

イグアス ソフトウェア システムズ

The most successful Czech company in ESA projects, focused on GNSS

SBAS software
development in the
Czech Republic



ピーター バレシュ
代表取締役社長



イグアス ソフトウェア システムズ



プラハ, チェコ共和国



Galileo/GSA HQ
2012



2008



2004

Iguassu Software Systems (ISS) history

- 1994 established as Czech subsidiary of SciSys UK
- 1995 → in European Space Agency (ESA) projects (i.e. well before the Czech membership in ESA)
- 2000 became independent Czech SME (through
- over 150 man years in space engineering work
- Most successful Czech owned company in winning projects
- The only Czech company to work on Galileo system development, as member of INDRA consortium

20 years working for ESA



ISS Managing Director history in space industry since 1975

- 1975-1988 ESA/ESOC staff member (1st Czech staff)
- Since 1997 MD of Iguassu
- 2006 co-founder and repeatedly elected president of the industry association “Czech Space Alliance”
- 2009 & 2014 co-author of the strategic document for the Czech government – the National Space Plan and the National Space Plan 2014-2019

ISS team – principal skills

- design & development of high tech real-time software solutions, mainly in space, e.g. satnav
- broad international experience in Western Europe, USA and Latin America, now starting Asia



- extensive experience in working in international teams
- language skills – English, Spanish, German, Korean
- limited Brazilian Portuguese,

3人のイグアススタッフが今日本語を勉強しています

- marketing consultancy for Latin America & Czech space

Why



?

- In 2006 the ISS MD made the 1st and unwilling visit to Japan - for an EU Gateway ICT event
- Against expectation, he was immediately fascinated by the culture, and the people
- After visiting JAXA he realised the extent and successes of the Japanese space programme
- In 2011 he attended the EU Japan Centre's HRTP course and started meeting Japanese space companies
- Now supporting the Czech government in negotiating a bi-lateral space cooperation agreement



Where is the possible synergy with ? GNSS

- 1994 Europe launched the EGNOS programme
- 2005 EGNOS started initial operations
- 2010 Michibiki was launched
- EGNOS and QZSS have differences but also commonalities
- Cooperation and sharing of experiences should therefore be mutually interesting and beneficial
- Iguassu has been developing EGNOS software solutions and tools for ESA since 2005
- Iguassu is now becoming the preferred supplier of EGNOS software for Thales Alenia Space



Iguassu heritage in SBAS projects

- SBAS navigation/education tools are available on



www.navipedia.net/index.php/GNSS:Tools

- all except 1 were developed, or enhanced, by Iguassu
 - SISNetLAB
 - User Application Software
 - SBAS simulator etc....
- Iguassu also established the first EGNOS monitoring station in Central Europe

