

# Update on ESA GNSS Education Activities

(WG-C Session, 4 Dec 2017)

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European Space Agency

*12<sup>th</sup> Meeting of the International Committee on Global  
Navigation Satellite Systems, Kyoto, Japan, Dec 2017*

# ESA Activities in support to GNSS Education

- **ESA GNSS Cubsats with universities**
- **ESA GNSS Education Books, GNSS processing SW and Education SW tools**
- **ESA/ JRC International GNSS Summer School**
- **ESA NAVIPEDIA**
- **Bi-annual ESA International Colloquium on Scientific and Fundamental aspects of GNSS/Galileo**



**Scientific and Fundamental Aspects of GNSS / Galileo**  
6th International Colloquium

**COMPASS**

**GPS**

**EGNO**

**WAAS**

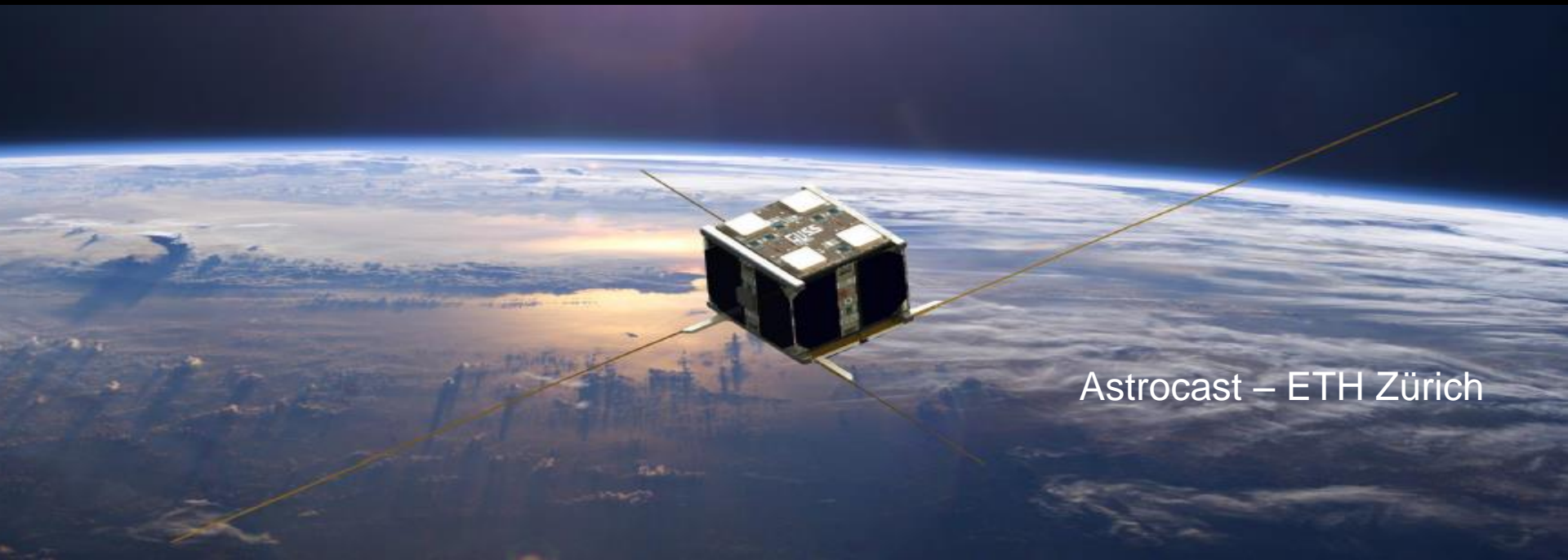
**MSAS**

**QZSS**

**GNSS DATA PROCESSING**  
Volume 1: Fundamentals and Algorithms

**ESA/JRC International Summerschool on GNSS 2017**  
04 - 15 September 2017  
Longyearbyen, Svalbard - Spitsbergen, Norway

