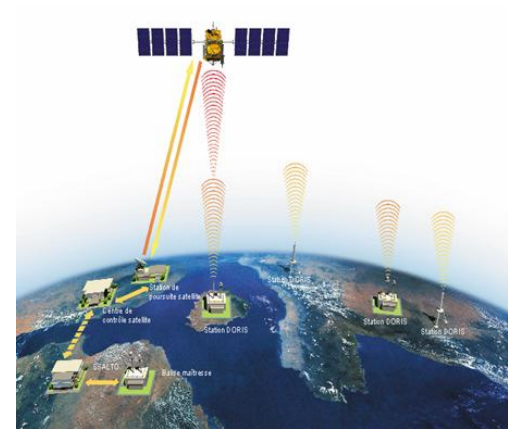# DORIS : a few new system features in 2015

Cécile Manfredi
Jean-Pierre Chauveau
Christian Jayles
Jean-François Dutrey
Albert Auriol

IDS AWG, May 28th, 2015

SCOPE

- – Fourth Generation Beacon (« B4G ») :

  status
- – Near-Real-Time Pole coordinates
- – Near-Real-Time Receiver Frequency Bias
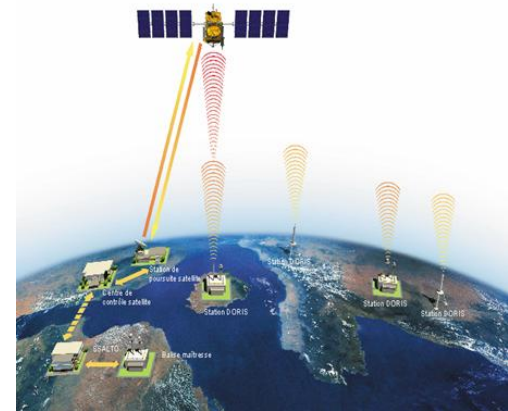- – Near-Real-Time Beacon Frequency Bias

Fourth generation Beacon

– Electronic design with 2015 components

– RF wires longer (up to 50 m) allowing better masks clearances

– Already integrated in existing system

– Schedule :

- Tender on line (on May 13th)

- Final choice by the end of 2015

- Prototype and pre-production units by mid-2017

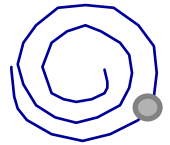- First production units by the end of 2017
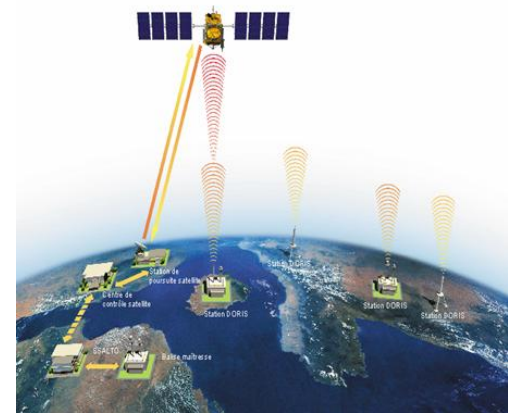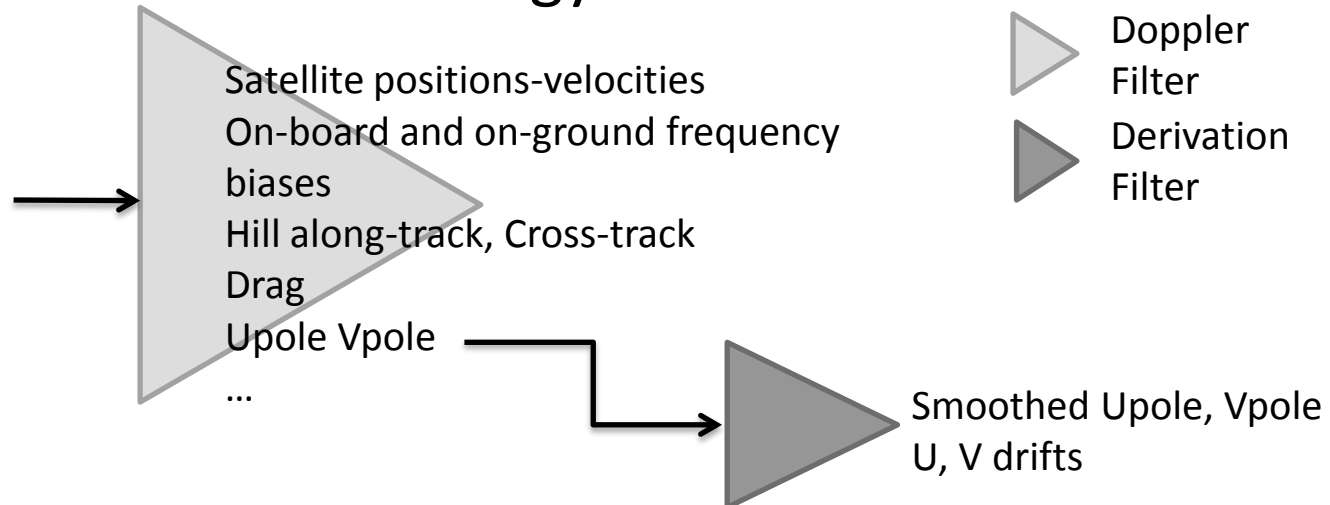
DORIS Auxiliary Data

