

# DORIS/RINEX data processing with GIPSY/OASIS II and GipsyX Preliminary results and plans

Pascal Willis (IGN/IPGP), Willy Bertiger (JPL),  
Kevin Miller (JPL)

# OUTLINE

- GipsyX developments at JPL
- Jason2/POD tests using GPS data:
  - GIPSY/OASIS II vs GipsyX
- Status of DORIS/RINEX data processing using GIPSY/OASIS II
- Status of DORIS/RINEX data processing using GipsyX
- Conclusions

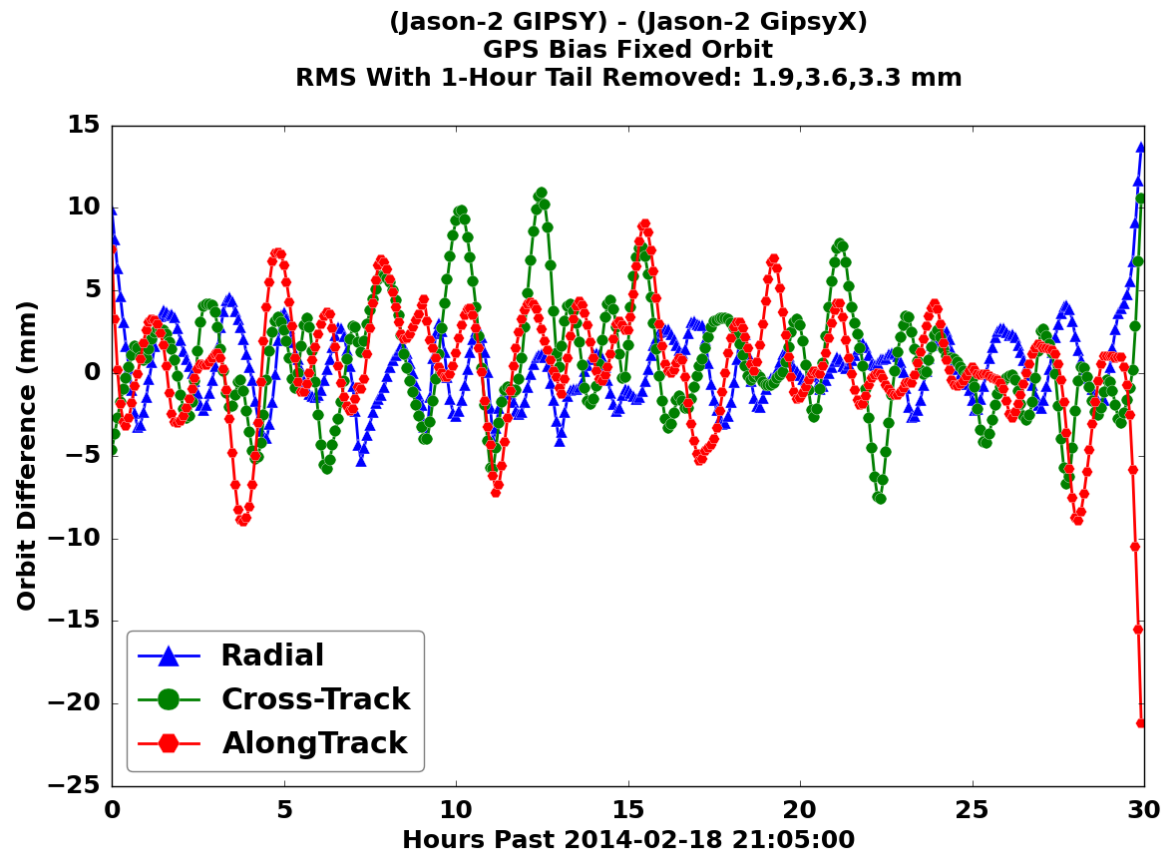
# GipsyX developments at JPL

- GipsyX is a complete rewrite of GIPSY/OASIS II
  - using C++ instead of Fortran
  - Using Python instead of perl, csh, bash,...
  - with a simplified user interface, multi-platforms
- Real-time support for
  - GPS operational ground segment
  - JPL Global Differential GNSS System (GDGPS)
- Multi-GNSS and multi-technique (SLR, DORIS, VLBI)

