OPUS Products

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Outline

- What is OPUS?
  - Processing Applications
  - Publishing Option

- Coming Attractions
  - IGS08 . . . . . (improved CORS coordinates)
  - OPUS-Net . . . . . (improved processing strategy)
  - OPUS-Projects . . . . (multiple stations and occupations)

What is OPUS?

The Online Positioning User Service, OPUS, is a growing set of web-based applications offering access to the tools and resources provided by the NGS. OPUS currently offers:

- Processing applications for individual data files.
- A publishing option for OPUS results.

OPUS can be reached through a link on the NGS home page,
http://geodesy.noaa.gov

Or directly using the URL
http://geodesy.noaa.gov/OPUS/

OPUS data processing applications.

These applications provide completely automated, high accuracy data processing for individual marks. Beautiful in their simplicity, you need only provide:

- Your email address.
- 15 minutes to 48 hours of GPS L1 + L2 data.
- The antenna type.
- The offset to the Antenna Reference Point (ARP).

Then click a button and you'll receive an email containing coordinates for your mark accurate to a few centimeters.

OPUS: Online Positioning User Service

National Geodetic Survey

NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education | Search

OPUS Menu

- Upload
- About OPUS
- Published Solutions
- Contact OPUS

Upload your data file.

Tie your GPS observation to the National Spatial Reference System.

What is OPUS? **FAQs**

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* **Email address** - your solution will be sent here.

CR\My Documents\Downloads\corv059f.09o Browse...

* **Data file** of dual-frequency GPS observations. **sample**

Sample Solutions

ASH700936C_M D/M element, milled chokerings, -radome

Antenna type - choosing wrong may degrade your accuracy.

1.521 meters above your mark.

Antenna height of your antenna's reference point.

Options to **customize** your solution.

Upload to Rapid-Static | Upload to Static

for data > 15 min. < 2 hrs. for data > 2 hrs. < 48 hrs.

Here is an example of the data upload page.

Why are there two upload buttons?

The strategies needed to successfully fix phase ambiguities to their integer values are different for short and long data sets. Thus two buttons:

- Rapid-static (15 min to 2 hrs).
- Static (2 hrs to 48 hrs).

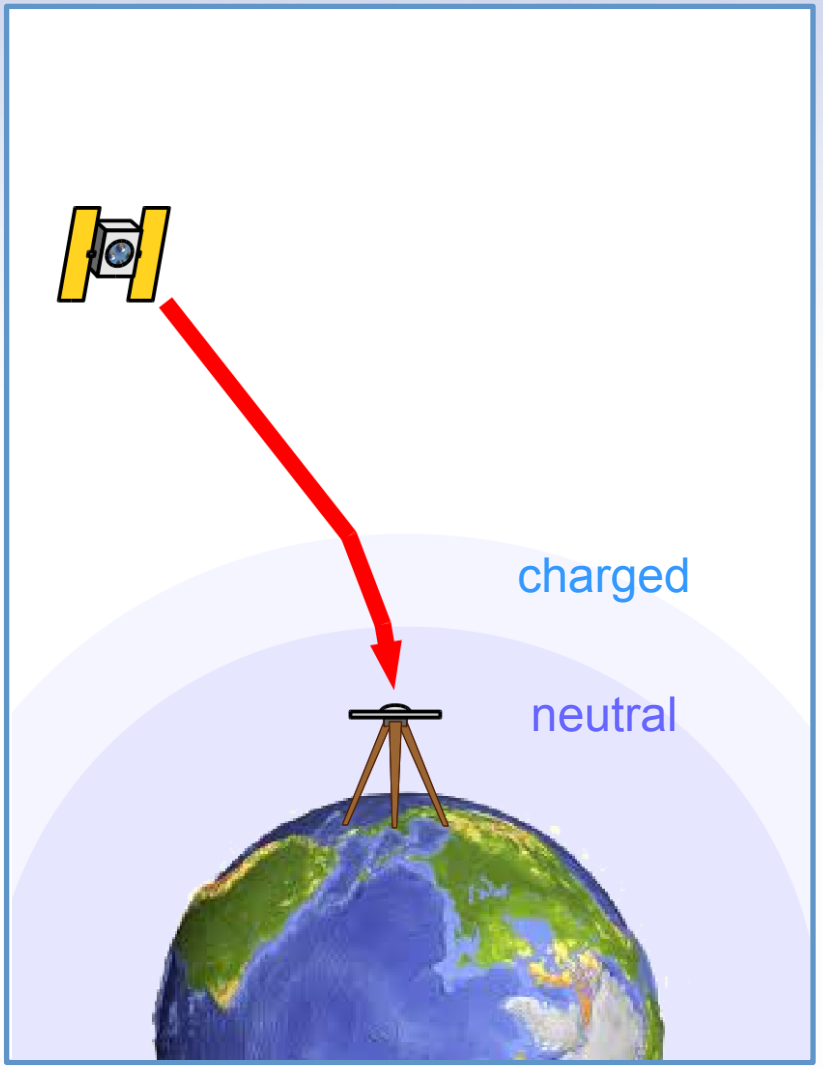
Although the integer fixing strategies are different, the processing quality is not. Both use:

- The best available numerical models.
- Up-to-date CORS data, coordinates and velocities. (Some data are available within 1 hr.)
- IGS Satellite Ephemerides. (Predicted available immediately.)
- Ion-free, integer-fixed phase.

Why different strategies to fix integers?

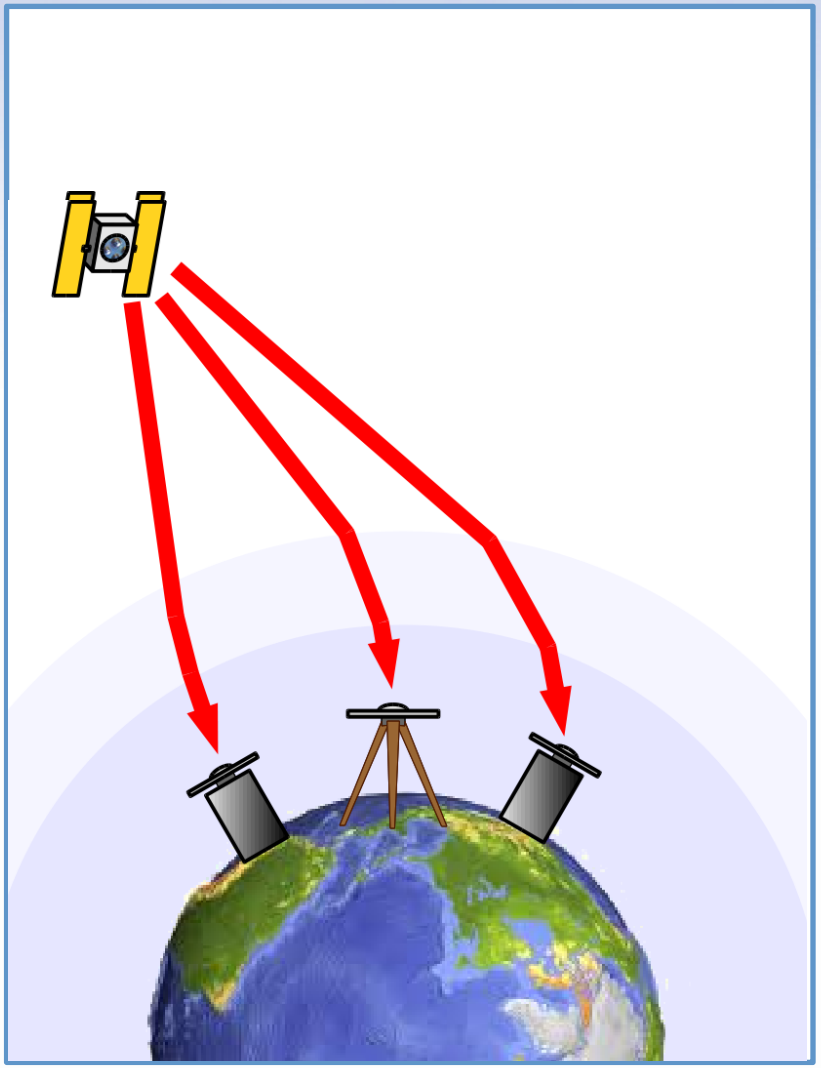
As the GNSS signals travel from the satellite to your antenna, a variety of effects come into play. Most have well determined corrections but several do not. Until we determine these unknown corrections, we can't accurately compute the integers or coordinates. Most significant of these are:

