

# *Europe's Premier Professional GNSS Receiver Manufacturer*



**MundoGEO#Connect LatinAmerica 2013**  
**| June 18 to 20 | São Paulo (SP) Brazil**

*ir. Peter A. GROGNARD*  
*Founder & CEO, Septentrio*



# Septentrio Company Introduction

- Europe's leading manufacturer of professional OEM receivers
- Privately-held company with headquarters in the heart of Europe, and offices in Los Angeles and Beijing.
- Recognized Pioneer & World Leader for Galileo Receiver R&D



## MISSION

**Design, develop & commercialize  
High-end OEM satellite navigation products  
Based on the Company's proprietary satellite  
navigation technology**

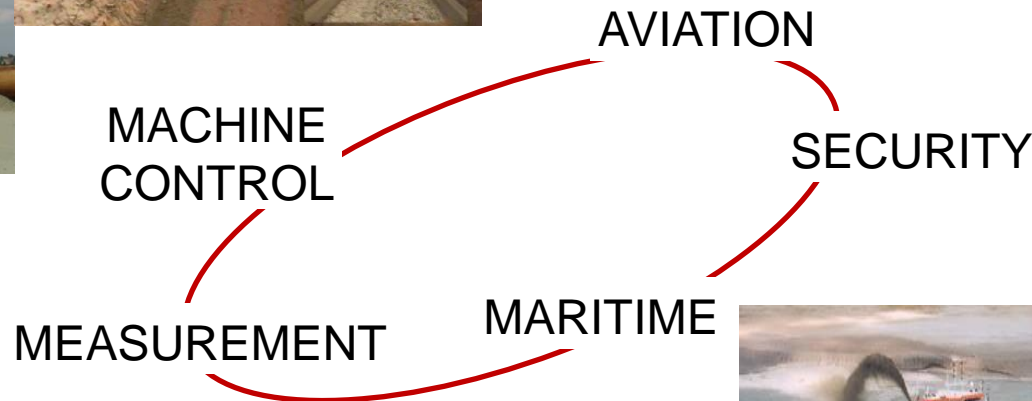
# Septentrio Group – Global Presence

- Septentrio NV
  - Belgian Company based in Leuven (near Brussels)
- Septentrio Inc
  - California Corporation
  - Majority-Owned by Septentrio nv
- Altus Inc
  - California Corporation
  - Manufacturer of Survey Equipment
  - Majority-Owned by Septentrio Inc
- Office in Beijing, China
- Worldwide dealership





# GNSS receivers and applications : high-precision and high-integrity applications



# Product Lines - Overview

## ■ AsteRx

Compact low power high-update rate rover receivers

- AsteRx-m : Ultra low power GPS/GLO RTK receiver
- AsteRx2eL : RTK/PPP receiver
- AsteRxi : GNSS/INS integrated solutions
- AsteRx2eH: Dual Antenna receiver for heading applications

## ■ PolaRx

High-quality multi-constellation reference station/scientific

## ■ AiRx

FAA certifiable receiver for avionics

## ■ PPSDK

Development kit for integration of positioning/ navigation algorithms and post-processing

# The AsteRx family

**AsteRxi**  
GPS/GLO  
L1/L2  
GNSS/INS



**AsteRx-m**  
GPS/GLO  
L1/L2  
RTK  
@ 0.5 W



**AsteRx2e**  
GPS/GLO  
L1/L2 RTK



**AsteRx2eL**  
GPS/GLO  
L1/L2/L-band  
RTK/TerraStar



**AsteRx3**  
GPS/GLO/GAL  
L1/L2/L5/E5  
RTK



**AsteRx2eH**  
GPS/GLO  
L1/L2  
Dual-antenna  
RTK+heading



# The PolaRx family

## PolaRx4

272 Channels  
GPS/GLO/GAL/COMP  
L1/L2/L5/E5  
Webserver  
Rinex Logging  
FTP Push...



## PolaRx4 TR

272 channels  
GPS/GLO/GAL/COMP  
L1/L2/L5/E5  
Webserver  
Rinex Logging  
FTP Push...