Iguassu SBAS Tools available on ESA website

SISNeTlab www.egnos-pro.esa.int/sisnetlab/download.html

SBAS TeACHER www.egnos-pro.esa.int/sbasteacher/index.html

SBAS MeNTOR www.egnos-pro.esa.int/sbasmentor/index.html

SBAS Simulator www.egnos-pro.esa.int/sbassimulator/index.html

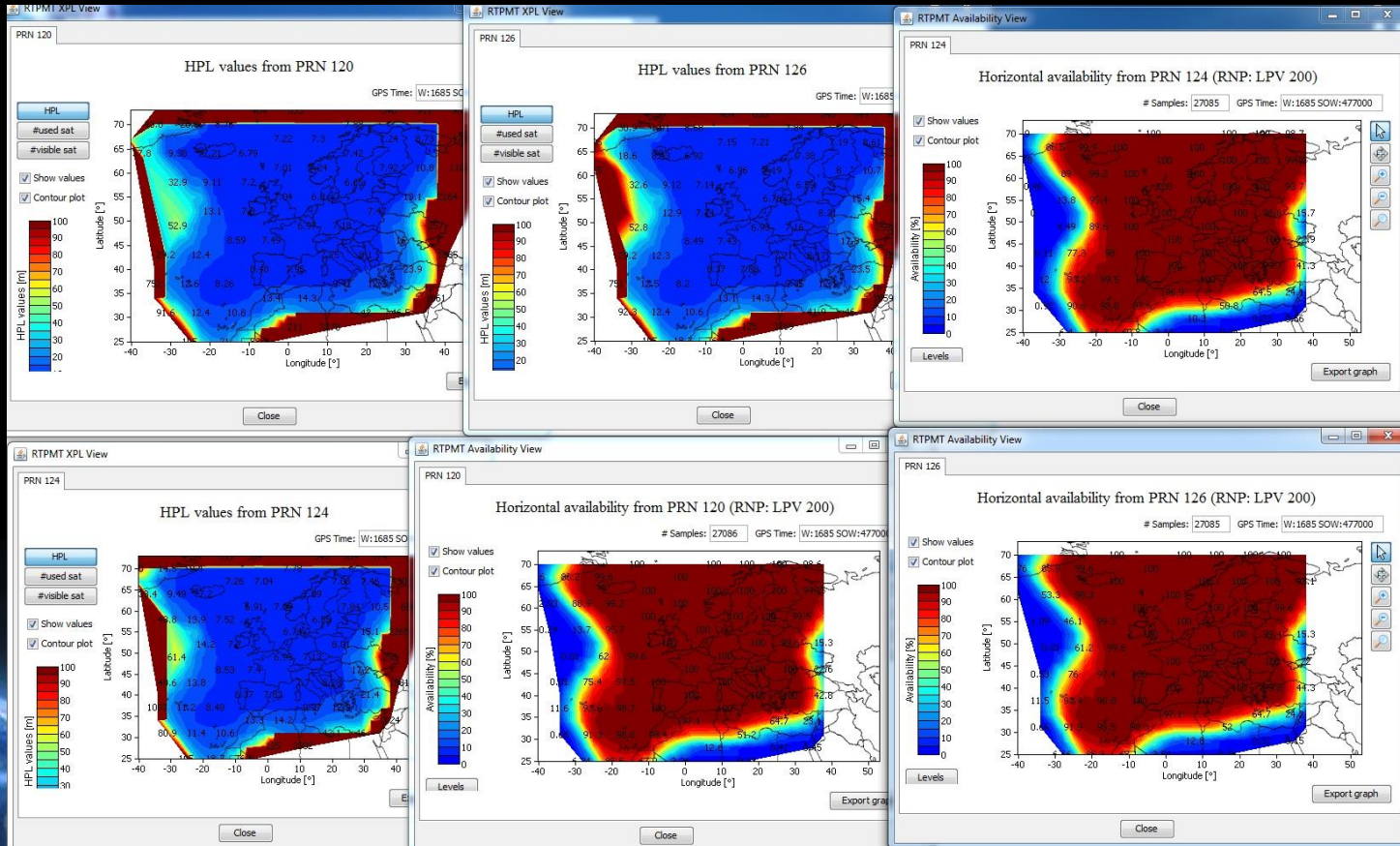


Real-time SBAS Performance Monitoring Tool

