

“Quickmaps and history of the effects of ionospheric scintillations on GPS/GLONASS signals” Project status

SDA for ESA Space Weather Applications Pilot Project

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In partnership with

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ESA Space Weather Workshop:
Developing a European Space Weather Network

ESTEC, Noordwijk, 3-5 November 2003
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Introduction

Project status

- User needs & technical specifications
- Service development starting
- User Interface web site data bank
- Calibration

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Industry : user needs

User needs list (Ref. number)		Activity				
		Out exploration	Aviation	GPS/ATV mission analysis	GPS equipt	Telecoms
SCINT	Scintillations	(not/used)	(not/used)			
1	Where and When	1	1	2		1
2	Intensity	1	1			1
3	Worst case		1			
4	Prediction	1	1			2
TEC	Other ionospheric parameters					
1	VTEC (vertical)	2				
2	VTEC time variation & TID detection/statistics	2				
3	Horizontal TEC gradient					
SYST	Effects on the systems		(not/used)			
1	GDOP degradation	2				
2	Location/Navigation/Timing induced GPS errors	2	2		2	
3	GPS/GLONASS availability		1	1	1	
4	Signal power attenuation class of receiver robustness			1	2	2
5		3				
SYST	Other topics	sat. gaps	Not/used			
6	GPS alarm bulletin	2	1			
SW	Additional needs					
1	CME storms	3				

Priorities from 1 (highest) to 3 (lowest) knowing the context of the original proposal

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Science : user needs

User needs list (Ref. number)		Comments	Priorities
SCINT	Scintillations		
5	Data base / history	The parameters are listed	1
6	Archive system and easy access	For long term analysis	1
2	Index definition and calibration	Need for external data (ISM,...)	1
4	Prediction	Model testing in the future	3
TEC	Other ionospheric parameters		
1	VTEC (vertical)	Minimum accuracy expected	2
2-3	VTEC time variation & TID detection/statistics	Monitoring for scientific investigation	2

Priorities from 1 (highest) to 3 (lowest) knowing the context of the original proposal

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Technical specifications: scintillations products

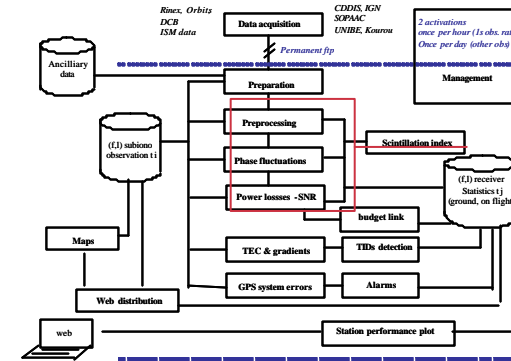
User needs list (Ref. number)		Service development plan			
		Product	Basic Service	Added value	Future
SCINT	Scintillations				
1	Where and When	global maps of scintillation location	X		
2	Intensity	global maps of scintillation index	b.e.		
3	Worst case	Study report, alert message (tbd)		X	
4	Prediction	models testing and comparison			X

Maps: discrete, projection at sub-ionospheric point, with night/day transition, 1h refreshment (objective)
24 hours animation

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Service development: starting



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Service development: preliminary criteria analysis

Ionospheric scintillations identification mixed criteria:

- 1: cycle slip levels on both frequencies
- 2: power attenuation
- 3: phase fluctuations
- 4: losses of observation (especially L1-L2)

Test on criteria 4 (L2 losses) 1 day at Fortaleza



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User Interface

Web site: under construction

Data bank: NetCDF format files for scintillations & TEC

- > array-oriented scientific data
 - > machine-independent format
 - > dimensions, variables, attributes (global, local)
- (<http://www.unidata.ucar.edu/packages/netcdf/>)

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Web site: homepage

esa
ESA/ESTEC Pilot Project for Space Weather applications
CLS

A service to monitor the effects of ionospheric scintillations on GPS/GLONASS signals

The objective of this project is a versatile and real time service to monitor ionospheric scintillations and their effects on the accuracy of GPS/GLONASS global navigation systems. Scintillation irregularities of the ionosphere cause errors in the navigation, the 1500 km altitude layer may cause signal power fluctuations, noise and degradation of the message and finally navigation errors.

The service is planned to be on the basis of GPS networks, HF Telecommunications and Services (GPS/GNSS).

The service is under development. A first flight will be done in April 2004.

[The Space Weather Applications Pilot Project](#)

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Homepage | Project | Applications | Proposed services | Consortium | Partners and Services | Site map | Feedback

under
construction

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Calibration

ISM (Ionospheric Scintillation Monitors)

Data sets from IESSG at Nottingham Univ. of 5 ISMs in Europe

One dedicated ISM is planned at Kourou

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