*Precise timing applications*



## PolaRxS

136 channels  
GPS/GLO/GAL/COMP  
L1/L2/L5/E5  
Ultra low noise OCXO  
100 Hz measurements  
*Ionospheric monitoring*



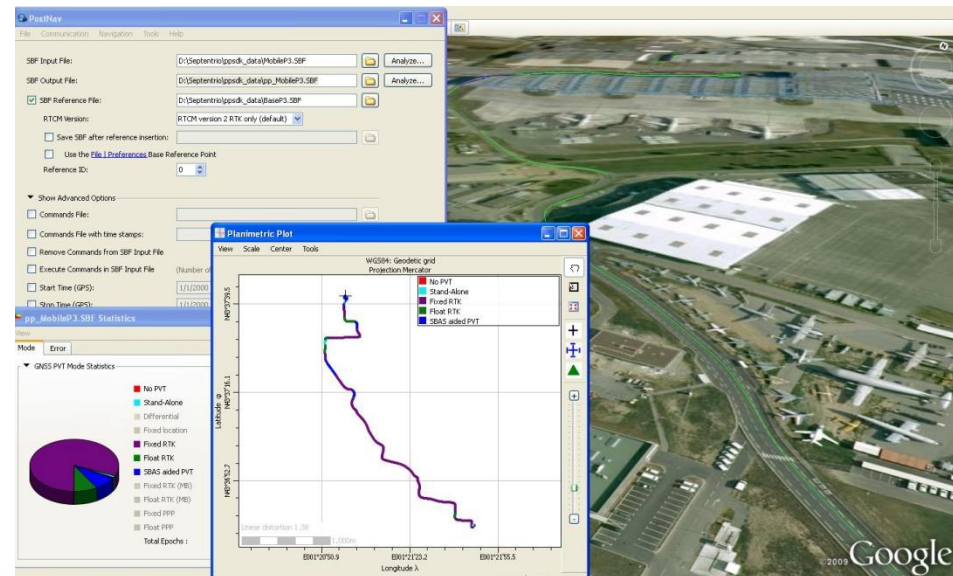
# AiRx2 : upgradable dual-frequency BETA-3 receiver

- 16 channels GPS L1 C/A code/carrier
- 4 channels L1 SBAS
- In-the-field upgrade paths for GPS L5 and Galileo
- DO229 / DO-160 /DO178 level B
- Compact and low power
  - 60 x 100 mm ~ 4W
- Embedded independent health processor
- Maintenance port for in-the-field maintenance
- Raw data output
- RAIM and pRAIM
- Fault Detection/Exclusion
- Continuous and initiated BIT
- Multiple data and signalling outputs
  - RS233/422, but also upgrade paths for ARINC 429 and AFDX
  - Incl. health bit, DO-229 bit, reset pin, maintenance pin





- Recalculate position solutions offline with different assumptions
- Based on receiver positioning algorithms
- Post-processing : Measure without base station, then calculate offline
- SDK for integration in 3rd party applications



# Major Trends – *Mega Tendências*

- #1 - Low-power high-precision RTK
- #2 – PPP - Decimeter-precision worldwide
- #3 - Deployment of new GNSS systems/satellites
  - Galileo and Beidou
  - More interference – need for interference mitigation
- #4 - Ionosphpherical effects – Septentrio solutions
- #5 – Septentrio and UAVs

# #1 Low-Power High-Precision RTK

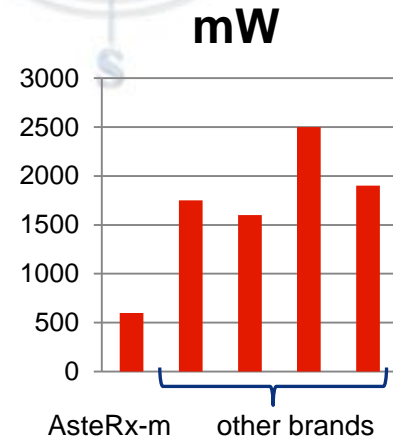
## AsteRx-m Compact Low Power High Precision GPS receiver module