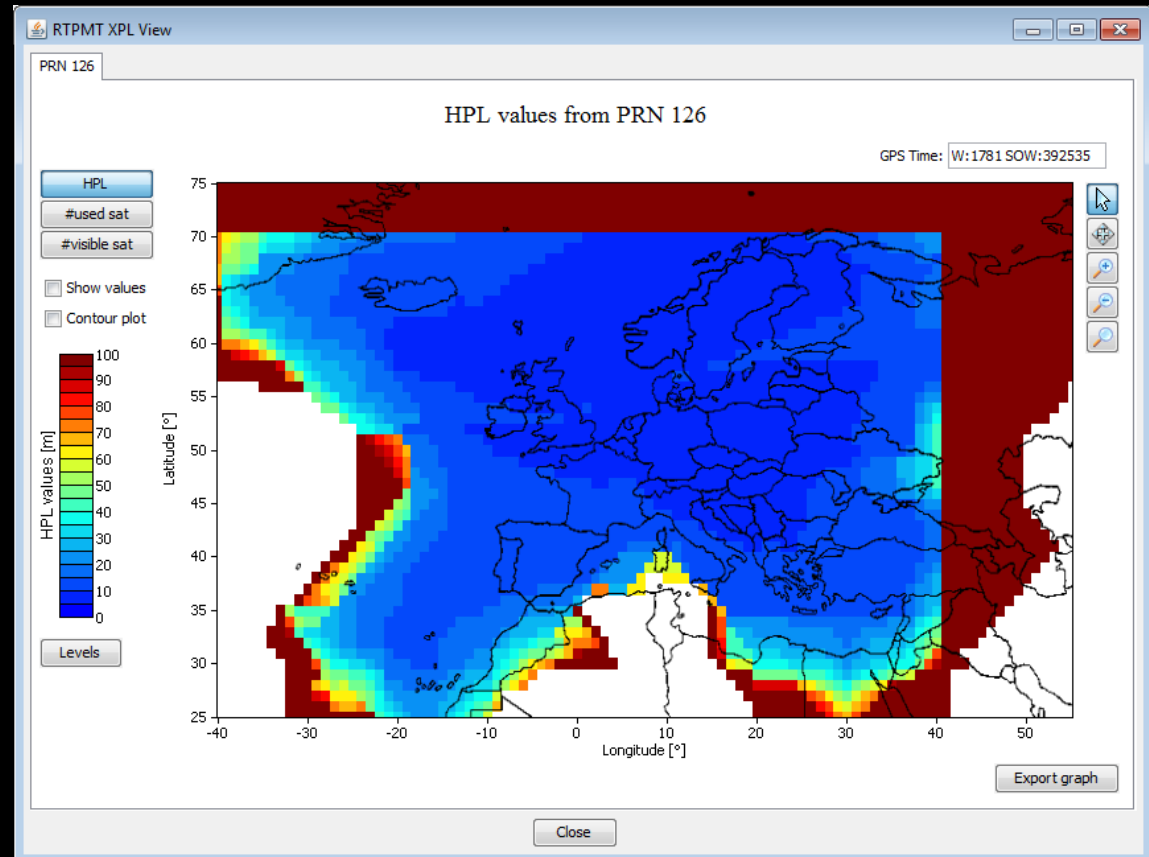
- performance monitoring especially important for “safety of life” systems (EGNOS certified)
- for developers, operators, monitoring authority..
- graphic user interface, e.g. line plots of key parameters, Stanford plot (xPE vs xPL), maps etc.
- immediate review of system performance
- applicable to all SBAS systems – i.e. also MSAS, GAGAN, QZSS