# Jason2/POD tests using GPS data: GIPSY/OASIS II vs GipsyX (1/2)

- Most force models have been implemented for LEOs from GIPSY/OASIS II
  - Updates required for Time Variable Gravity (TVG)
  - Dynamic panel orientations added but need to be tested for DORIS satellites (SPOTs, ...)
- End-to-end Jason2 POD tests were conducted using GPS data (aside for TVG)

# Jason2/POD tests using GPS data: GIPSY/OASIS II vs GipsyX (2/2)



NB: Physical models for Jason2/GPS data processing are the same, except for TVG

# DORIS/RINEX data processing

	GIPSY/OASIS II	GipsyX
Pseudo-range	Prefit	Postfit
Phase	Prefit	Prefit
Doppler	Postfit	Postfit

Prefit: comparison of observed – computed (no estimation)

Postif: full parameter estimations

Test done on Jason2/DORIS RINEX data because:

- precise external orbit is available from GPS
- DORIS/Doppler file is also available
- However, SAA effect on Jason2

Acknowledging help from  
Flavien Mercier, Christian Jayles,  
Nikita Zelensky, Frank Lemoine

# Status of DORIS/RINEX data processing using GIPSY/OASIS II (1/4)

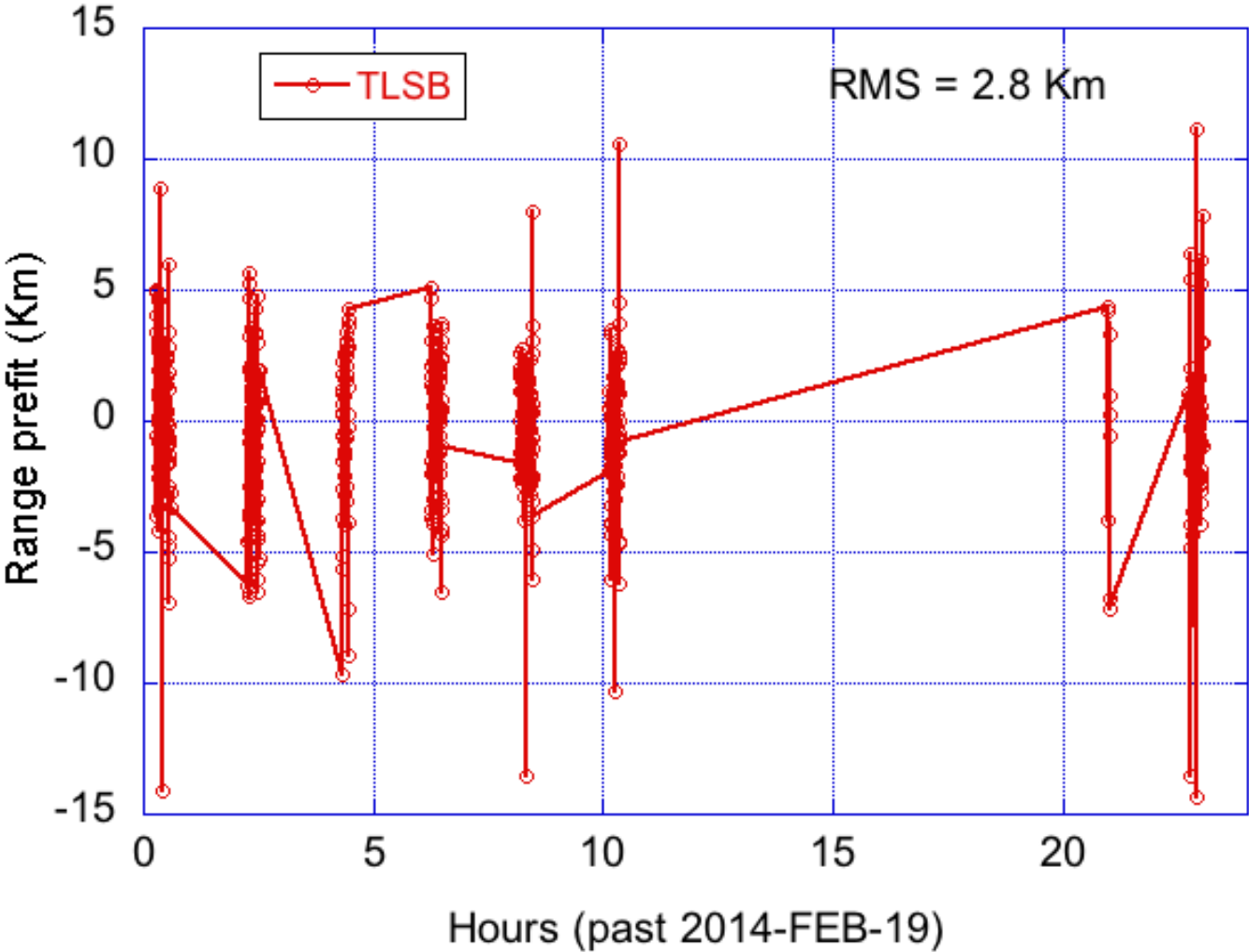
- Expressing time in TAI
  - Correcting satellite clock with linear model derived from time series date offset from RINEX data
  - Modify time tag and measurement
- Phase center correction (ground stations and satellite)
  - Using ionosphere free values ( $1.04 * D1 - 0.04 * D2$ )
- Relativity model for satellite clock
  - Periodic effect (may need to be revisited)