- (R)evolution :

GPS Rx + data collector



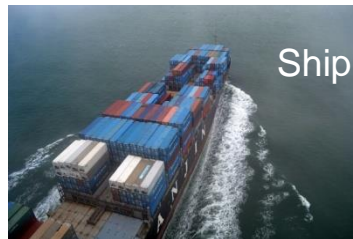
precision GPS integrated in PDA



- AsteRx-m : world-leading high-precision GPS/GLO RTK receiver with lowest power consumption
- Integration in industrial tablet and other low-power platforms for multitude of applications :



All-in-one Agriculture screen

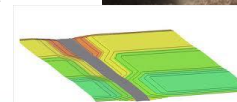


Ship piloting



GIS/Survey tablet

Construction work management



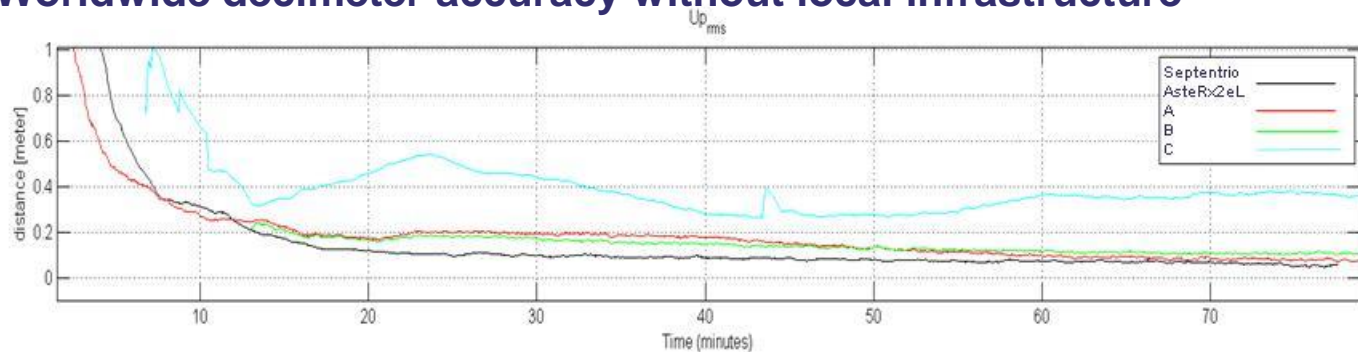


# #2 – Decimeter-precision worldwide AsteRx2eL for PPP Worldwide



- General purpose dual frequency GPS/GLONASS receiver
- Common interface with AsteRx2e and AsteRx3 family
  - RTK incl. RTK moving base
  - L-band receiver on-board for Terrastar-D
    - **Worldwide decimeter accuracy without local infrastructure**

TERRASTAR



- Seeding of Terrastar-D for instantaneous convergence
  - Extremely reliable network for correction generation and distribution (common with offshore operations)
  - Over-the-air service commissioning
- 
- Ethernet interface, WebGUI
  - OEM or hardplastic housing

# #3 - Deployment of new GNSS systems/satellites

## PolaRx4 Multi-GNSS reference station

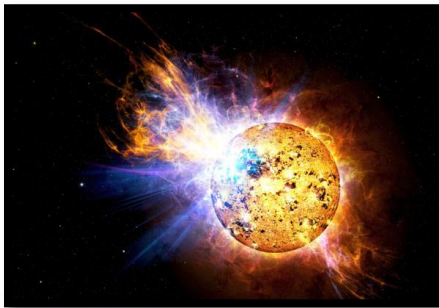
- Signals support
  - GPS L1, L2, L5
  - GLO L1, L2, L3 RF ready
  - GAL E1/E5a/E5b/E5ab (inc AltBOC)
  - COMPASS Ready – Beidou build available
  - Real all in view (4 constellations x 12 sats, all signal)
- Advanced Interference Mitigation (digital, in-band)
- 100Hz Measurement output
- Integrated webserver/ftp
- Clock Steering + Disciplined Ref out (VCTCXO)
- Compatible with Geo++ GNSmart
- Special time transfer variant PolaRx4TR



