

National Geodetic Survey

NGS and OPUS Activities

Dr. Neil D. Weston
National Geodetic Survey, NOAA
Silver Spring, MD, USA

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

OPUS

Online Positioning User Service

- Provide access to the US National Spatial Reference System (NSRS).
- Provide accurate, reliable and consistent geodetic coordinates.
- Provide coordinate accuracies to within a few centimeters.
- Provide GPS solutions in a timely fashion.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

OPUS Requirements

- Dual frequency GPS data from geodetic quality receivers and antennas.
- RINEX datasets with at least 15 minutes of observables.
- Web access for data submission.
- Email address to deliver ASCII and/or XML OPUS solution report.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

Online Positioning User Service

OPUS Upload | What is OPUS | Using OPUS | Recent Solutions | FAQ | OPUS Policies | Contact OPUS

ATTENTION: Trouble OPUS and OPUS-RS users must read OPUS FAQ #17. The OPUS Team

For those of you that have shorter data-sets, please try OPUS Rapid Static.

1. Enter your email address

2. Enter your DATA file. Now accepting RINEX and selected receiver formats. Data files may also be compressed (.ZIP, .rar, .gz)

3. NONE no antenna selected - see FAQ #6

4. 0.0 meters

5. Options If desired, select from several options to modify the basic OPUS procedure.

Upload File

Your data must be dual frequency data (L1 and L2) and a minimum of 2 hours of observations is recommended. Your coordinate file must be L2, L3, 00, 00 or 00 seconds. OPUS overwrites all data to a 30 second rate.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

Processing Methodology

- Compute rover (user's receiver) location.
- Retrieve ancillary information.
 - Broadcast and precise ephemeris files from IGS Central Bureau.
 - CORS and IGS site coordinates from NGSIDB.
- Performs three independent double-difference solutions within the ITRF reference frame.
- Compare and average the results.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

Processing Methodology (cont.)

- Generate NAD83 coordinates with HTDP.
- Email solution to the user.
- Archive solution, update logs and plot rover position on dynamically generated maps.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

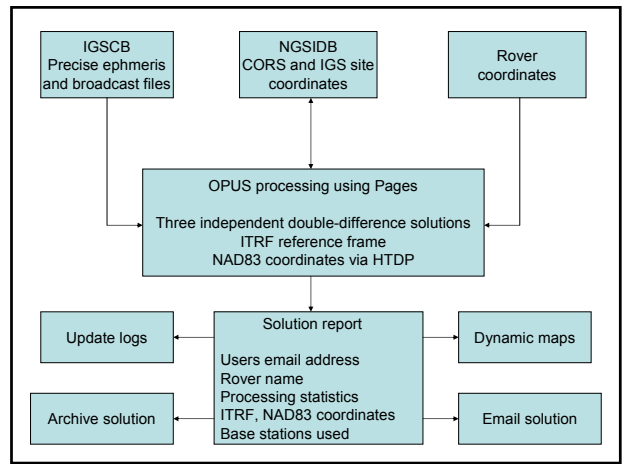
National Geodetic Survey

Coordinates

- ITRF coordinates - epoch at day of observation.
- NAD83 coordinates – epoch Jan 1, 2002.
- UTM coordinates with appropriate zone.
- SPC coordinates (for regional and local surveys).
- US National grid designator.
- Orthometric heights – Geoid03, Geoid06.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007



National Geodetic Survey

OPUS Projects

- Define a project.
- Process GPS campaign data consistently.
- Field personnel submit GPS data via OPUS.
- Manager monitors, quality checks, processes data and information via the web.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

OPUS Projects (cont.)

- OPUS - Initial quality control – all datasets
Phase I
- OPUS Projects - Network adjustments
Phase II
- OPUS Projects - Combination of sessions
Phase III

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

File Management

GPS Network Processing

southern louisiana height modernization 2006
File Management Page

Active Observation Files

100219s Dto Added 16 08 15 on 12/13/2004 by Bonnie.Taylor@noaa.gov

Remove Selected File | View OPUS Report | E5bRINDEX File

UnRemove Observation Files

042430w Dto Added 15 07 15 on 11/08/2004 by WALKER@CTENGINEERING.COM

UnRemove Selected File | View OPUS Report

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

National Geodetic Survey

Project Session Viewer

GPS Network Processing

southern louisiana height modernization 2006
View Sessions Page

Session 1 - Starts 10/03/2006 at 22:19:26 - Ends 10/04/2006 at 18:02:04 - Duration 19:42:38
11wz740 Dto Overlap 19 42 38

