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Space Geodesy Analysis Centre

1999
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- GPS
- SLR
- DORIS
- GLONASS
- VLBI
- IERS
- GSFC
- PCGIAP
- Absolute gravity
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- GPS
  - IGS Regional Network Associate Analysis Centre
  - Global POD, EOP, regional solutions
  - LEO POD
  - Absolute Sea Level Monitoring Campaigns
GPS Processing Site Report - ALIC

Computed Velocities:
North: 76.1 mm/year (sigma 0.2)
East: 31.9 mm/year (sigma 0.2)
Up: -3.2 mm/year (sigma 0.2)

Repeatability Plots (metres)
GPS Processing Site Report - DST1

Computed Velocities:
North: 73.6 mm/year (sigma 0.2)
East: 37.8 mm/year (sigma 0.2)
Up: 4.6 mm/year (sigma 0.2)

Repeatability Plots (metres)
### Estimated parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SLR</th>
<th>DORIS</th>
<th>GPS</th>
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<tbody>
<tr>
<td>Station Coordinates</td>
<td>WPLTN stations</td>
<td>Asia-Pacific stations</td>
<td>Global and Asia-Pacific stations</td>
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<tr>
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<td>Daily</td>
<td>Daily</td>
<td>Daily</td>
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<tr>
<td>State vectors</td>
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<td>5-day arc</td>
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<tr>
<td>Solar Radiation</td>
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<td>One per arc</td>
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<td>Pressure Scale factor</td>
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<td>Drag</td>
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<tr>
<td>General Acceleration</td>
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<tr>
<td>Measurement Biases</td>
<td>Pass by pass range and time biases.</td>
<td>Pass by pass range rate and time biases.</td>
<td>Carrier Phase Ambiguities.</td>
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<td></td>
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<td>Cycle slips.</td>
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<td>Tropospheric scale factor every two hours</td>
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<tr>
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<td>at every station.</td>
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</tbody>
</table>

- Reference stations constrained to ITRF96 at 1mm
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Normal Equations (EMATRIX)

\[ \text{SLR}_{\text{monthly}} \{ \text{Lageos 1/2, Starlette, Stella, Glonass} \} \]

GPS\(_{\text{daily}} \} \}

DORIS\(_{\text{daily}} \} \}

Normal Equations (SINEX)

\[ \text{VLBI}_{\text{daily}} \} \}

Reference Frame

Terrestrial Ties

Combined Solution
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• GPS results
  – Global MicroCosm
  – Orbit (versus IGS final product)
    • RMS 7 - 10 cm radially
    • RMS 15 - 25 cm along and cross track
  – Station coordinates (weekly combined)
    • RMS 9 - 14 mm difference to MIT SSC
    • 5, 7, 6 mm (N,E,U) repeatability
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- SLR
  - ILRS Associate Analysis Centre
  - Lageos1, Lageos2, Stella, Starlette, Etalon-1, Etalon-2, Glonass
  - Station performance monitoring
  - Five day EOP
  - Multi-satellite combined solutions
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Lageos-1, Oct. 1998, SLR Post-Fit Residuals
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• SLR results
  – RMS postfit residuals for Lageos-1 and Lageos-2, 1 month arc; 5 - 7 mm
  – Stromlo and Yaragadee; 2 - 4 mm
  – Transformed to ITRF96 at the combination stage
  – 3-D RMS for station coordinates 9 - 13 mm for combined monthly Lageos-1 and Lageos-2
  – month to month repeatability of station coordinates; 15mm
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Mount Stromlo Range and Time Biases (Oct. 1998)

Yaragadee Range and Time Biases (Oct. 1998)
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- DORIS
  - SPOT-2 (SPOT-4 to follow)
  - IGN/CSTG results
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- DORIS results
  - 51 station solutions
  - rms fit 5-day arc 0.8 mm/sec
  - matching CNES, UT-CSR 0.5 mm/sec for 1 day arc
  - 1-5 mas x-pole (wrt IGS)
  - 1-3 mas y-pole (wrt IGS)
  - fits ITRF SSC at the 7mm level
  - 3,6,2 mm E,N,U respectively
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• GLONASS
  – IGEX analysis centre
  – SLR orbits
  – Microwave analysis system development
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- **GLONASS results**
  - SLR solutions for IGEX98
  - 8 GLONASS satellites
  - 10 day arcs being computed
  - orbit parameters
    - state vector
    - solar radiation scale factor
    - y-bias
    - range and time bias
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• GLONASS results…
  – reference frame CSR L06
  – global parameters estimated in Lageos-2 solutions
  – 2-3cm fit
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• GLONASS results…
  – rms difference from CODE microwave solution at 20 - 30 cm level (radially)
    • reference frame
    • EOP
    • 10 day arcs
    • no knowledge of SRP models
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• IERS
  – Combination solutions
    • SLR, GPS and DORIS solutions to ITRF
  – ITRS time series project
  – submitted SLR and GPS solutions
  – Local ties
    • telescope IVP determination software
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- VLBI
  - preparing for IVS analysis centre
  - VLBI SINEX combined with satellite techniques
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• GSFC
  – Partners in long term time series of combined solutions
  – AUSLIG July 1995 onwards
  – GSFC prior to 1995
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• PCGIAP
  – Analysis centre for GPS, SLR and DORIS
  – Densification of the ITRF in the Asia-Pacific Region
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• Absolute gravity
  – analysis of the February 1996 absolute gravity data
  – further observations
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• Future
  – relative weights of SLR solutions
  – relative weights of combined technique solutions
  – Antarctica
    • near real time monitoring ice movement with DORIS
  – IVS analysis centre
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• Future…
  – LEO combined solutions by collocations of techniques at the space-craft -- significant recommendation of GEMSTONE
  – altimetry data analysis for gravity anomaly recovery over oceans/ocean-geoid (within 2 years)
  – gravity field estimation (within 2 years) using combinations of GPS/LEO, SLR, and DORIS -- CHAMP, GRACE
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