# #4 - Ionosphpherical effects – Septentrio solutions

## PolaRxS Scintillation monitor

- Multi-frequency, multi-constellation receiver dedicated to ionospheric monitoring and space weather applications
- Successfully developed in cooperation with UNESP – Prof Galera
- Key features :
  - Triple frequency GPS, GLO, GAL
  - Up to 100Hz MEAS output (signal phase + intensity)
  - Lock+ for tracking high dynamics
  - Ultra-low phase noise oscillator (OCXO) – lowest noise observations on the market
  - Modern connectivity (Ethernet, WebGUI, ftp)







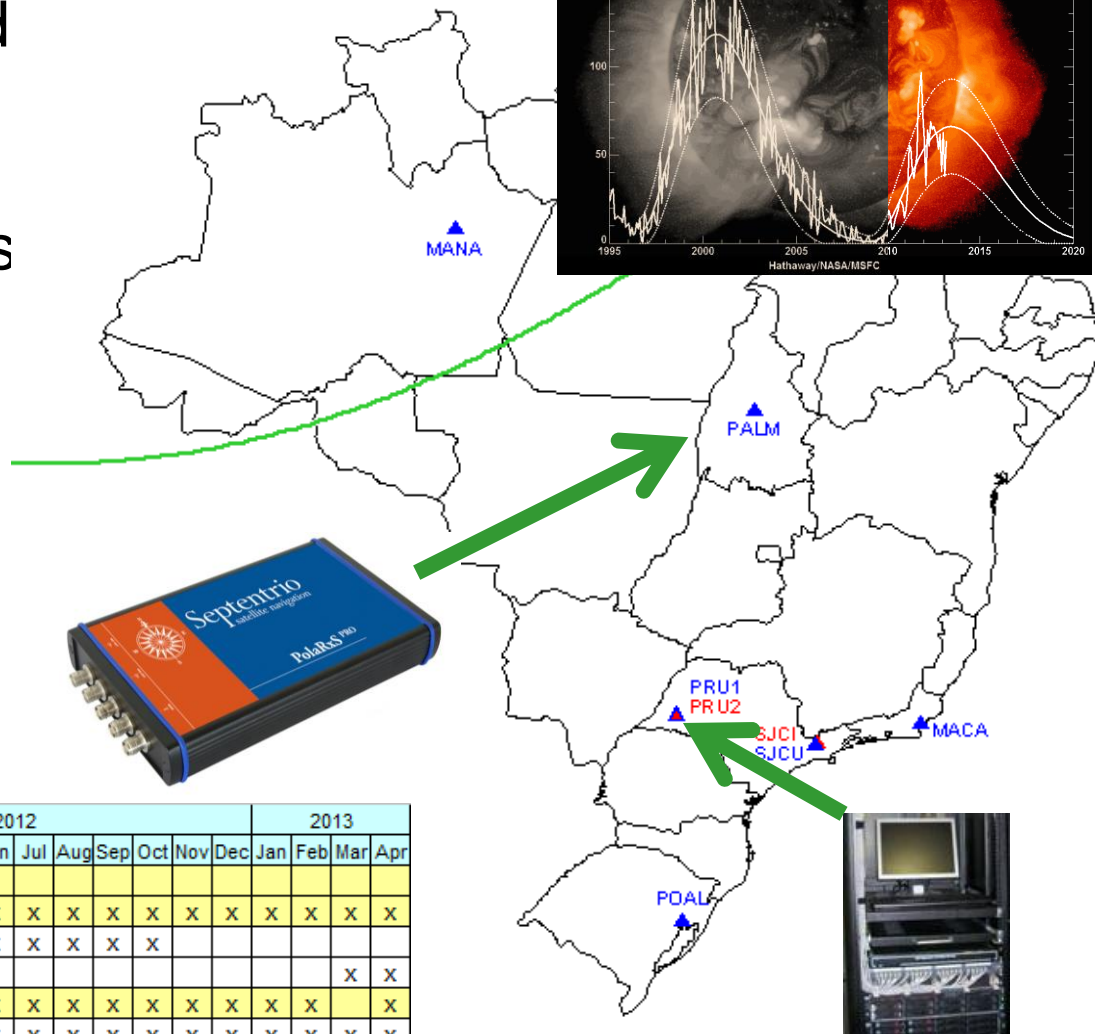
Maintaining reliable tracking  
during strong scintillations