Session 2 - Starts 10/03/2006 at 00:00:00 - Ends 10/03/2006 at 23:59:30 - Duration 23:59:30
cong2740 Dto Overlap 23 59 30

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

Processing a Project

OPUS: Processing southern Louisiana height modernization 2006

1. Select a Session =>

Click a session to display stations at

06275A
06276A
06276B
06277A
06278A

2. Designate Stations =>

Choose a Station

covg2740
gode2740
mdo12740
nlb2740
203274t
2038274t
2132274u
2022274u
2167274u

Use + buttons to designate

FEK
HUB &
OMIT

2a. Fix Station

covg

2b. Hub Stations

gode
mdo1
nlb

2c. Omit Stations

2223274u

3. Click PROCESS

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

Dynamic Session Map

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

OPUS-RS OPUS Rapid Static

- OPUS-RS uses RSGPS engine (from OSU) instead of Pages.
- Uses P1 and P2 as well as L1 and L2 observations.
- Resolves all ambiguities with LAMBDA.
- Geometry free linear combination used to determine DD ionospheric delays.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

OPUS-RS Operational Modes

- May be used in two modes:
Network and Rover
- In network mode, only reference stations are used to solve for ambiguities and double difference ionospheric delays.
- In rover mode, ionospheric delays and tropospheric parameters are interpolated from reference stations to rover.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

OPUS-RS Performance

- Produces a solution with 15 minutes of data (vs. 2 hours for OPUS).
- Network solution rather than individual baselines.
- Accuracy: 2 cm horizontal, 4 cm vertical.
- Quality indicators based on W ratio from LAMBDA validation tests.

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

OPUS-RS Performance (Data)

```

USER: charles@earthlink.net          DATE: August 29, 2005
INDEX FILE: bkly1180.05m             TIME: 12:09:34 UTC

SOFTWARE: rsmgs 0.6 R022.pcl        START: 2005/04/28 14:00:00
EPOCHS: 19013204.0ph [ultra-rapid]   STOP: 2005/04/28 15:00:00
NAV FILE: hsd01180.05m              OBS USED: 2220 / 2113 : 984
ANT NAME: NONE                       QUALITY INDICATORS: 8.33 / 6.54
ASP HEIGHT: 0.0                      OVERALL RMS: 0.010 (m)

REF FRAME: NAD_83 (GORS96) (EPOCH: 2002.0000)      ITRF00 (EPOCH: 2005.3222)
X: 776242.978 (m) 0.002 (m)      776242.306 (m) 0.002 (m)
Y: -4986708.281 (m) 0.026 (m)    -4986706.835 (m) 0.026 (m)
Z: 3888159.007 (m) 0.015 (m)      3888158.876 (m) 0.015 (m)

LAT: 37 47 52.09045 0.011 (m)    37 47 52.11755 0.011 (m)
E LONG: 278 50 52.04960 0.005 (m) 278 50 52.03155 0.005 (m)
W LONG: 81 9 7.95040 0.005 (m)    81 9 7.98845 0.005 (m)
EL HDG: 692.489 (m) 0.026 (m)     691.398 (m) 0.026 (m)
ORIG HDG: 723.765 (m) 0.036 (m) [Goid03 NAVD83]

UTM COORDINATES      STATE PLANE COORDINATES
UTM (Zone 17)        SPC (4702 WV S)
Northing (Y) [meters] 4183392.127      88537.805
Easting (X) [meters]  486599.893      586595.234
Convergence [degrees] -0.0938516      +0.09493656
Point Scale           0.99946221      0.99949431
Combined Factor       0.99949357      0.99949364

US NATIONAL GRID DESIGNATOR: 17SNM8460083392 (NAD 83)

BASE STATIONS USED
PID  DESIGNATION  LATITUDE  LONGITUDE  DISTANCE (m)
094648  GALT  GALLIPOLIS  CORS  ARP  N30S019.148  W082S440.092  152255.7
095767  DOBS  DOBSON  CORS  ARP  N362531.514  W0804311.711  157086.8
N31371  BLVD  BLACKSBURG  CORS  ARP  N371221.637  W0802452.276  92575.9
    
```

National Oceanic and Atmospheric Administration

6th FIG Regional Conference
San Jose, Costa Rica
12-15 November, 2007

Desired OPUS Features

- Process multiple files from users as a network.
- Process single frequency (L1) data.
- Publish OPUS results in a database for external user access.
- Reduce occupation time.

Comments / suggestions

Gracias
Thank you