The international DORIS Service (IDS)  
Recent developments in preparation for ITRF2013

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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
DORIS satellites

<table>
<thead>
<tr>
<th>Year</th>
<th>Satellite</th>
<th>Mission Details</th>
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<tbody>
<tr>
<td>1990</td>
<td>SPOT2</td>
<td>D1G</td>
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<td>1995</td>
<td>Topex/Poseidon</td>
<td>D1G , SLR, GPS</td>
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<tr>
<td>1996</td>
<td>SPOT3</td>
<td>D1G</td>
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<tr>
<td>1997</td>
<td>Jason-1</td>
<td>DGM, SLR, GPS</td>
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<td>1998</td>
<td>Envisat</td>
<td>D2G, SLR</td>
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<td>1999</td>
<td>SPOT5</td>
<td>DGM</td>
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<tr>
<td>2000</td>
<td>Jason-2</td>
<td>DGXX, SLR, GPS</td>
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<td>2001</td>
<td>CryoSat-2</td>
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<td>2002</td>
<td>HY-2A</td>
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<td>2003</td>
<td>Saral</td>
<td>DGXX, SLR</td>
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<td>2004</td>
<td>Sentinel-3A</td>
<td>DGXX-S, SLR, GPS</td>
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<td>2005</td>
<td>Sentinel 3B...</td>
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<td>2006</td>
<td>Jason CS</td>
<td>DGXX-S, SLR, GPS</td>
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<tr>
<td>2007</td>
<td>Swot</td>
<td>DGXX-S, SLR, GPS</td>
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DORIS tracking network (2013)

NB: Also explore network through GoogleEarth: http://ids-doris.org/network/googleearth.html
Exploring DORIS Network through GoogleEarth
Example of DORIS stations

- Yarragadee (Australia)
- Jiufeng (China)
- Cibinong (Indonesia)
- Betio (Kiribati)
DORIS co-locations

DORIS stations co-located with other IERS techniques (VLBI, SLR or GNSS)
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 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), CNES/CLS (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)
    (also available through interactive Web tool)
• 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
(previous) jumps in DORIS station heights - Problem solved
Red = ids01
Black = ids02

Same data
New reprocessing
+ Jason-2 data
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 – 5 more years)
  – Improved Gravity Fields (EIGEN-6, GOC3)
    • Including drifts and seasonal corrections
  – South Atlantic Anomaly corrections for SPOT5 and Jason-1 (see Stepanek et al., 2010)
  – Height jumps artefacts (few groups only) solved
  – 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.

• Contact: pascal.willis@ign.fr
BACK-UP SLIDES
IDS Web site (http://ids-doris.org)
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)
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)