Mitigating the impact of the  
degraded measurement on  
high precision positioning  
(RTK, PPP)

# CIGALA/CALIBRA Network

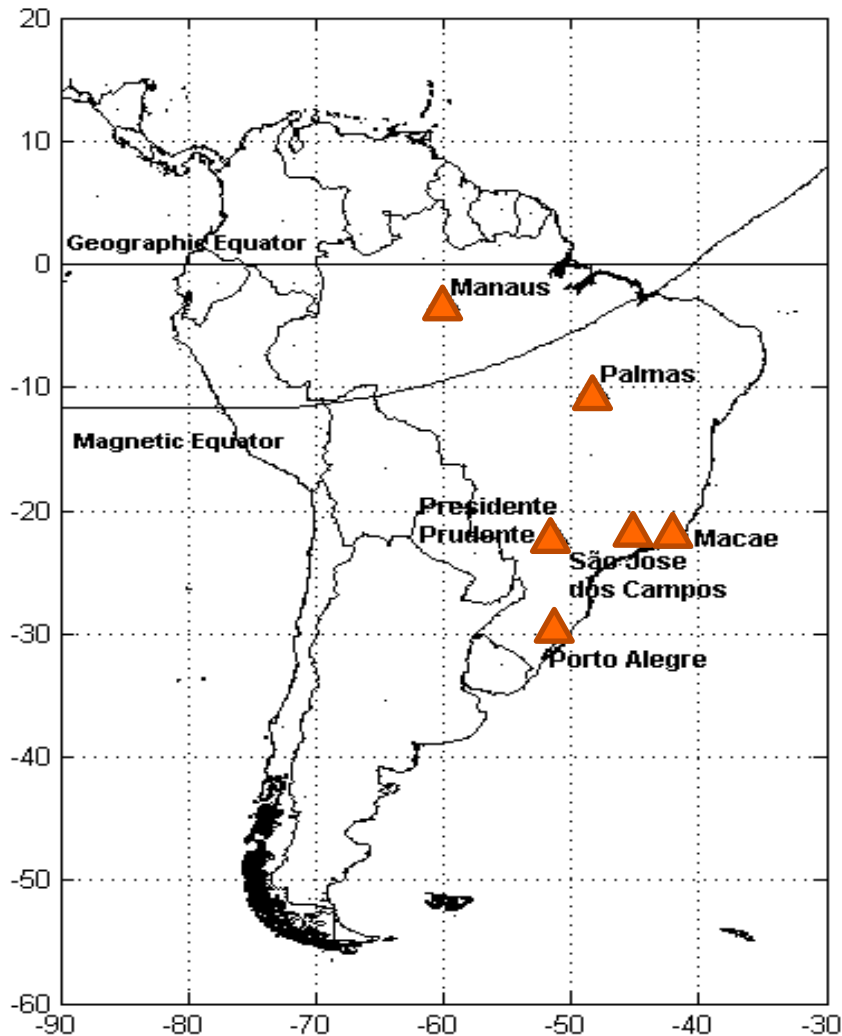
- 8 ISMR Stations spread across whole Brazil
- Full operational since more than 2 years
- 3 new stations to be deployed
- Powered by PolaRxS