- The charged atmosphere. (ionosphere)
- The neutral atmosphere. (troposphere)



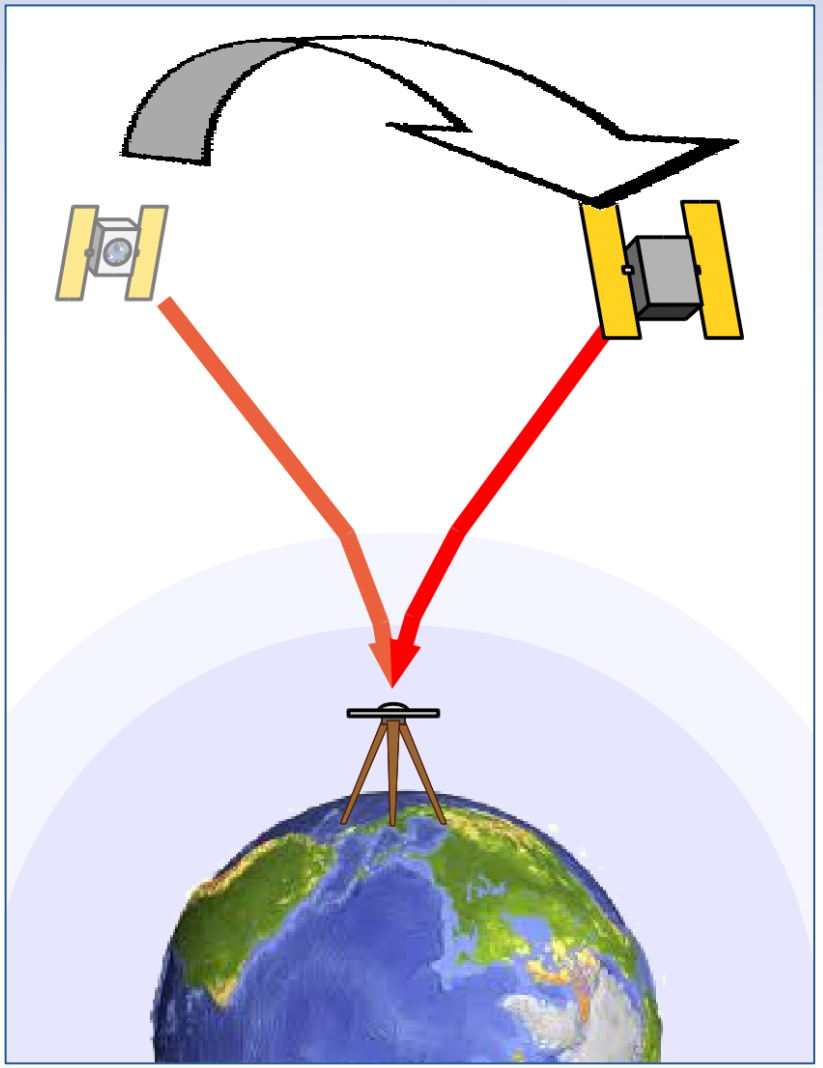
How do you get those corrections?

OPUS Rapid−Static handles data spans shorter than 2 hrs. It uses additional data from the CORS surrounding your mark to compute charged and neutral atmosphere corrections at the CORS. It then interpolates those values to your mark's location. Using the interpolated corrections, the integers and the coordinates can be confidently determined.



And for longer data spans?

If you can afford to occupy a mark for a longer time, the change in satellite position relative to your antenna eliminates all but the appropriate set of corrections. This is the strategy of OPUS Static: given 2 hrs of data or more, the atmosphere corrections, the integers and the antenna coordinates can be confidently determined in the processing.



How good can I do with OPUS?

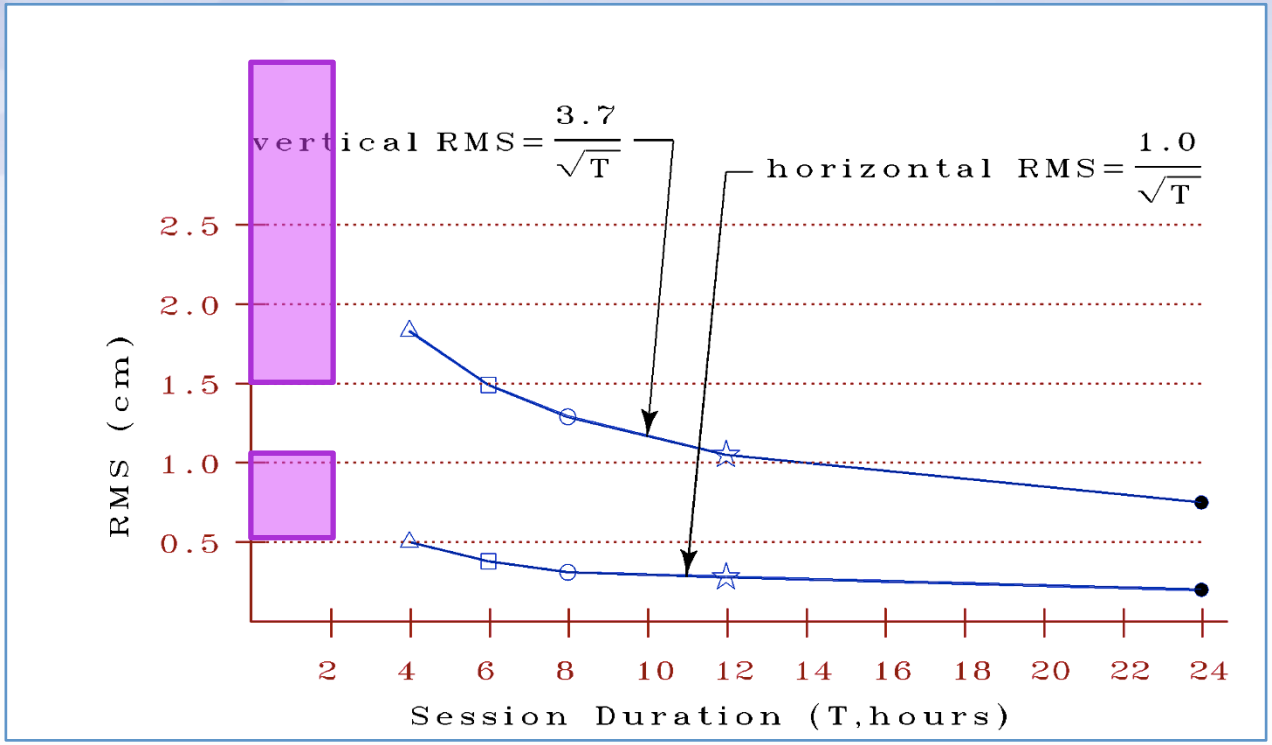
OPUS typically yields accuracies of:

- horizontal: 1 – 2 cm.
- vertical: 2 – 4 cm.

However, there is no guarantee that this stated accuracy will result from any given data set. Confirming the quality of the OPUS solution is your responsibility. That's the "price" for the simplicity of this processing.

A little more specific rule of thumb.