Real-time SBAS Performance Monitoring Tool

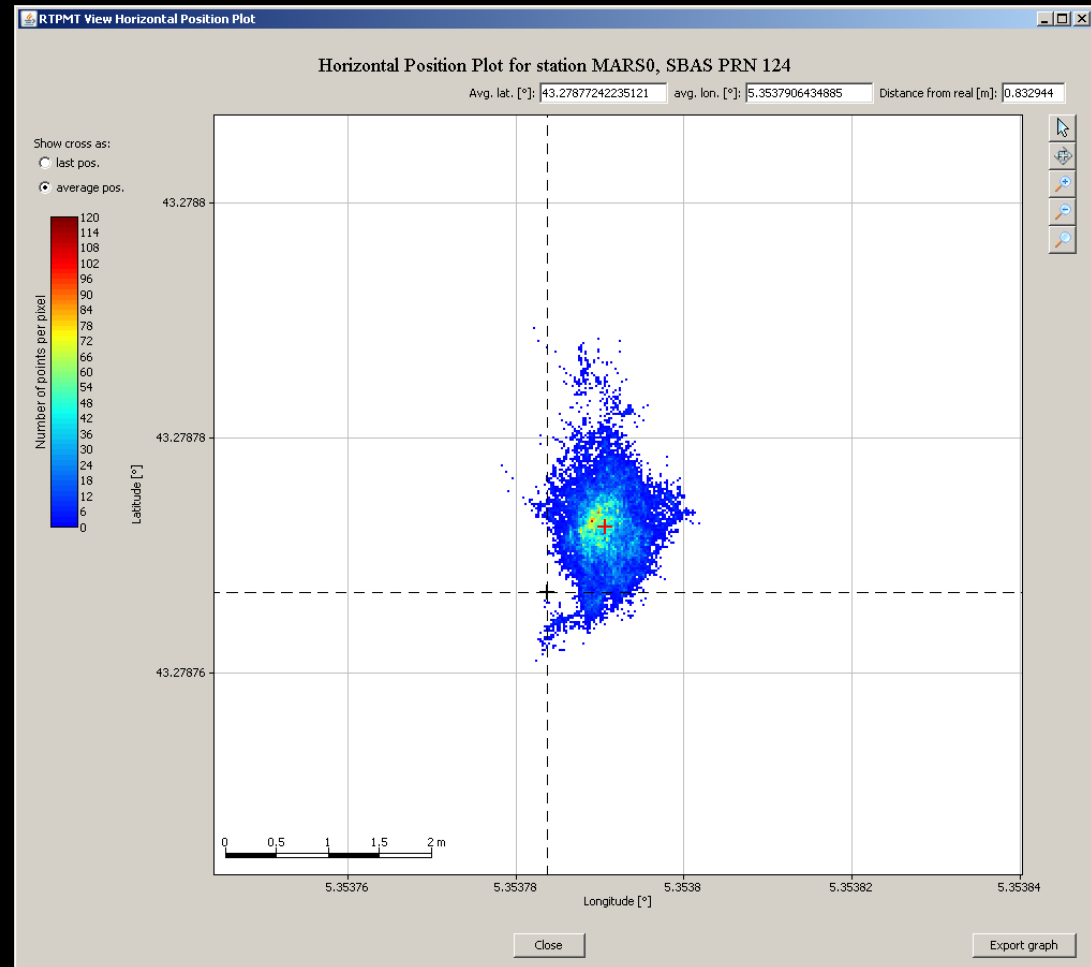


Real-time SBAS Performance Monitoring Tool



Horizontal Protection Level over Europe

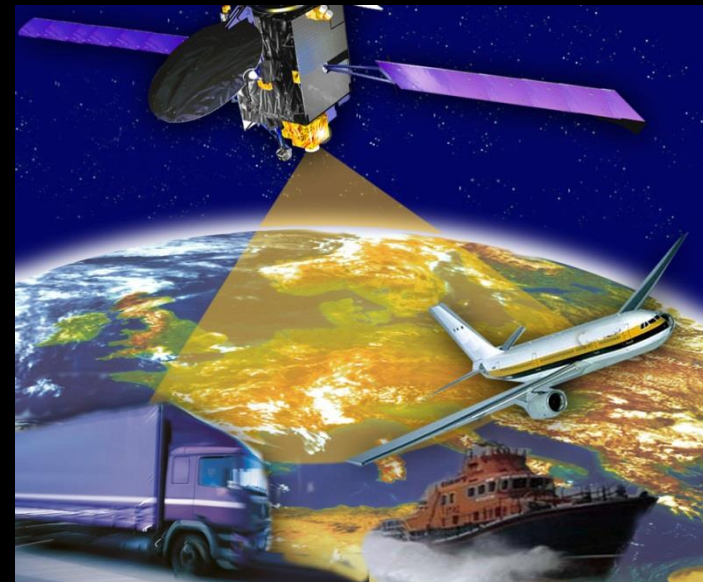
Real-time SBAS Performance Monitoring Tool



Real-time SBAS Performance Monitoring Tool

Integrated into Thales Alenia Space's key EGNOS testing and simulations product **SPEED**.