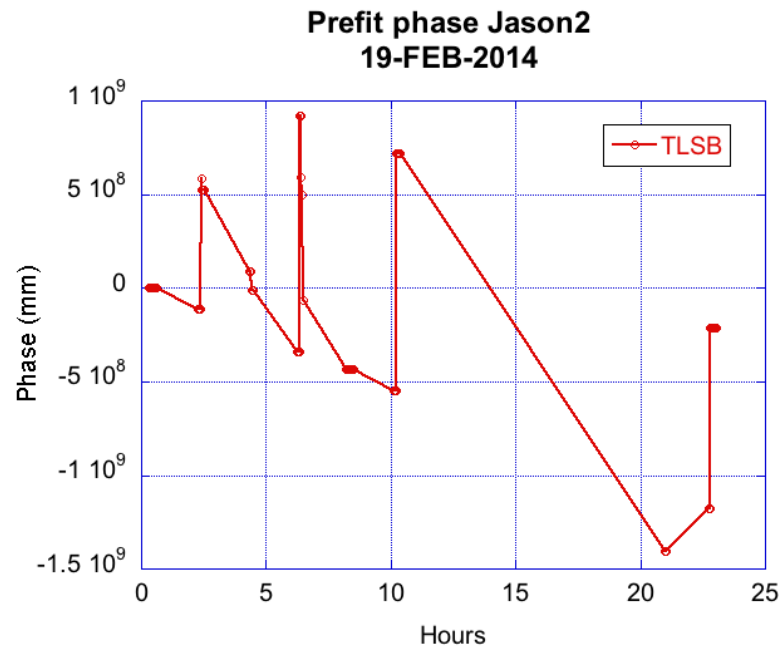
# Status of DORIS/RINEX data processing using GIPSY/OASIS II (2/4)

- Test day is 2014-FEB-19
- Station coordinates from internal IGN solution (position/velocity)
- Processing phase + pseudo-range (same run)
  - Prefit only
    - 2.8 Km for pseudo-range (TBC)
    - 57 cm for phase (TBC)