Several studies of OPUS accuracy versus occupation duration are available. Their results are the basis of the "rule of thumb" shown here. The shaded areas indicate typical accuracies for OPUS Rapid−Static, but these can't really be summarized simply. For an estimate tailored to your circumstances, visit http://geodesy.noaa.gov/OPUSI/Plots/Gmap/OPUSRS_sigmap.shtml



Eckl et al., 2001, "Accuracy of GPS-derived relative positions as a function of interstation distance and observing-session duration", J. of Geod. 75, 633-640. Soler et al., 2009, "Accuracy of Rapid Static Online Positioning User Service (OPUS-RS) Revisited, 13 (2), 119-132.

An OPUS Static example.

Here is the basic report from OPUS Static for an sample 2 hr data set.

This is a known mark, so I know that this result is in good agreement with the accepted coordinates (2.1 cm horizontally and 1.6 cm vertically), but more generally, how can you know if this is a *good* solution?

```
      USER: mark.schenewerk@noaa.gov                DATE: March 31, 2010
RINEX FILE: corv059f.09o                            TIME: 19:43:42 UTC


  SOFTWARE: page5  0909.08 master40.pl 081023      START: 2009/02/28  05:00:00
 EPHEMERIS: igs15206.eph [precise]                  STOP: 2009/02/28  06:59:00
  NAV FILE: brdc0590.09n                       OBS USED:  5984 /  6181   :  97%
  ANT NAME: ASH700936C_M    NONE             # FIXED AMB:    31 /    31   : 100%
ARP HEIGHT: 1.521                           OVERALL RMS: 0.009(m)


 REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)            ITRF00 (EPOCH:2009.1596)

         X:     -2498422.603(m)   0.011(m)          -2498423.344(m)   0.011(m)
         Y:     -3802821.159(m)   0.007(m)          -3802819.941(m)   0.007(m)
         Z:      4454736.661(m)   0.021(m)           4454736.734(m)   0.021(m)

       LAT:   44 35  7.91060      0.016(m)        44 35  7.92618      0.016(m)
     E LON:  236 41 43.48046      0.013(m)       236 41 43.42207      0.013(m)
     W LON:  123 18 16.51954      0.013(m)       123 18 16.57793      0.013(m)
    EL HGT:          106.011(m)   0.014(m)              105.627(m)   0.014(m)
 ORTHO HGT:          128.542(m)   0.020(m) [NAVD88 (Computed using GEOID09)]

                        UTM COORDINATES    STATE PLANE COORDINATES
                         UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters]     4936954.909           105971.559
Easting (X)  [meters]      475821.304          2277335.367
Convergence  [degrees]    -0.21381419          -1.98897513
Point Scale                0.99960719           0.99994603
Combined Factor            0.99959057           0.99992941

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)



                                BASE STATIONS USED
PID       DESIGNATION                        LATITUDE    LONGITUDE DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP      N445628.313 W1230608.100   42648.2
DE6258 MCSO MARION CNTY COOP CORS ARP      N445825.701 W1225720.639   51226.8
DG5352 STAY STAYTON COOP CORS ARP          N444950.530 W1224915.036   47030.9
```

Minimal OPUS Static quality check.

The suggested OPUS Static solution quality measures are:

OBS USED	> 90%
# FIXED AMB	> 50%
OVERALL RMS	< 3 cm
peak-to-peak	< 5 cm

In this example, we have a 🙂.

```
      USER: mark.schenewerk@noaa.gov                DATE: March 31, 2010
RINEX FILE: corv059f.09o                            TIME: 19:43:42 UTC


  SOFTWARE: page5  0909.08 master40.pl 081023       START: 2009/02/28  05:00:00
 EPHEMERIS: igs15206.eph [precise]                  STOP: 2009/02/28  06:59:00
  NAV FILE: brdc0590.09n                              OBS USED:  5984 /  6181   :  97%
  ANT NAME: ASH700936C_M    NONE                    # FIXED AMB:    31 /    31   : 100%
ARP HEIGHT: 1.521                                   OVERALL RMS: 0.009(m)


 REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)            ITRF00 (EPOCH:2009.1596)

         X:     -2498422.603(m)   0.011(m)          -2498423.344(m)   0.011(m)
         Y:     -3802821.159(m)   0.007(m)          -3802819.941(m)   0.007(m)
         Z:      4454736.661(m)   0.021(m)           4454736.734(m)   0.021(m)

       LAT:   44 35  7.91060      0.016(m)        44 35  7.92618      0.016(m)
     E LON:  236 41 43.48046      0.013(m)       236 41 43.42207      0.013(m)
     W LON:  123 18 16.51954      0.013(m)       123 18 16.57793      0.013(m)
    EL HGT:          106.011(m)   0.014(m)                105.627(m)   0.014(m)
 ORTHO HGT:          128.542(m)   0.020(m) [NAVD88 (Computed using GEOID09)]

                        UTM COORDINATES    STATE PLANE COORDINATES
                         UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters]     4936954.909          105971.559
Easting (X)  [meters]      475821.304         2277335.367
Convergence  [degrees]    -0.21381419         -1.98897513
Point Scale                0.99960719          0.99994603
Combined Factor            0.99959057          0.99992941

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)



                              BASE STATIONS USED
PID       DESIGNATION                        LATITUDE    LONGITUDE DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP      N445628.313 W1230608.100   42648.2
DE6258 MCSO MARION CNTY COOP CORS ARP      N445825.701 W1225720.639   51226.8
DG5352 STAY STAYTON COOP CORS ARP          N444950.530 W1224915.036   47030.9
```

http://geodesy.noaa.gov/OPUS/about.jsp#accuracy

An OPUS Rapid–static example.

Here is the basic OPUS Rapid–static report for the same data.

Here again, I now this result agrees with the known coordinates (2.4 cm horizontally and 0.2 cm vertically), but how can you know if this is a *good* solution?

```
      USER: mark.schenewerk@noaa.gov                DATE: April 01, 2010
RINEX FILE: corv059f.09o                            TIME: 16:17:51 UTC


  SOFTWARE: rsgps  1.35 RS11.prl 1.57             START: 2009/02/28 05:00:00
 EPHEMERIS: igs15206.eph [precise]                  STOP: 2009/02/28 06:59:30
  NAV FILE: brdc0590.09n                       OBS USED:  5652 / 11169   :  51%
  ANT NAME: ASH700936C_M                     QUALITY IND.  48.23/108.85
ARP HEIGHT: 1.521                          NORMALIZED RMS:        0.280


 REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)            ITRF00 (EPOCH:2009.15959)

         X:     -2498422.589(m)   0.015(m)          -2498423.330(m)   0.015(m)
         Y:     -3802821.147(m)   0.012(m)          -3802819.929(m)   0.012(m)
         Z:      4454736.644(m)   0.021(m)           4454736.717(m)   0.021(m)

       LAT:   44 35  7.91061      0.004(m)        44 35  7.92619      0.004(m)
     E LON:  236 41 43.48069      0.011(m)       236 41 43.42230      0.011(m)
     W LON:  123 18 16.51931      0.011(m)       123 18 16.57770      0.011(m)
    EL HGT:          105.986(m)   0.026(m)              105.602(m)   0.026(m)
 ORTHO HGT:          128.517(m)   0.030(m) [NAVD88 (Computed using GEOID09)]

                        UTM COORDINATES    STATE PLANE COORDINATES
                         UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters]     4936954.909           105971.559
Easting (X)  [meters]      475821.309          2277335.372
Convergence  [degrees]    -0.21381414          -1.98897509
Point Scale                0.99960719           0.99994603
Combined Factor            0.99959058           0.99992942

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)



                                BASE STATIONS USED
PID       DESIGNATION                          LATITUDE    LONGITUDE DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP      N445628.313 W1230608.100   42648.2
DG5352 STAY STAYTON COOP CORS ARP          N444950.530 W1224915.036   47030.9
DE6258 MCSO MARION CNTY COOP CORS ARP      N445825.701 W1225720.639   51226.8
DI7529 P367 NEWPRTAIR_OR2007 CORS ARP      N443506.870 W1240341.598   60113.5
```

Minimal OPUS Rapid-static quality check.