# Supporting GNSS Scientific Cubesats with Universities



Astrocast – ETH Zürich

# ESA/JRC International GNSS Summer School



in cooperation with



INSTITUTE OF  
SPACE TECHNOLOGY & SPACE APPLICATIONS



## ESA/JRC International Summerschool on GNSS 2017

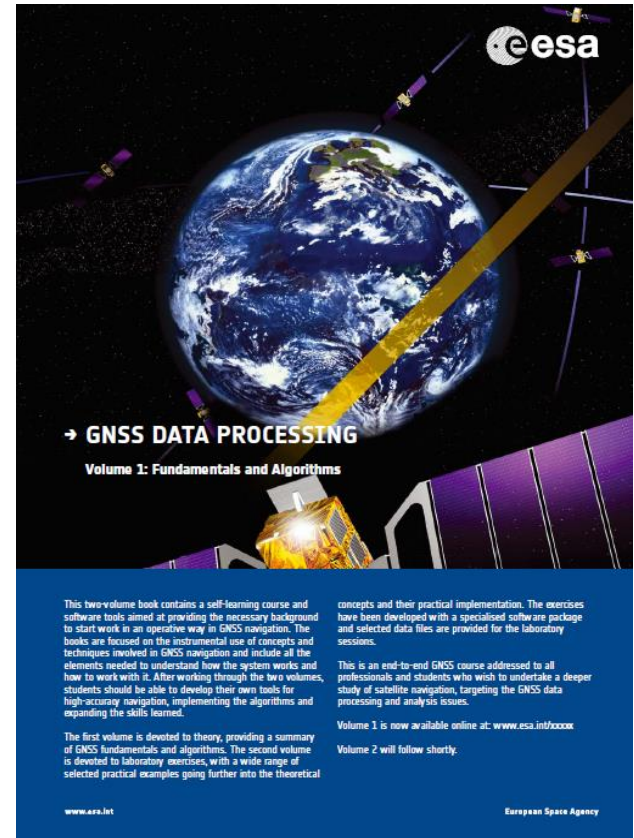
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# Producing GNSS Education Books / Tools

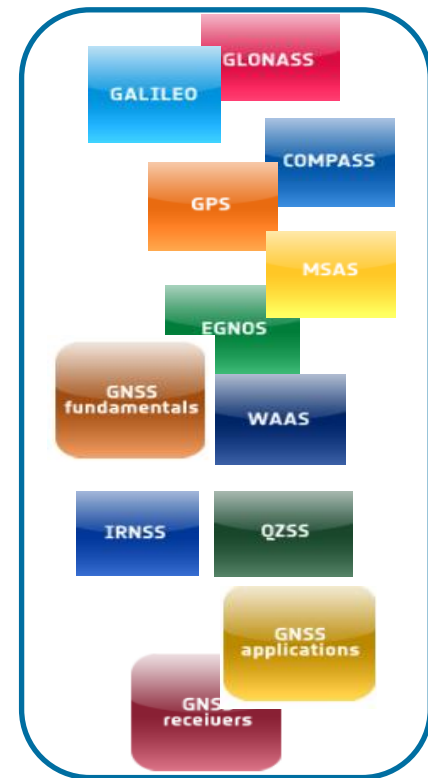
- Access on line to the **ESA ESA GNSS Data Processing Book** - TM-23: this two-volume book contains a self-learning course and software tools aimed at providing the necessary background to start work in an operative way in GNSS navigation.
- **GLAB tool** which performs precise modeling of GNSS observables (pseudorange and carrier phase)
- **Several SBAS dedicated education tools**
  - SBAS Simulator
  - SBAS teacher SBAS mentor
  - SiSnetLab
  - EGNOS toolkit