- New TM format containing on board estimates
  - Pole coordinates and drifts
  - Beacons and satellites USO frequencies and drifts

- Will be available for Jason3 and Sentinel3
  - Available in Near-Real-Time (typically 3h)

- Goals
  - Deliver real-time pole estimates with a good accuracy
  - Deliver a real-time monitoring of the beacons network frequencies

- Ground activation for Cryosat2, HY2, Jason2, Saral

Pole coordinates and drifts

- DIODE estimation strategy

Satellite positions-velocities
On-board and on-ground frequency biases
Hill along-track, Cross-track
Drag
Upole Vpole
…

Doppler Filter

Derivation Filter

Smoothed Upole, Vpole
U, V drifts

- Variation model for period < 1 day
  - Described in IERS conventions

- Outputs
  - Smoothed mean pole coordinates
  - Mean pole drift

Pole: inter-satellite comparison

- In theory, same pole for all the satellites

- Ground activation with the last DIODE version
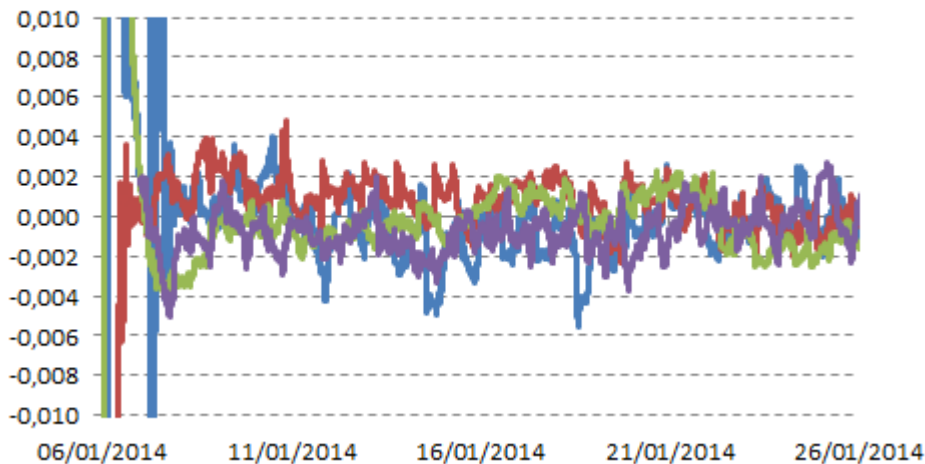 - On a calm period without maneuver or event
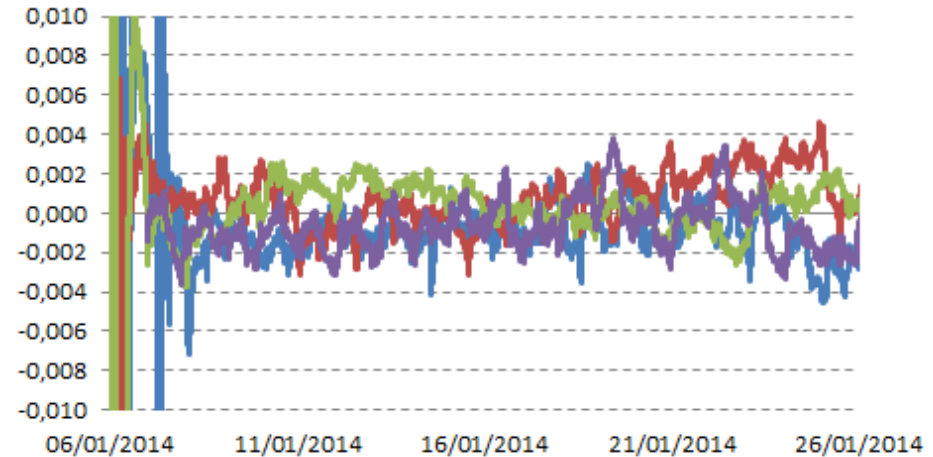