The suggested OPUS Rapid-static solution quality measures are:

OBS USED	> 50%
QUALITY IND.	> 3
NORM. RMS	≈ 1
Uncertainties	< 5 cm

In this case, I only give this a 😐.

```
      USER: mark.schenewerk@noaa.gov                DATE: April 01, 2010
RINEX FILE: corv059f.09o                            TIME: 16:17:51 UTC


  SOFTWARE: rsgps  1.35 RS11.prl 1.57           START: 2009/02/28 05:00:00
 EPHEMERIS: igs15206.eph [precise]              STOP: 2009/02/28 06:59:30
  NAV FILE: brdc0590.09n                    OBS USED:  5652 / 11169   :  51%
  ANT NAME: ASH700936C_M                  QUALITY IND.  48.23/108.85
ARP HEIGHT: 1.521                       NORMALIZED RMS:        0.280


 REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)            ITRF00 (EPOCH:2009.15959)

         X:     -2498422.589(m)   0.015(m)          -2498423.330(m)   0.015(m)
         Y:     -3802821.147(m)   0.012(m)          -3802819.929(m)   0.012(m)
         Z:      4454736.644(m)   0.021(m)           4454736.717(m)   0.021(m)

       LAT:   44 35  7.91061      0.004(m)        44 35  7.92619      0.004(m)
     E LON:  236 41 43.48069      0.011(m)       236 41 43.42230      0.011(m)
     W LON:  123 18 16.51931      0.011(m)       123 18 16.57770      0.011(m)
    EL HGT:          105.986(m)   0.026(m)                105.602(m)  0.026(m)
 ORTHO HGT:          128.517(m)   0.030(m) [NAVD88 (Computed using GEOID09)]

                        UTM COORDINATES    STATE PLANE COORDINATES
                         UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters]     4936954.909          105971.559
Easting (X)  [meters]      475821.309         2277335.372
Convergence  [degrees]    -0.21381414         -1.98897509
Point Scale                0.99960719          0.99994603
Combined Factor            0.99959058          0.99992942

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)



                              BASE STATIONS USED
PID       DESIGNATION                          LATITUDE    LONGITUDE DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP      N445628.313 W1230608.100   42648.2
DG5352 STAY STAYTON COOP CORS ARP          N444950.530 W1224915.036   47030.9
DE6258 MCSO MARION CNTY COOP CORS ARP      N445825.701 W1225720.639   51226.8
DI7529 P367 NEWPRTAIR_OR2007 CORS ARP      N443506.870 W1240341.598   60113.5
```

http://geodesy.noaa.gov/OPUS/about.jsp#accuracy

The OPUS publishing option.

OPUS provides a means to share your results with others. This is completely voluntary and there are some rules (http://geodesy.noaa.gov/OPUS/about.jsp#publishing).

Publishing through OPUS is separate from the more conventional method of publishing to the IDB. Eventually, these will be fully reconciled.

Publish Your OPUS Solutions

Publishing helps maintain local ties to the National Spatial Reference System, and, by linking observations, strengthens the models used to translate between modern and legacy mapping products.

Step 1. Follow These Requirements

Field Procedures

- GPS **data file** ≥ 4 hour duration
- quality **mark setting**
- experienced observer
- fixed height tripod recommended
- brace tripod legs with sandbags or chain
- verify **antenna height** and plumb
- see **HARN guidelines**

Mark Attributes

- photos of mark & equipment
- details (name, type, stability, etc.)
- description to aid mark recovery
- preview **mark description form** & **help file**

High-Quality OPUS Solution

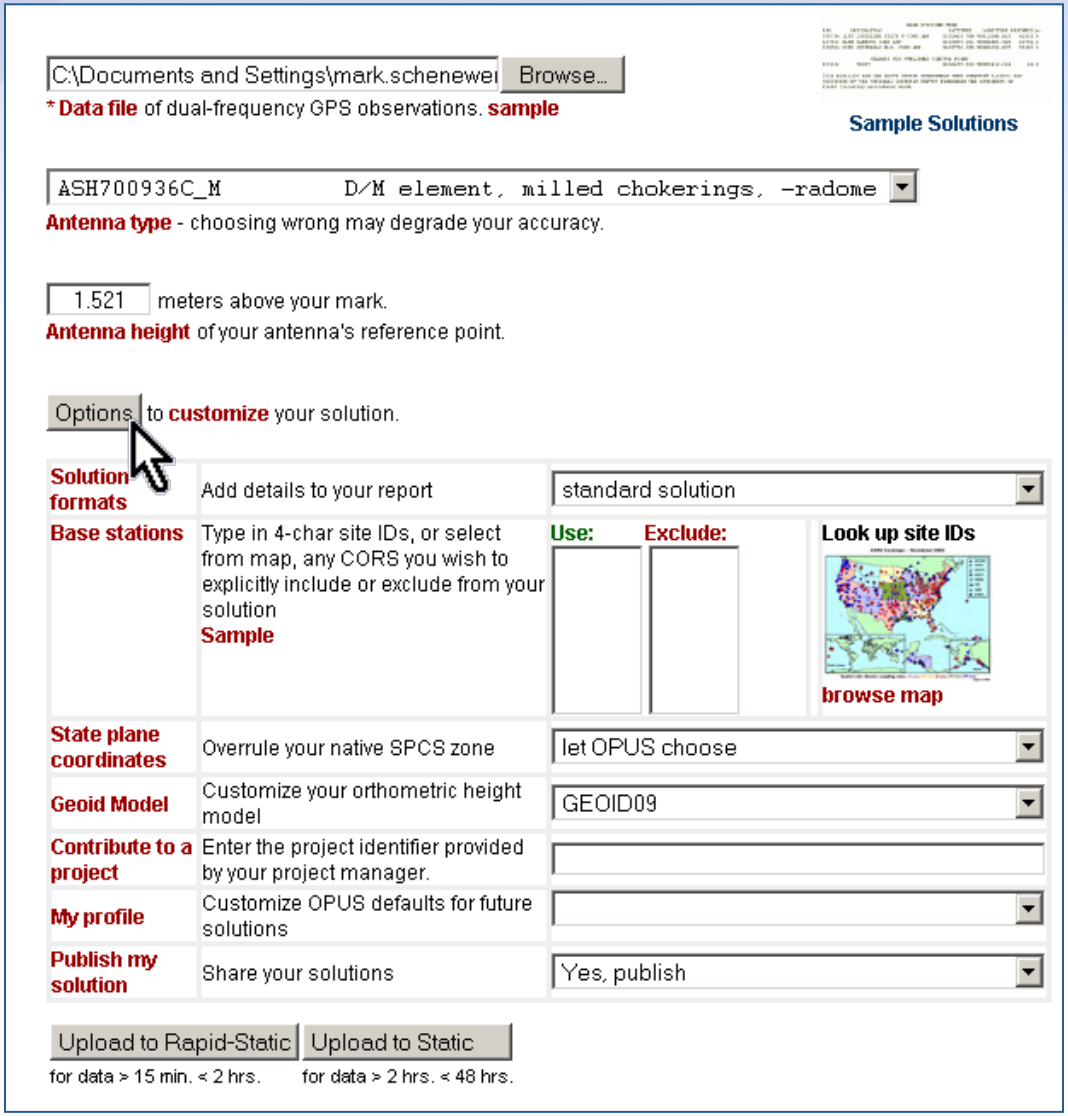
- ≥ 70% observations used
- ≥ 70% ambiguities fixed
- ≤ 3 cm RMS
- ≤ 4 cm peak-to-peaks, lat. & lon.
- ≤ 8 cm peak-to-peak, el. hgt.
- properly identify **antenna type**
- precise or rapid orbits (avail. next day)

How do I publish my results?