	2011												2012												2013			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
MACA					X	X	X	X	X	X	X	X	X											X	X	X	X	X
MAC2															X	X	X	X	X	X	X	X	X	X	X	X	X	X
MANA						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
MAN2																										X	X	
PALM				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POAL							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PRU1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PRU2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SJCI				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
SJCE																								X	X	X	X	X

gege@fct.unesp.br

# CIGALA continuous monitoring network in Brazil

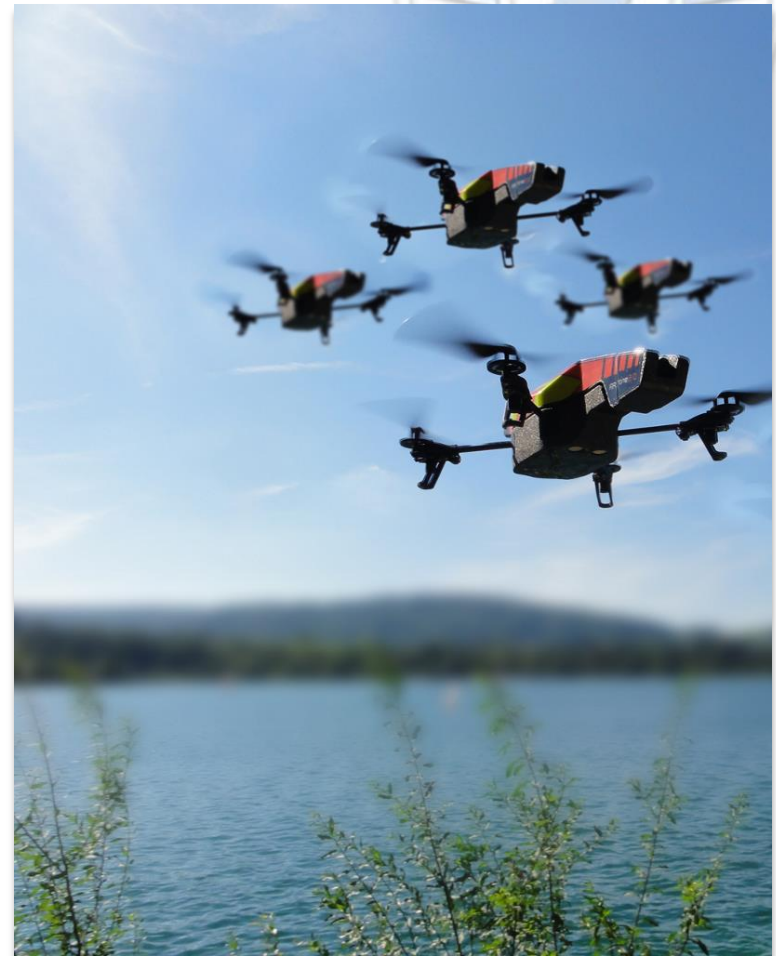


- 8 stations in Brazil
- Two stations at São José dos Campos and Pres. Prudente
- Data stored locally and sent to repository at UNESP, Pres. Prudente
- Data mirrored at INGV, Rome
- <http://cigala.galileoic.org/>



## #5 – Septentrio and UAVs

- High-precision GNSS receivers for demanding UAV navigation
  - Stabilizing cameras
  - No-drift hovering
  - Hi-precision landing
  - 10cm everywhere
  - Relative navigation
  - Bad visibility Nav.



# Flying in Civil Airspace

- FAA M&R Act. 2012
  - Fully integrate UAVs into national airspace by September 2015
  - FAA-certifiable GNSS OEM receivers is an answer to facilitate



**AiRx2** with Advanced Interference Mitigation & safety processor meets relevant safety criteria.

# UAV / UAS Septentrio's Solution

Your Navigation Situations	Our Solution
Payload Georeferencing – Compact, Low Power – Relative Navigation	<b>AsteRx-m</b>
VTOL Hovering, Heading and Attitude	<b>AsteRx2eH</b>
Accurate Positioning Everywhere without a Base Station	<b>AsteRx2eL</b> <small>TERRASTAR<sup>®</sup> READY</small>
Navigation in Bad Visibility with Inertials	<b>AsteRxi</b>
Flying in Civil Airspace, Certified	<b>AiRx2</b>

## Ask About Our Navigation Whitepapers

GNSS Interferences

<http://bit.ly/RwbCtq>

Why it may be time to consider  
Certified Avionics for UAS

<http://bit.ly/TxvVm4>



# Muito Obrigado!

Check out our products at

<http://www.septentrio.com/products>

