2 – 16 $\mu\text{Sv/hr}$
- during GLE: ~100 – 1500 $\mu\text{Sv/hr}$
- < 20 mSv/yr

GLE

- > 500 MeV
- Neutron monitor

SEP OBSERVATIONS



GLE Alert
National & Kapodistrian University of Athens / Cosmic Ray Group
ISNet Company

DATA UPDATED EVERY MINUTE
Sun, Sep 10, 2017 at 17:19:46 UTC

Service Description | Disclaimer | Acknowledgement | Archived GLEs | Get GLE Email

General Alert Status

Stations Summary

Alert	[05]	Total	[34]
WARNING	[00]	Real Time	[18]
WATCH	[00]	Near Real Time	[02]
QUIET	[29]	Not in Real Time	[14]



Stations Info

AATB	QUIET	APTJ	QUIET	ATHN	QUIET	IRSN	QUIET
BURE	QUIET	CALM	QUIET	ESOI	QUIET	FSMT	QUIET
INVK	ALERT	IRK2	QUIET	IRK3	QUIET	IRKT	QUIET
JUNG	QUIET	JUNG1	QUIET	KERG	ALERT	KIEL2	QUIET
LMKS	QUIET	MCMV	QUIET	MCRL	QUIET	MGDN	QUIET
MOSC	QUIET	MRNY	QUIET	NAIN	QUIET	NEWK	QUIET
NVBK	QUIET	OULU	QUIET	PWNK	QUIET	ROME	QUIET
SOPB	ALERT	SOPQ	QUIET	TERA	ALERT	THUL	ALERT

SEP FORECAST

Alert Viewer Current time: 12-06-2018 09:10

Geomagnetic Storm Alert	No alert since 39 days	Nothing to report
SEP Proton Storm Alert > 10 MeV	No alert since 234 days	Nothing to report
SEP Proton Storm Alert > 60 MeV	No alert since 276 days	Nothing to report

Legend: ★ ... an alert has been issued
... risk impact (timing and level, ● low, ● medium, ● high, ● extreme)

Click on the icons to see alert details

Sat 09 Sep 2017

Register for COMESEP alerts

Flare: 09 SEP 12:00, 07 SEP 12:00, 08 SEP 12:00, 09 SEP 12:00, 10 SEP 12:00, 11 SEP 12:00, 12 SEP 12:00, 13 SEP 12:00

CME: 09 SEP 12:00, 10 SEP 12:00, 11 SEP 12:00, 12 SEP 12:00, 13 SEP 12:00

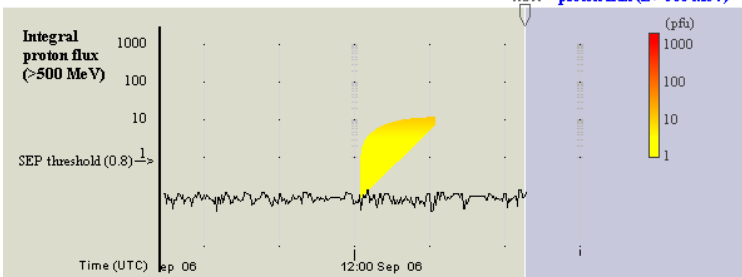
SEP: 09 SEP 12:00, 10 SEP 12:00, 11 SEP 12:00, 12 SEP 12:00, 13 SEP 12:00

Impact: Radiation10MeVpu.SEPFORECAST@10-09-2017 16:16:00 #E

Estimated risk level issued by SEPFORCAST for a SEP proton storm (>10 MeV) at Earth is MEDIUM due to:

- expeted occurrence probability: Likely
- expeted severity: Minor

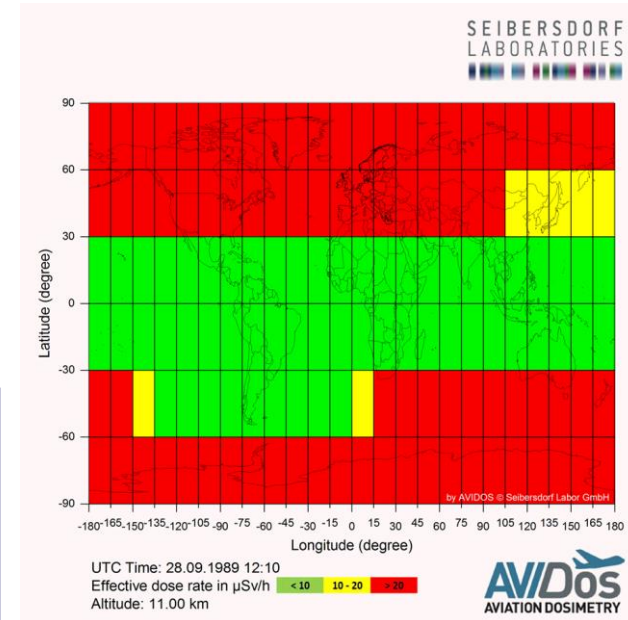
HESPERIA UMASEP-500 (>500 MeV SEP event and GLE forecaster)



Automatic forecast:
No >500MeV SEP event is expected.



DOSE NOWCAST



A D V I S O R Y