Cryosat2

HY2

Jason2

Saral

Pole: inter-satellite comparison

- Mean pole comparison: DIODE – IERS bulletin B

Mean pole (U) : DIODE - IERS (arcsec)

Mean pole (V) : DIODE - IERS (arcsec)

	Cryosat2	HY2	Jason2	Saral
POLE_U	1.499E-03	1.427E-03	1.223E-03	1.242E-03
POLE_V	1.597E-03	1.491E-03	1.099E-03	1.384E-03

RMS (arcsec) on the converged period

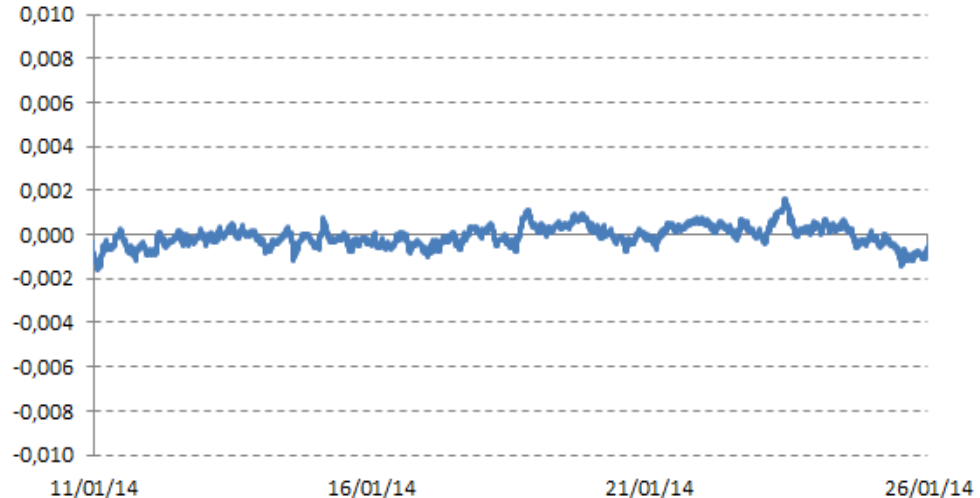**INTERNATIONAL DORIS SERVICE**

IDS

DORIS

Pole: multi-satellites melting

- The four poles estimates are mixed: composite value

DIODE mixed mean pole (U) - IERS (arcsec)