Go to the OPUS upload page and fill out the form as you normally would, but before clicking the upload button, click the Options button causing the options to appear.

Select "Yes, publish" for the "Publish my solution" option.

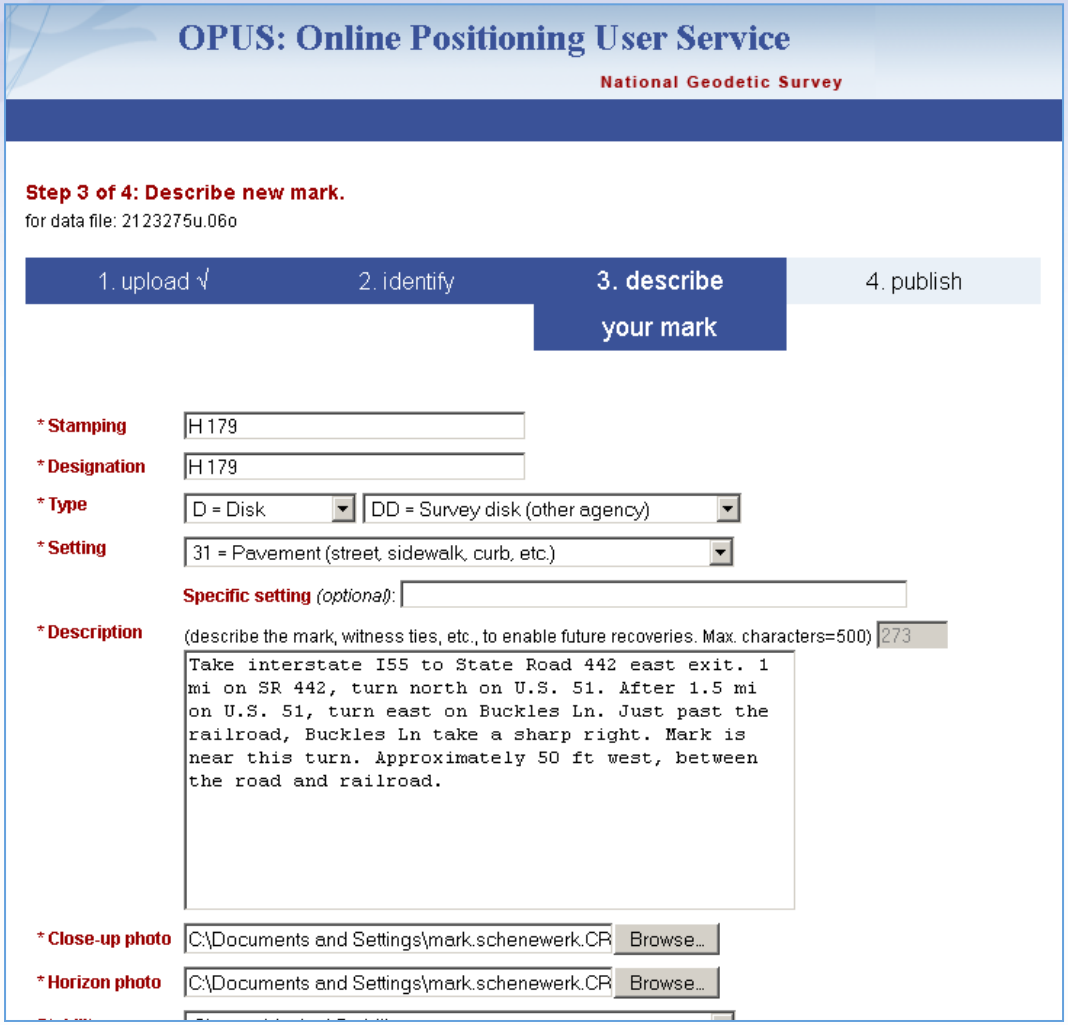
Now click Upload.



The mark description forms.

The processing will proceed normally, but in this case you'll visit two more forms where you'll describe the mark from which the data were collected.

You can abort at any time and will still receive your solution.



QC your submission and you're done.

Again, you'll always receive your OPUS solution in an email.

If you've completed the mark description forms, you'll receive a separate email giving you a chance to review your description. You can modify the description or even abort at this point, but normally you'll confirm the submission.

There are automated and manual reviews to insure submissions meet the rules so, occasionally, a follow-up email is sent. Normally however, your submission should be available for others to use in a few hours.

Take a look some published results.

If you are interested in publishing, I encourage you to review the on-line documentation and explore some of the previously published results. Published solutions are available through a link on the OPUS upload page.

SURVEY DATASHEET (Version 1.0)

PID: QE0636
Designation: CORVALLIS MAG STA=226
Stamping: 226 1941
Stability: May hold commonly subject to ground movement
Setting: Set in top of concrete monument
Mark Condition: G
Description: Found as described in IDB for QE0636.
Station is on the OSU campus.
Observed: 2010-05-24T15:28:00Z See Also 2000-03-09
Source: OPUS - page5 1009.28

Close-up View

REF_FRAME:	EPOCH:	SOURCE:	UNITS:	SET PROFILE	DETAILS
NAD_83(CORS96)	2002.0000	NAVD88 (Computed using GEOID09)	m		

LAT:	44° 33' 58.18935"	± 0.027 m
LON:	-123° 16' 17.92558"	± 0.037 m
ELL HT:	47.433	± 0.058 m
X:	-2497041.502	± 0.023 m
Y:	-3805485.031	± 0.033 m
Z:	4453162.520	± 0.060 m
ORTHO HT:	70.098	± 0.100 m

	UTM 10	**SPC** 3601(OR N)
NORTHING:	4934794.408m	103730.548m
EASTING:	478429.190m	2279875.945m
CONVERGENCE:	-0.19062354°	-1.96561258°
POINT SCALE:	0.99960572	0.99994950
COMBINED FACTOR:	0.99959829	0.99994206

CONTRIBUTED BY

mark.l.armstrong
National Geodetic Survey

CORS COORDINATES

The world, it is a changin'…

... with apologies to Bob Dylan.

Physically: Every place is in motion. Some places move predictably, some chaotically and some dynamically respond to their environment.

Technically: Our knowledge of these and other phenomena is improving. As a result, old hardware is improved and new hardware built. Likewise, old software is improved and new software is developed.

Logistically: Even excluding these changes, our tools age: GNSS satellites and sites come and go.

Enough philosophy already!

The last comprehensive CORS adjustment was completed more than a decade ago. In this digital age, that makes it old tech. Nevertheless, the coordinates were pretty good.

However, in many cases, the velocities were poor. Add a growing number of new CORS with modelled rather than measured velocities and an increasingly untenable circumstance was developing.

Welcome IGS08 and NAD 83(2011)!

The International GNSS Service (IGS) has completed a multi-year solution of all suitable GNSS sites. Known as the IGS08 reference frame, this became operational in April 2011.

Rebischung, Schmid and Ray, 2011, "[IGSMAIL-6354] Upcoming switch to IGS08/igs08.atx", http://igscb.jpl.nasa.gov/pipermail/igsmail/2011/006346.html.