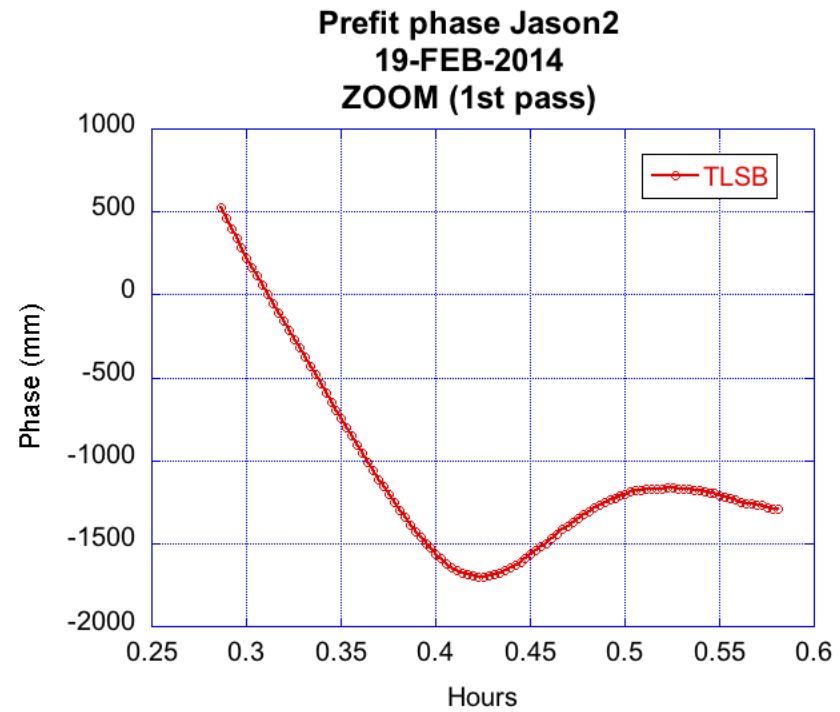
# DORIS range prefit 2014-FEB-19



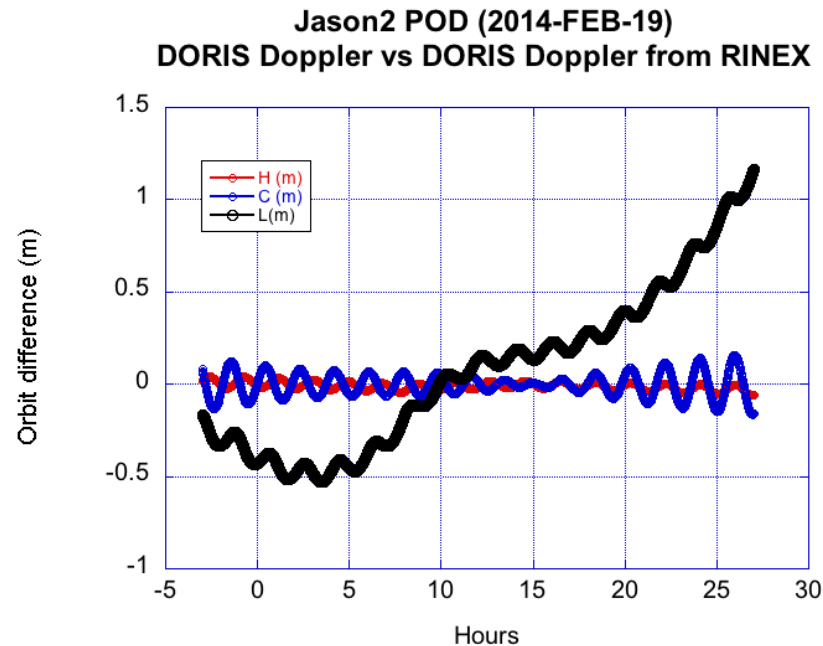


Phase prefit  
(before estimation)

RMS 57 cm (1st pass)



# Status of DORIS/RINEX data processing using GIPSY/OASIS II (4/4)



H = 2.3 cm

C = 6.4 cm

L = 44.7 cm

Time tagging problem

- Postfit : 0.6736 mm/s (vs 0.4290 mm/s)
- Rejection: 6.97% (vs 1.97%)

# Status of DORIS/RINEX data processing using GipsyX

- Test day is 2014-02-19
- Jason2/DORIS POD data processing
  - Station coordinates from latest DPOD2014 solution
- Processing 10s phase data but with phase break every 20s (Doppler)
- Combined processing of DORIS phase and pseudo-range
  - Phase residuals 4.4 mm, 3.9% Outliers
  - Range residuals 2.2 km, 9.6% Outliers
  - RMS orbit differences with GIPSY, Radial, Cross-Track, Along-Track : 3.3 cm, 5.4 cm, 9.5 cm

# CONCLUSIONS

- Major problems (time tagging error) solved for DORIS/RINEX data processing with both GIPSY/OASIS II and GipsyX
- Remaining problems still need to be investigated
  - residuals are still too high
  - Smaller time tagging problem is still present
- When done, full transition for DORIS from GIPSY/OASIS II to GipsyX needs to be organized