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

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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

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<th>GIPSY/OASIS II</th>
<th>GipsyX</th>
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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

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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)
Phase prefilt
(before estimation)

RMS 57 cm (1st pass)
Status of DORIS/RINEX data processing using GIPSY/OASIS II (4/4)

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

H = 2.3 cm
C = 6.4 cm
L = 44.7 cm

Time tagging problem
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