Further development and certification in progress under ESA contract



Interference monitoring System for GNSS stations

Iguassu - software design & development

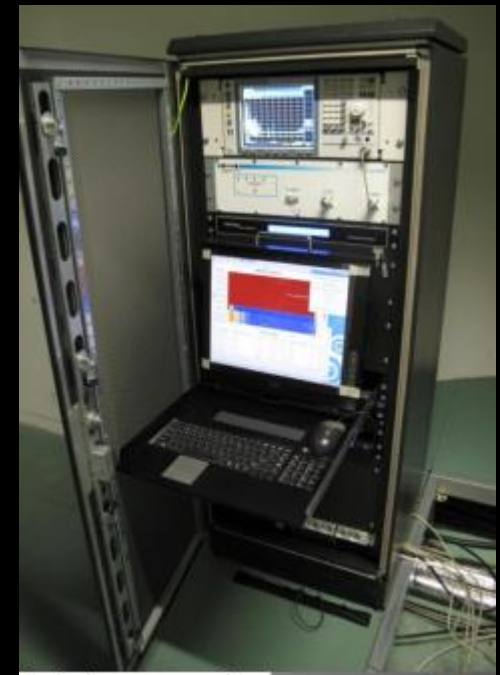
Airbus Defence & Space, Germany - prime,
h/w design & dev't.

**detecting and capturing interference events
near the sensing stations (e.g. RIMS)**

central processing s/w, collects data from
each station and remote operation

follows the DO-229 standard and the signal
characteristics

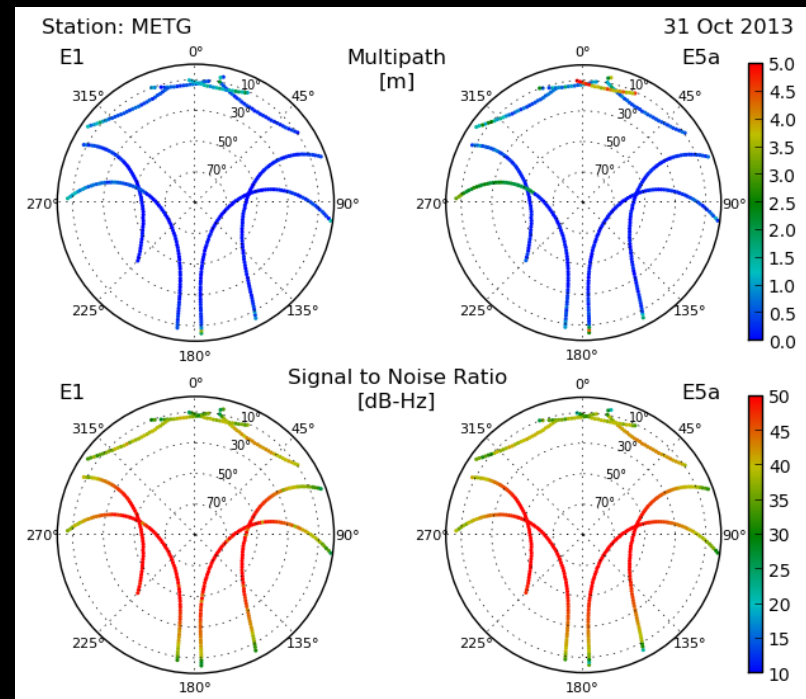
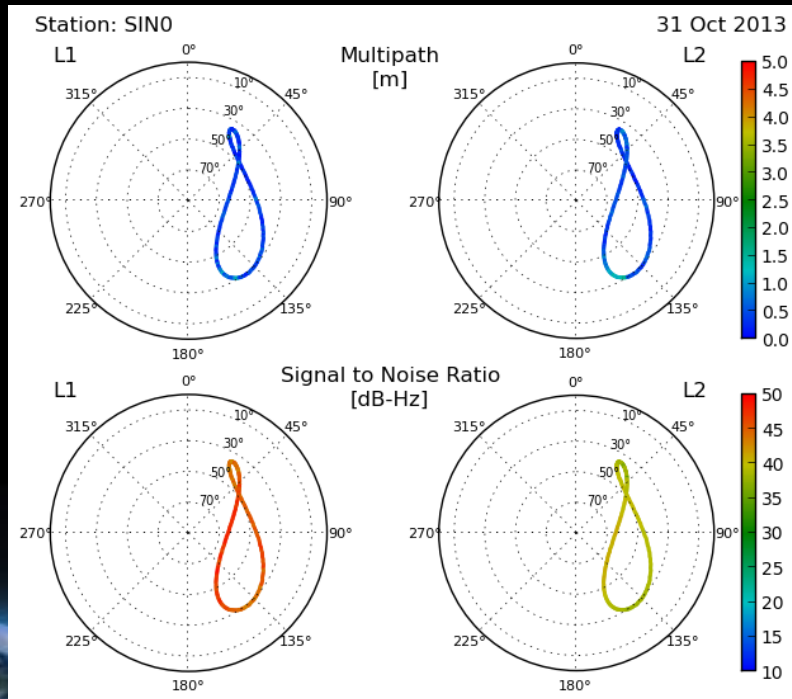
applicable for all SBAS systems