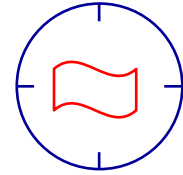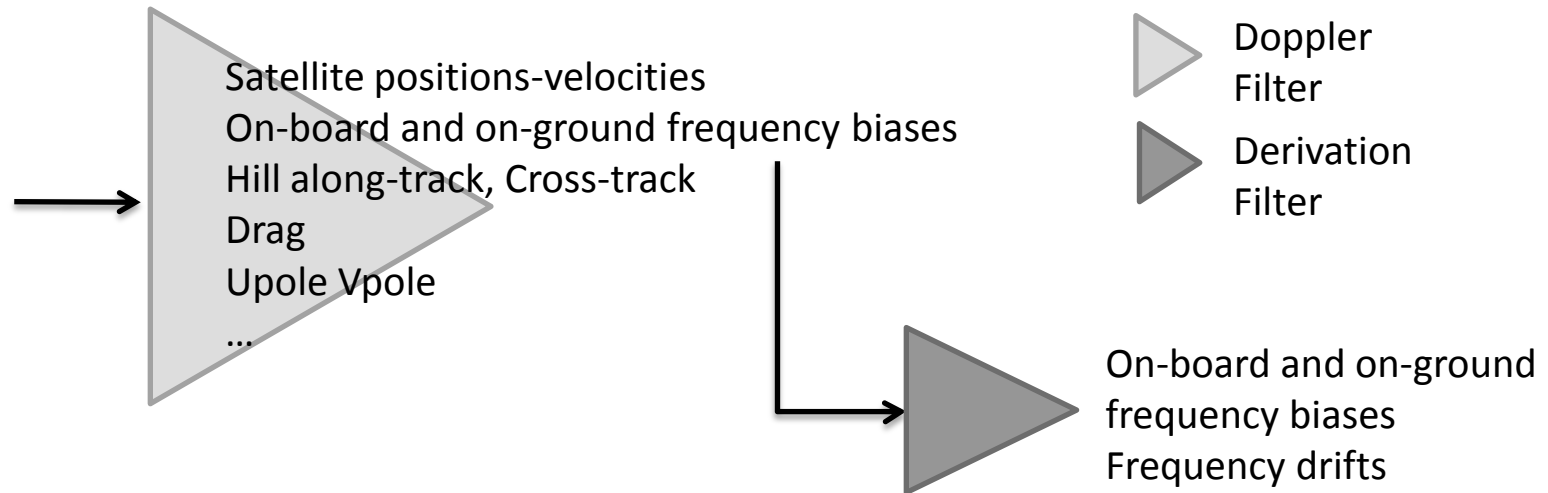**DIODE mixed mean pole (V) - IERS (arcsec)**

	MINIMUM	MAXIMUM	MEAN	ST DEV	RMS
	**********	*********	**********	*********	*********
POLE_U	-1.874E-03	1.472E-03	-0.151E-03	6.023E-04	0.621E-03
POLE_V	-1.635E-03	1.651E-03	-0.121E-03	4.621E-04	0.477E-03

Frequencies and drifts

- DIODE estimation strategy

Satellite positions-velocities
On-board and on-ground frequency biases
Hill along-track, Cross-track
Drag
Upole Vpole
…