In turn, the NGS has built upon its contribution to the IGS08 by completing an adjustment of all U.S. CORS. Although, strictly speaking, not part of the IGS08 reference frame, these NGS coordinates are consistent with and will be labelled IGS08. This adjustment was then rotated to match the NAD 83 system. This last product will be designated the NAD 83(2011). CORS and OPUS will make the IGS08 and NAD 83(2011) operational in July 2011. (http://beta.ngs.noaa.gov/myear/)

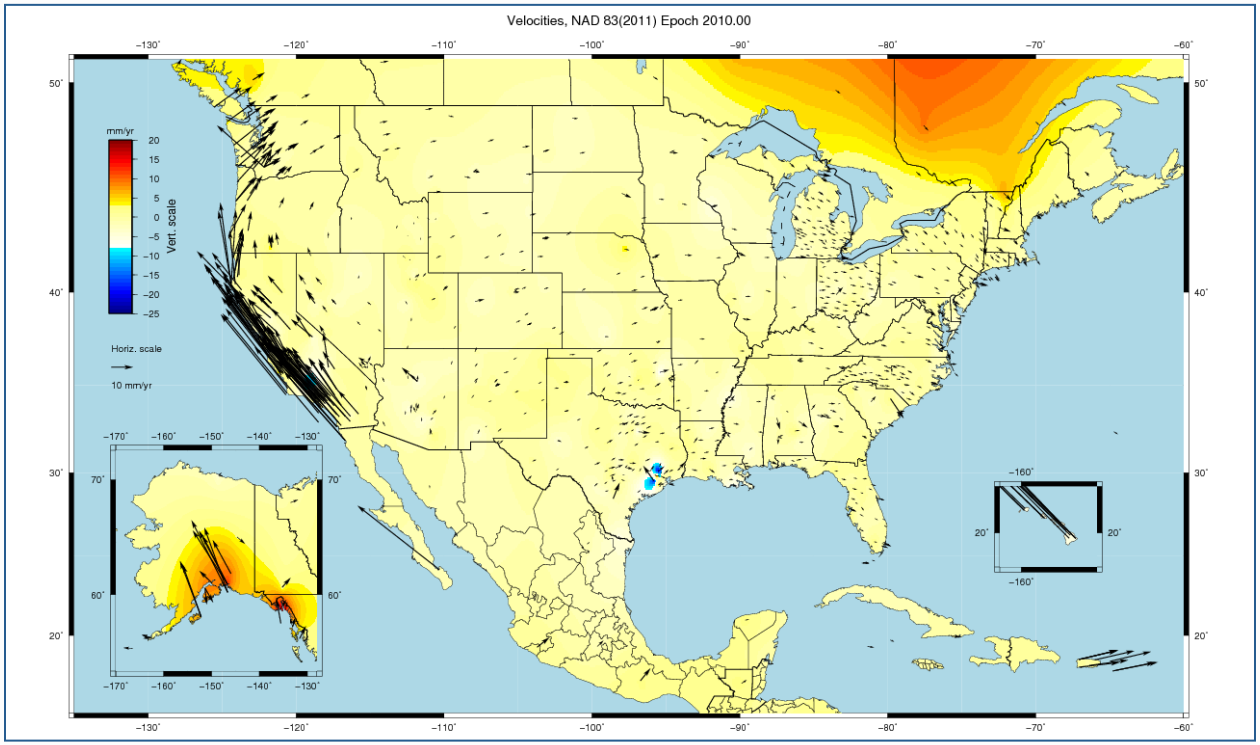
Why all the hubbub?

- This is the most consistent (internally and with other space geodesy techniques) adjustment to date.
- Data from 1997 – 2010.5 were included.
- All recognized discontinuities were accounted for.
- Absolute antenna models were used.
- State of the art geophysical models were used.
- The reference epoch for IGS08 coordinates is 2005.0 and 2010.0 for the NAD 83(2011).
- The plan is to have this reference frame evolve via on-going processing and periodic readjustments.

Put this all together and you have better coordinates, velocities and uncertainties now and into the future.

What's this mean for me?

- Truthfully, probably some needless anxiety.
- Better coordinates, velocities and uncertainties.
  In particular, better vertical velocities.
- Improved results from OPUS.
- Less concern when combining old with new results.



OPUS-NET

What is OPUS-Net?

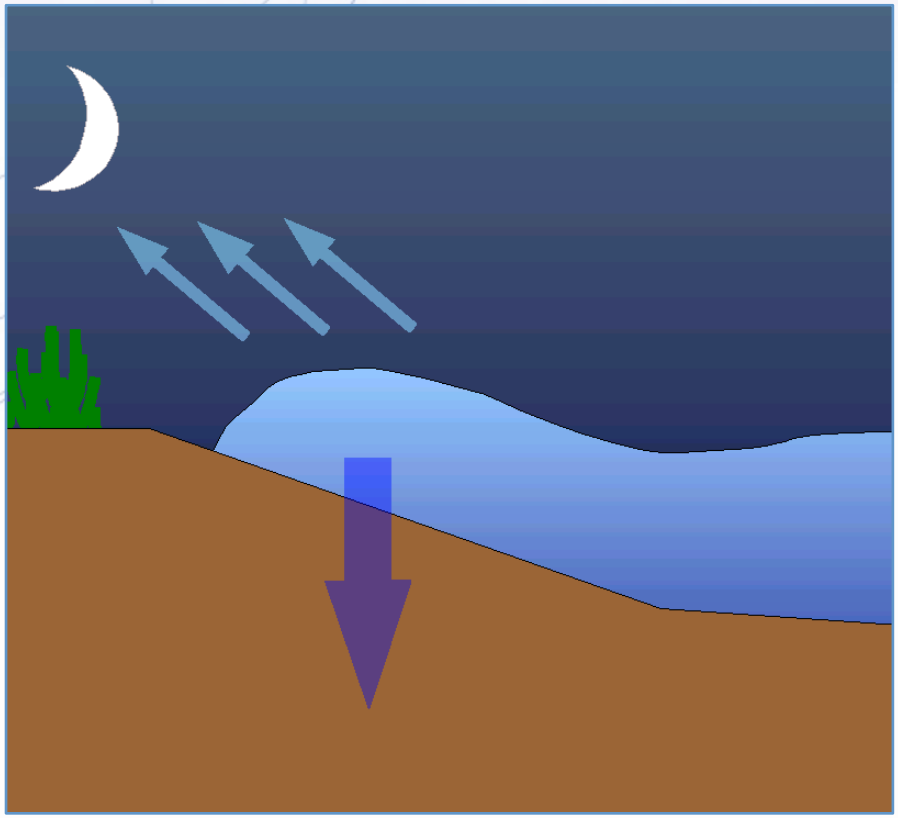
OPUS-Net *looks like* the other OPUS processing applications.
The four "beautifully simple" questions and options remain.
The difference is an enhanced processing strategy:

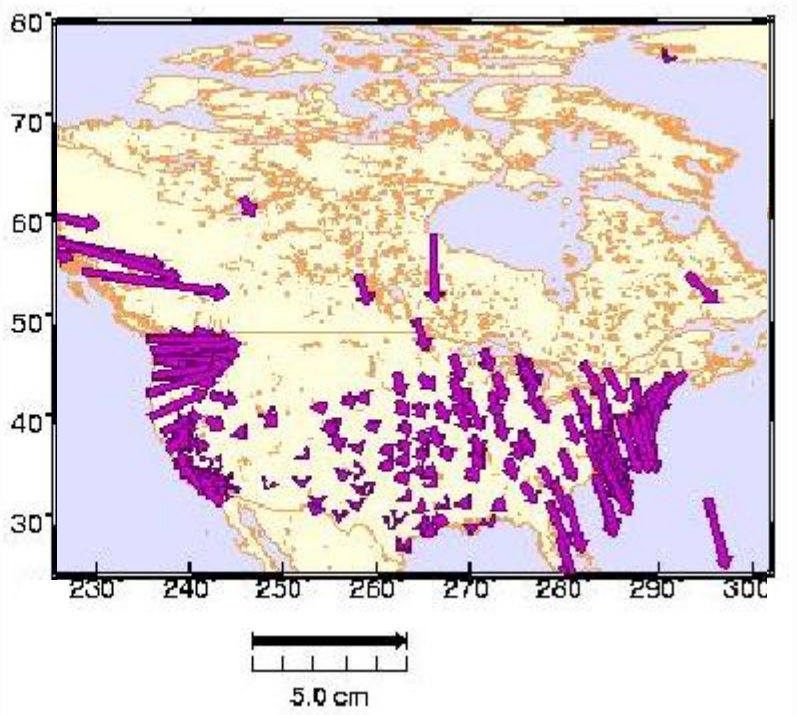
- Includes ocean-tide loading model.
- Uses a combination of near and distant CORS.
- Performs a network solution which includes your data.