Multi-constellation long-term performance monitoring system

- Long-term analysis of GNSS data
- Support for EGNOS, GPS, Galileo, Glonass, Beidou, QZSS, with possible configuration of other GNSS systems
- Monitoring of more than 40 stations around the world
- Implementation of the most recent ARAIM algorithm
- Auto-generation of reports – daily, monthly, yearly
- Upgrade of the system using GNSS data mining and error corrections is currently in progress

Multi-constellation long-term performance monitoring system



Multipath and SNR from for station Nanyang, Singapore (QZSS) and Metsahovi, Finland (Galileo)

SBAS Simulator – free tool for universities

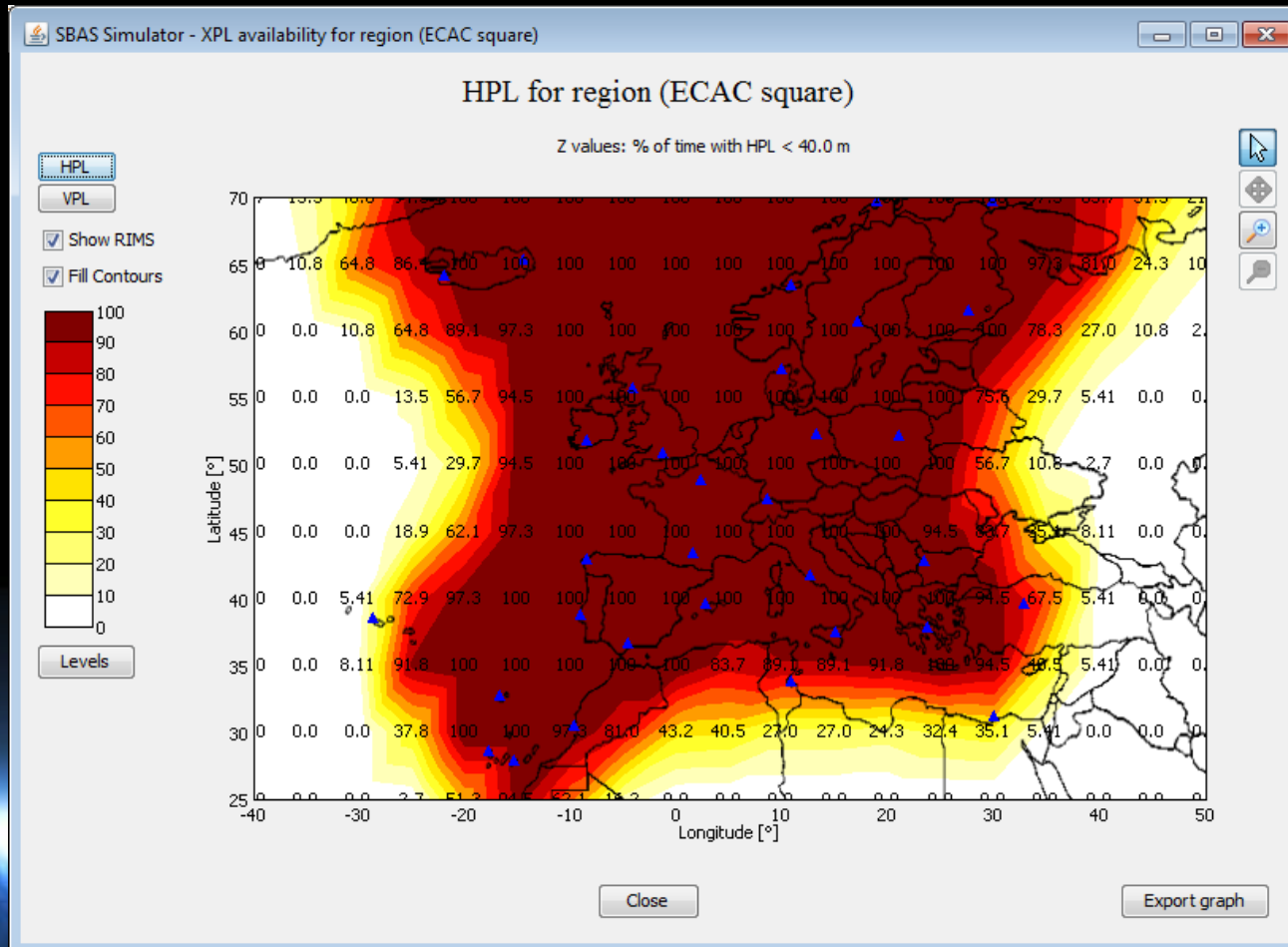
- Simulator of EGNOS and other SBAS systems
- Configurable constellations
- Configurable ground segment – RIMS stations
- Configurable macro-models of error sources – ionosphere, UDRE, FLT algorithm, ...
- Results presented as plots (CSV also available)
- 3D model of Earth and satellites