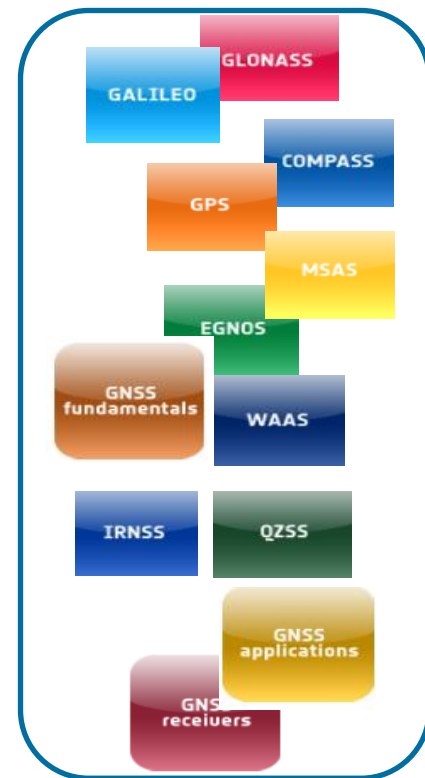
# NAVIPEDIA: Status

- NAVIPEDIA is today extensively used by universities and Galileo application developers.
- NAVIPEDIA is also used as reference as part of the European Satellite Navigation Conference (ESNC) for the GNSS application developers
- An APP version of NAVIPEDIA (for both Android and iOS operational systems) is currently under final conclusion.
- By October 2016, about 1.5 million visits received on NAVIPEDIA website so far ([www.navipedia.org](http://www.navipedia.org))
- Most visited articles are on GNSS fundamentals and GNSS applications.



# NAVIPEDIA and ICG

- NAVIPEDIA have been offered to the ICG as a solid and global reference in GNSS education. Can be of great interest for new emerging countries in the field of GNSS.
- It may be of interest to get support from the ICG participant GNSS worldwide providers to Review and complement of the current information of NAVIPEDIA towards making NAVIPEDIA an excellent reference ICG educational tool.



International Committee on  
Global Navigation Satellite Systems



# International Colloquium Scientific and Fundamental Aspects of the Galileo Programme



2007, 1<sup>st</sup> Colloquium, Toulouse, **France**

2009, 2<sup>nd</sup> Colloquium, Padua, **Italy**

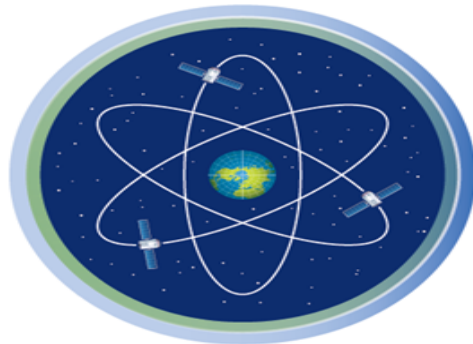
2011, 3<sup>rd</sup> Colloquium, Copenhagen, **Denmark**

2013, 4<sup>th</sup> Colloquium, Prague, **Czech Republic**

2015, 5<sup>th</sup> Colloquium, Braunschweig, **Germany**

2017, 6<sup>th</sup> Colloquium, Valencia, **Spain**





# Scientific and Fundamental Aspects of GNSS / Galileo

## 6<sup>th</sup> International Colloquium

**25-27 October 2017 – Valencia, Spain**









## Scientific and Fundamental Aspects of GNSS / Galileo

### 6th International Colloquium

25 - 27 October 2017, Valencia

|  |  |  |  |
|--|--|--|--|
| <p>Organised by:</p>    | <p>Gold Sponsors:</p>   | <p>Silver Sponsor:</p>   | <p>Institutional Sponsors:</p>   |
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# 6<sup>th</sup> International Colloquium on Scientific and Fundamental aspects of GNSS/Galileo



- The **6<sup>th</sup> International Colloquium on Scientific and Fundamental aspects of GNSS/Galileo** was held from 25-27<sup>th</sup> October, at UPV University, Valencia (Spain) with over 170 participants and covering all major GNSS Scientific domains. This Colloquium has become **a major reference conference on GNSS Science worldwide**.
- **Use of Galileo for science is increasing** recognizing the Galileo System unique features/differentiators (AltBOC signals, access to Metadata, PHMs, LRR, etc)
- **Multiple scientific result were presented covering all major GNSS Science fields** (e.g. incl. a major scientific breakthrough on computation of General relativity gravitational frequency shift with eccentric Galileo satellites)
- Several **new technologies and new platforms were** proposed to increase scientific scope and make science more accessible, such as, use of Software Receivers, Internet-of-Things devices, cubesats, UAVs, HAPS, ...
- New **ideas on new ways of using GNSS for science** were also identified (in the fields of EO with Reflectometry and in situ; fundamental physics; space navigation; Earth & space weather; astronomy; etc).
- Several **concrete proposals were also made on potential instruments that could be considered for future Galileo satellites**, with benefits for both Galileo and the scientific community (e.g. accelerometer, gyroscopes, magnetometers, VLBI transmitter, two-way time transfer, plasma instruments, active Laser Retro-Reflectors, ...)



***Thank you for your attention !***