OPUS-Net is being tested now. A BETA version should be available before the end of 2011.

What's ocean-tide loading?

As the tide swells and ebbs, the changing weight of water pressing on the Earth's crust causes it to deform in sympathy with the tide. This effect can be as large as several centimeters.





Why use near and distant CORS?

Although it may seem counter-intuitive, including distant CORS enables better neutral atmosphere corrections. As we've discussed, having these makes everything else better.

More CORS minimizes the effects of missing data from and changes at the CORS used in your solution.

Furthermore, this allows OPUS-Net to emphasize "quality" as well as "quantity." The best understood CORS in North America (and the world) will always be used in the processing.

And the network solution?

OPUS Static processes each baseline independently from the others. The coordinates you receive in your OPUS solution report are the mean and peak-to-peak scatter computed from these independent solutions.

Network solutions combine all data in a common solution. This "let the data speak" meaning the strengths and weaknesses inherent in the data are distributed more realistically. The results are more robust coordinates and more realistic uncertainties.

Do we *really* need another OPUS flavor?

Probably yes.

Weston and Ray have found that OPUS-Net reduces the scatter in the north and east components with no degradation in the height component. Moreover, the resulting coordinates agree better with other sources such as the IGS combinations.

Weston and Ray, "Test of the Use of Regional Networks for OPUS Processing", 2010, EGU General Assembly 2010, Geophysical Research Abstracts.

OPUS-PROJECTS

What Is OPUS-Projects?

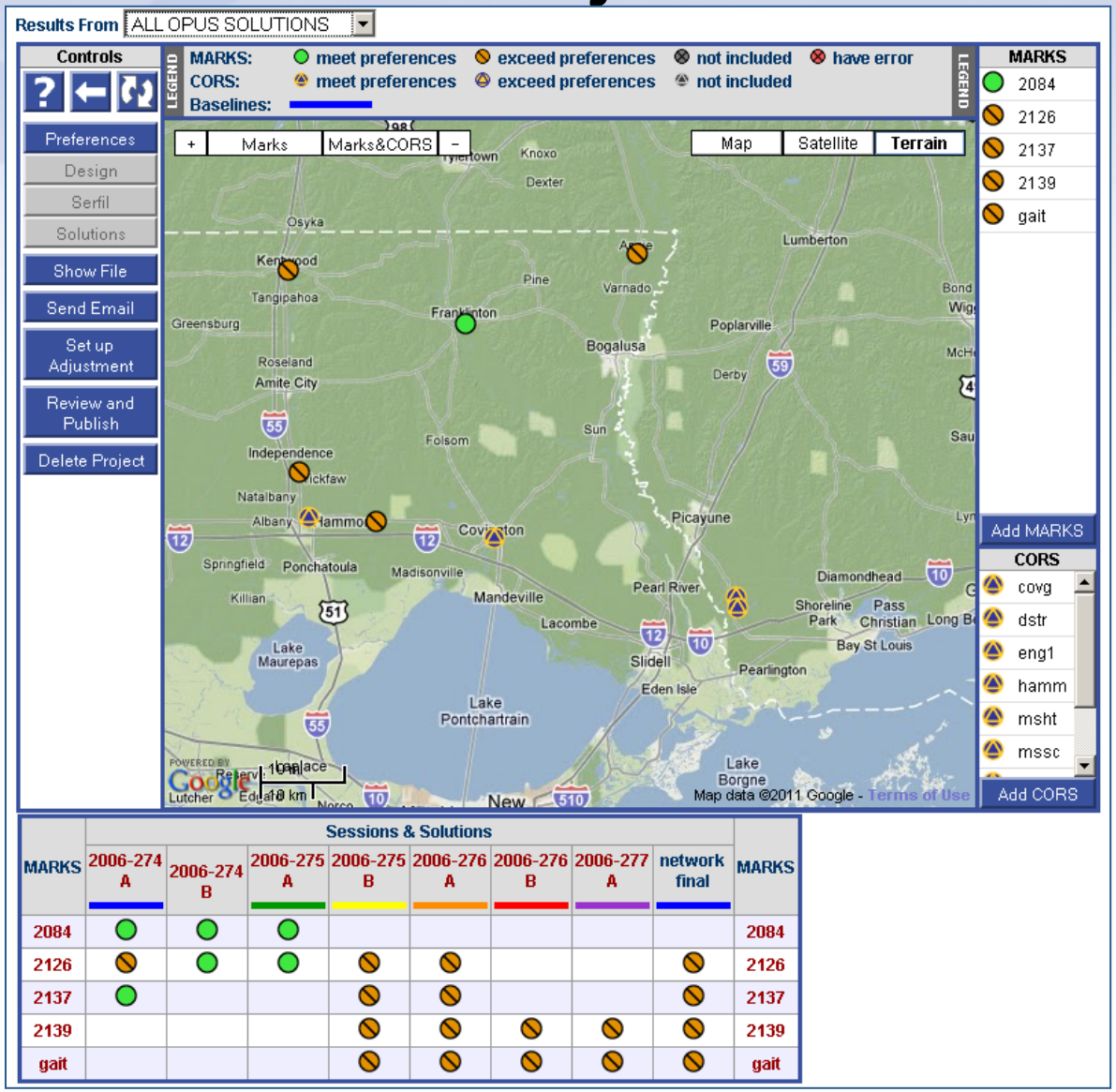
OPUS-Projects gives users web-based access to simple visualization, management and processing tools for multiple sites and multiple occupations. These tools include:

- The advantages of data uploading through OPUS.
- Data visualization and management aids.
- Enhanced data processing using the PAGES suite.
- Solution visualization aids.

Although still in BETA development, OPUS-Projects is available now. The next training workshop is in San Diego in July with more workshops to come.