Doppler
Filter

Derivation
Filter

On-board and on-ground
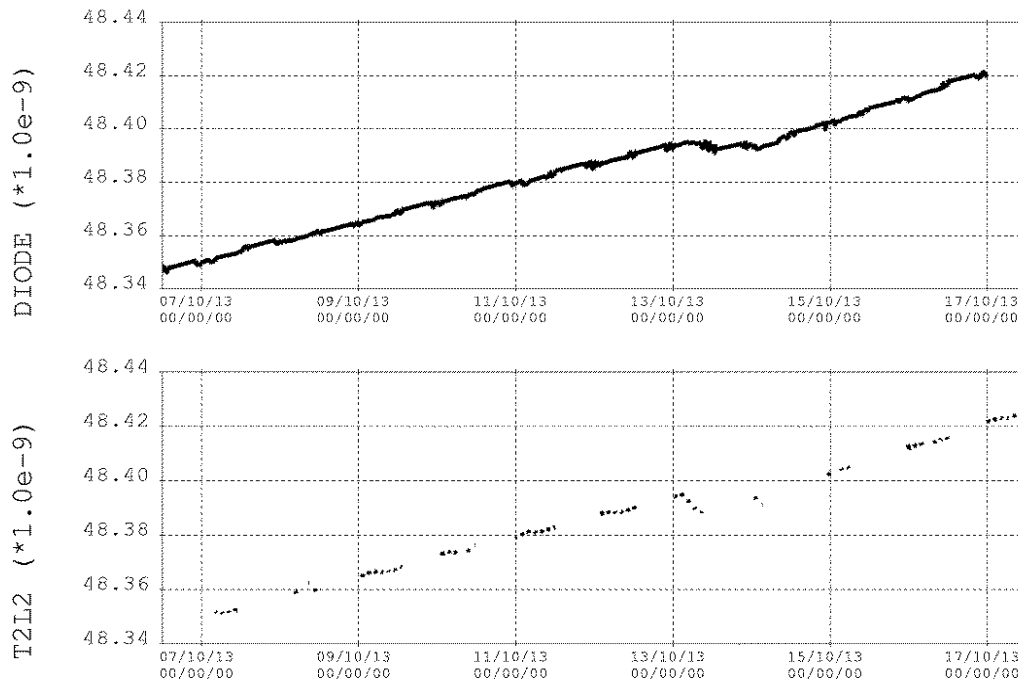frequency biases
Frequency drifts

- Outputs
  – Smoothed on-board and on-ground frequency estimations
  – On-board and on-ground frequency drifts