EGNOS / SBAS Simulator

- Java applet tool available for free on web:
<http://www.iguassu.cz/sbas-sim/>
- Popular with ESA, Airbus Space & Defence ...

➔ upgrade in progress under new ESA contract

EGNOS / SBAS Simulator



SBAS Teacher

- Tool for visualize the content of EGNOS messages
- Messages are decoded from the hexadecimal format (EMS)
- User can visually alter the content of the message and convert it back to the original format
- Tool is [available for free](http://www.egnos-pro.esa.int/sbasteacher/index.html) at
www.egnos-pro.esa.int/sbasteacher/index.html

SBAS Teacher

Message Type 25 - Long term satellite error corrections

Preamble: 53 9A C6

MT: CRC:

Velocity Code: 0 1

satellite	PRN mask	IODE	δx (ECEF)	δy (ECEF)	δz (ECEF)	δa_{f0}
	23	66	0.375 m	2.750 m	-5.500 m	9.313e-10 s
	4	6	0.000 m	0.375 m		

Velocity Code: 0 1

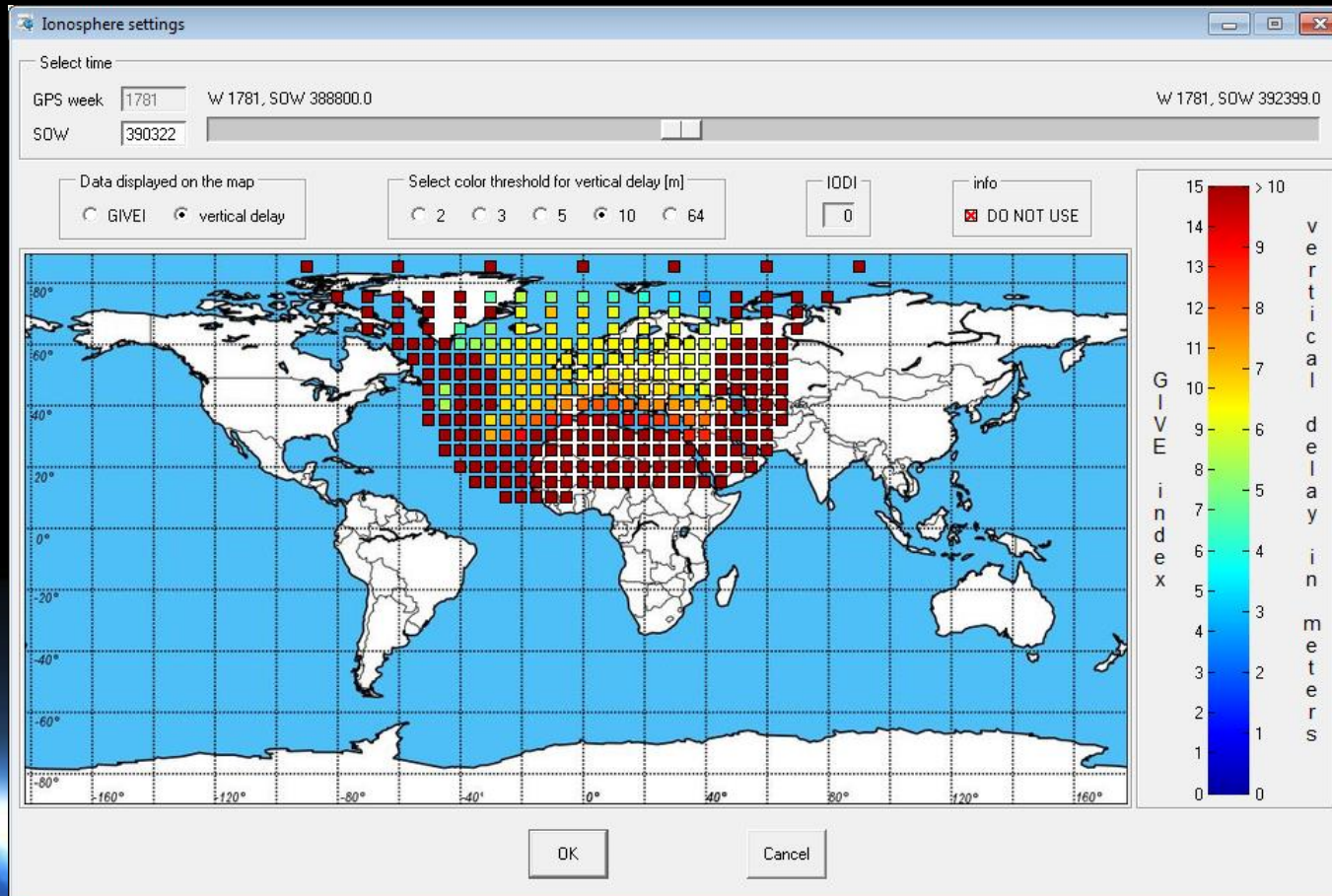
satellite	PRN mask	IODE	δx (ECEF)	δy (ECEF)	δz (ECEF)	δa_{f0}
	10	37	1.000 m	-5.375 m	2.750 m	4.191e-9 s

IODP: 0 1 2 3

SBAS Mentor

- Evolution of EGNOS Teacher
- Works with sequence of EGNOS messages
- User can visually modify all parameters decoded in the sequence
- The tool generates a new sequence of EGNOS messages reflecting changes made by user
- The tool **is available for free** at
www.egnos-pro.esa.int/sbasmentor/index.html

SBAS Mentor



Current development for ESA

- SBAS Simulator – new generation
- Upgrade of the Real-time SBAS performance monitoring system and qualification to DO – in cooperation with Thales Alenia Space -



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Clients and partners



一緒に頑張りましょう！



We can, for instance

- Jointly adapt the existing ISS
 - performance monitoring/measuring tools
 - free educational toolsfor Japanese conditions, needs and script
- Combine our respective experience in QZSS and EGNOS to develop new truly international multi-constellation GNSS software

一緒に頑張りましょう！



Where can we jointly look for opportunities?

- EU/GSA Horizon 2020
- Collaborative projects between ESA and JAXA
- Other international, national or bilateral (once the Czech Japan space cooperation agreement is signed) projects

ごせいちょう
ありがとうございます

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