The international DORIS Service (IDS)  
Current Status and Perspectives

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OUTLINE

• DORIS system
  – Infrastructure (satellites and ground network)
  – Recent developments (DGXX receivers)

• International DORIS Service
  – Scientific goals (IAG, IERS, GGOS)
  – Current organization
  – Available scientific products
  – Preparation of ITRF2013
Historical considerations

- Developed by CNES (French Space Agency)
  - for T/P for Precise Orbit Determination (1992)
  - First demonstration with SPOT-2 (1990)
  - Uplink system
  - 2 GHz, 400 MHz

- Other applications:
  - Geodesy / Geophysics (station coordinates and velocities, Earth Orientation, Geocenter Motion)
  - Atmospheric Sciences (Zenith Total Delays)

See also Willis et al., Adv. Space Res., 2010
DORIS satellites

Future missions pending approval

Future missions, nominal life time

Current missions, agreed life time

Past missions

HY-2A (China)

Saral (India)
DORIS tracking network (2013)

NB: Also explore network through GoogleEarth:
http://ids-doris.org/network/googleearth.html
DORIS co-locations

DORIS stations co-located with other IERS techniques (VLBI, SLR or GNSS)

- GNSS (IGS)
- SLR
- VLBI
- No active co-location < 1 km
Exploring DORIS Network through GoogleEarth

Depending on the resolution of the image, we sometimes adjusted the position of the antenna of the station according to our knowledge of the site. Some positions could still be improved with your help. Comments, maps and pictures are welcome at any time to help us to improve the virtual tour and should be e-mailed to the Central Bureau.
Example of DORIS stations

Yarragadee (Australia)

Cibinong (Indonesia)

Jiufeng (China)

Betio (Kiribati)
Recent developments (DG-XX receivers)

• New Capabilities:
  – Digital receiver
  – Phase measurement (vs. Doppler)
  – 7 channel-receiver
  – RINEX type format

See Auriol and Tourain, Adv. Space Res., 2010
IDS Scientific Goals

• Provide scientific products derived from DORIS data
• IAG Service since 2003 (IAG Pilot Project created in 1999)
• Submit DORIS solutions to IERS (since 1994)
• Participate in GGOS

• Annual reports available upon request
  – Contact: ids.central.bureau@ids-doris.org
IDS Web site (http://ids-doris.org)
IDS organization
(similar to all IAG Services)

- Central Bureau at CNES+CLS+IGN (France)
- 2 data centers: CDDIS (USA) and IGN (France)
- 7 Analysis Centers: ESA (Germany), GFZ (Germany), GOP (Czech Rep.), IGN (France), INASAN (Russia), LCA (France), NASA (USA)
  - (using 5 different software packages)
- 1 Combination Center (CLS, France)
- Governing Board
IDS Products

• Station coordinates (weekly time series)
  – Precision better than 10 mm (@ 1 week)

• Station velocities
  – Precision better than 0.5 mm/yr (20 years)

• Earth Orientation Parameters (Polar Motion)
  – Precision better than 0.5 mm/yr

• Geocenter Motion
Per week comparison to ITRF2008

Legend:

- idswd01
- idswd02

Number of stations

Year

TX (mm)

Year

TY (mm)

Year

TZ (mm)

Year
Red = ids01

Black = ids02

Same data

New reprocessing
Plot Tools
(A new Web tool for scientific users)
http://ids-doris.org/plottool/stcd/stcdtool.php
Plot Tools
(ex: Yarragadee, North)

NB: improvement after 2002 is due to new satellites (ENVISAT, SPOT-5)
Preparation of ITRF2013 (1/2)

• Goal
  – Reprocess all available DORIS data (1993-2013)
  – Provide IERS with a time series of weekly SINEX files

• Schedule:
  – 4-5 April 2013 : AWG Meeting, Toulouse, France
  – July 2013 : start of reprocessing (7 individual solutions)
  – September 2013: Combine available DORIS solutions
  – October 15-16, 2013 : AWG meeting, Greenbelt, USA
  – January 2014 : Preliminary delivery to IERS
  – April 2014 : Final delivery to IERS
Preparation of ITRF2013 (2/2)

• Major improvements
  – (More data)
  – Improved Gravity Fields (EIGEN-6, GOC3)
    • Including drifts and seasonal corrections
  – South Atlantic Anomaly corrections for SPOT5 and Jason-1
  – Antenna elevation dependency (ANTEX-file)
  – Solar Radiation Pressure
  – Atmospheric Drag
CONCLUSIONS

• DORIS system working since 1990 (7 satellites)
• New satellites planned until 2020+
• Internal DORIS Service (IDS) since 2003
  – 7 Analysis Centers, 2 data centers
  – Current preparation of ITRF2013
• Products available at IDS Web site (http://ids-doris.org)
  – Coordinate time series (SINEX + plot tools)
  – Results are improved when more satellites are available (since 2002.5)
  – Station information (site logs, local ties,...)
  – Earth Orientation Parameters
  – Geocenter Time Series
  – Etc.

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BACK-UP SLIDES
Plot Tools
(ex: Yarragadee, North)

NB: improvement after 2002 is due to new satellites (ENVISAT, SPOT-5)
Data for ITRF2013

- Latest version of DORIS 1B files (redeliveries for ENV in 2012, JA2 and CS2 in 2011, SP4 1998 in 2010)
- No data of 1992; HY-2A not included
- Jason-1 (back-up chain) 2004/11 (end TOP) → 2008/07 (start JA2)