Smoothed on-board frequency

- Comparison to T2L2 on Jason2
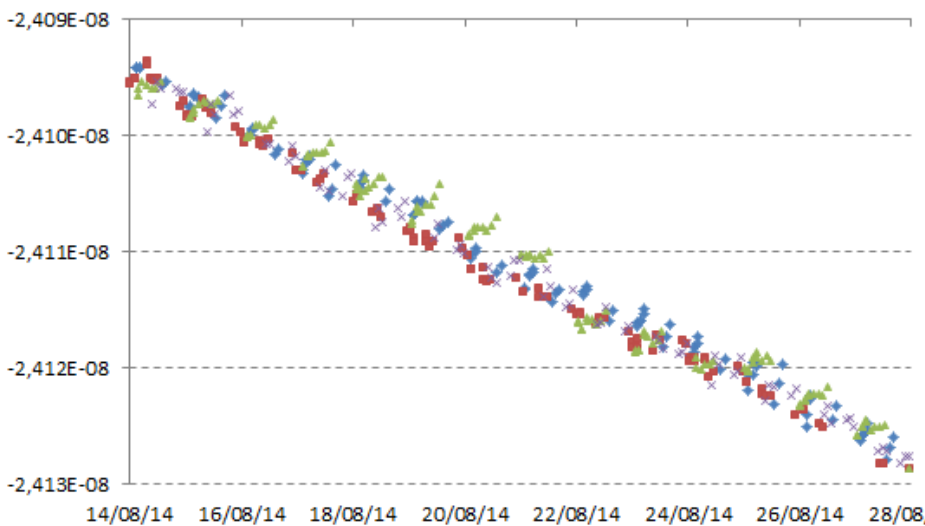

Compliance : $1.2 \times 10^{e-12}$

Results presented in next JASR issue

- On-board Sentinel 3: GNSS receiver for direct comparison
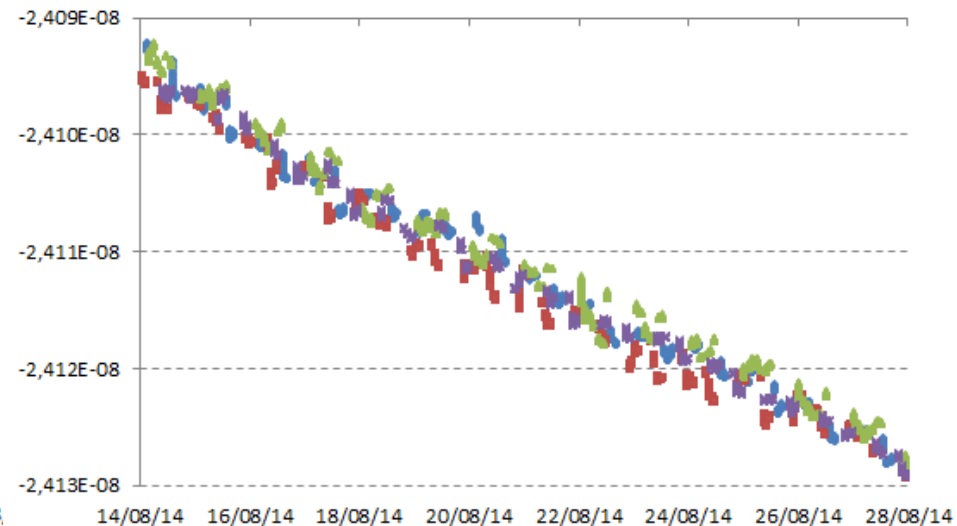
Frequencies: inter-satellite comparison

- On-board frequency depend on the satellite
- But same beacon frequencies for all satellites

RIO GRANDE: MOE frequency bias

(One estimate per pass)

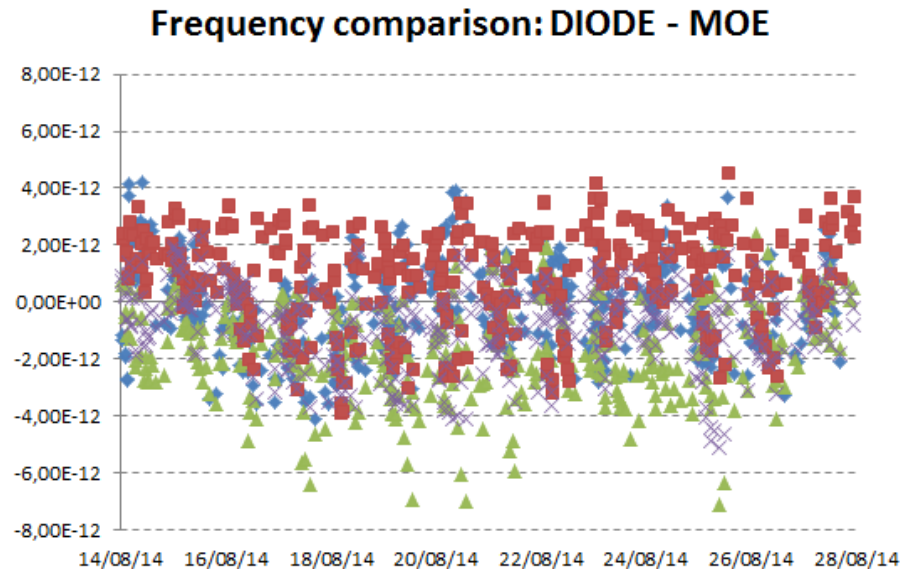**RIO GRANDE: DIODE frequency bias**

(One estimate per sequence)

- Good consistency at first sight

Frequencies: inter-satellite comparison

- DIODE frequency drift used for extrap. between two passes

Frequency comparison: DIODE - MOE

	◆ Cryosat2	▲ HY2	■ Jason2	✖ Saral
Mean	−0,149E−12	−1.477E−12	0.813E−12	−0.754E−12
RMS	1.635E−12	2.264E−12	1.898E−12	1.610E−12

Statistics ($\frac{\delta f}{f}$) on the converged period

- Future REGINA GNSS receivers for direct comparison

Conclusions, perspectives

- Poles coordinates : results are promising
  - RMS of mixed solution: ~0.5 mas
  - Need parameters optimization (kalman filtering)
  - Information can be reduced to one point every 2h
  - May be useful for IDS analysts ?

- Smoothed frequencies
  - RMS on-board as on-ground: < 2.0 10^{e-12}
  - Further investigation for short/mid-term frequency estimation
  - Useful for Integrity Survey
  - May be useful for IDS analysts ?

Thank you !

INTERNATIONAL DORIS SERVICE

IDS

DORIS