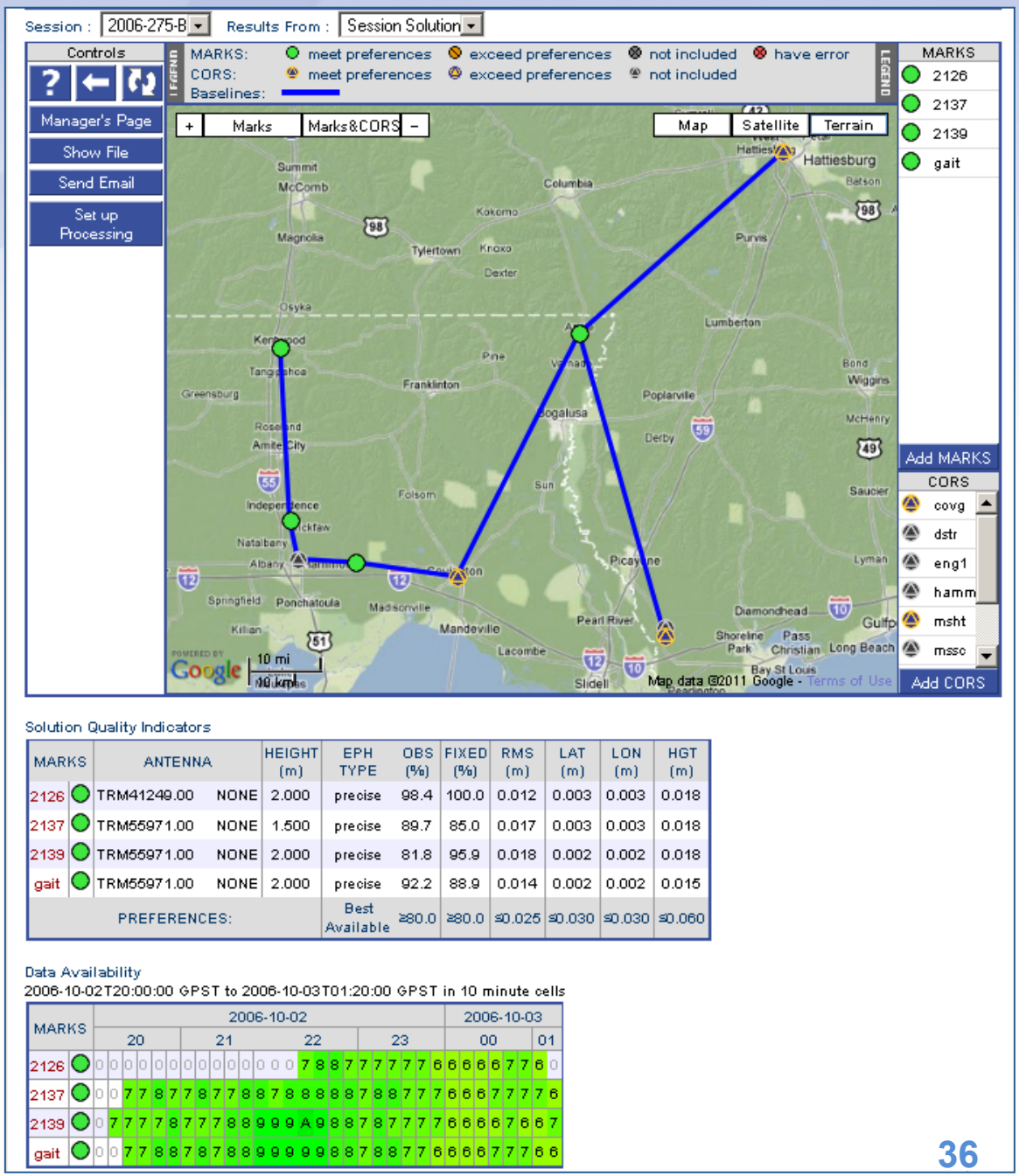
What exactly does OPUS-Projects do?

Once a project is created, field crews can upload their data to the project using OPUS. The field crews will still receive their OPUS reports, but so will the project manager helping him or her to better oversee the project while the data are taken.



Tell me more.

Furthermore, the project manager can immediately begin working with the data: review reports, edit mark descriptions, add CORS data and process "sessions", i.e. collections of project data that overlap in time.



Solution Quality Indicators

MARKS	ANTENNA		HEIGHT (m)	EPH TYPE	OBS (%)	FIXED (%)	RMS (m)	LAT (m)	LON (m)	HGT (m)
2126	TRM41249.00	NONE	2.000	precise	98.4	100.0	0.012	0.003	0.003	0.018
2137	TRM55971.00	NONE	1.500	precise	89.7	85.0	0.017	0.003	0.003	0.018
2139	TRM55971.00	NONE	2.000	precise	81.8	95.9	0.018	0.002	0.002	0.018
gait	TRM55971.00	NONE	2.000	precise	92.2	88.9	0.014	0.002	0.002	0.015
PREFERENCES:				Best Available	≥80.0	≥80.0	≤0.025	≤0.030	≤0.030	≤0.060

Data Availability

2006-10-02T20:00:00 GPST to 2006-10-03T01:20:00 GPST in 10 minute cells

MARKS	2006-10-02				2006-10-03	
	20	21	22	23	00	01
2126	0 0 0 0 0 0 0 0 0 0 0 0 0 0		7 8 8 7 7 7 7 7 7	6 6 6 6 6 7 7 6		0
2137	0 0	7 7 8 7 7 8 7 7 8 8 7 8 8 8 8 8 7 8 8 7 7			6 6 6 6 7 7 7 6	
2139	0	7 7 7 7 8 7 7 7 8 8 9 9 9 A 9 8 8 7 8 7 7 7 7			6 6 6 6 7 6 6 7	
gait	0 0	7 7 8 8 7 8 7 8 8 9 9 9 9 9 8 8 7 8 8 7 7			6 6 6 6 7 7 7 6 6	

What about publishing?

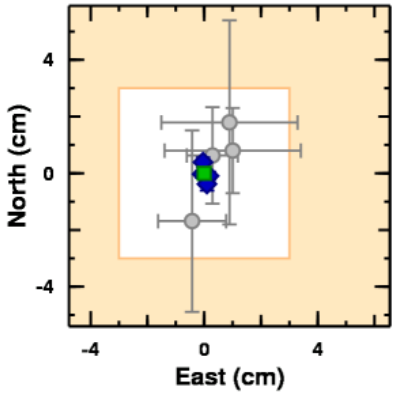
Once the sessions are processed, a network adjustment can be performed giving a self-consistent solution for all marks and all occupations. If desired, this result can be published to OPUS.

MARK 2126 Plotted Solution Results From All Sources

Shaded (orange) areas in the plots are outside the project's preferences. ■ are network solutions. ◆ are session solutions. ● are OPUS solutions.

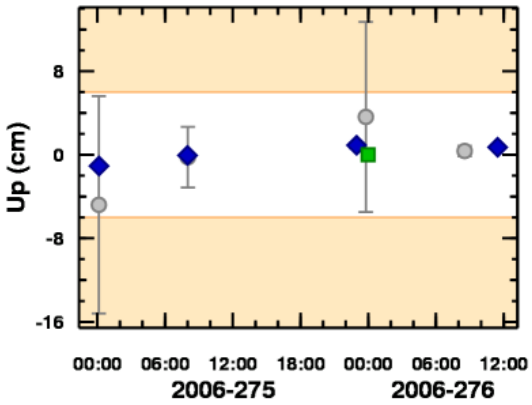
■ NETWORK SOLUTION	EAST (cm)	NORTH (cm)
network-final	0.0 ±0.0	0.0 ±0.1
◆ SESSION SOLUTION	EAST (cm)	NORTH (cm)
2006-274-A	-0.1 ±0.0	0.0 ±0.1
2006-275-A	0.2 ±0.0	-0.1 ±0.1
2006-275-B	0.1 ±0.1	-0.4 ±0.2
2006-276-A	0.0 ±0.0	0.4 ±0.2
● OPUS SOLUTION	EAST (cm)	NORTH (cm)
2126274w.06o	1.0 ±2.4	0.8 ±1.5
2126275g.06o	0.3 ±0.9	0.6 ±1.7
2126275w.06o	-0.4 ±1.2	-1.7 ±3.2
2126276g.06o	0.9 ±2.4	1.8 ±3.6

The (0, 0) point represents W089:48:34.33165 by N30:58:00.79986.

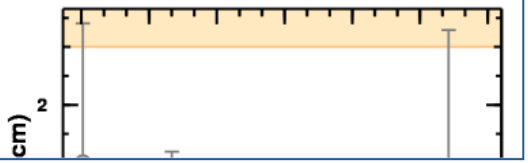


■ NETWORK SOLUTION	EPOCH	UP (cm)
network-final	2006-275T23:59:45 GPST	0.0 ±0.1
◆ SESSION SOLUTION	EPOCH	UP (cm)
2006-274-A	2006-275T00:08:44 GPST	-1.1 ±0.2
2006-275-A	2006-275T07:59:02 GPST	-0.1 ±0.2
2006-275-B	2006-275T22:58:02 GPST	0.9 ±0.3
2006-276-A	2006-276T11:27:49 GPST	0.7 ±0.2
● OPUS SOLUTION	EPOCH	UP (cm)
2126274w.06o	2006-275T00:07:55 GPST	-4.8 ±10.4
2126275g.06o	2006-275T08:00:57 GPST	-0.2 ±2.9
2126275w.06o	2006-275T23:47:02 GPST	3.6 ±9.1
2126276g.06o	2006-276T08:32:38 GPST	0.4 ±0.5

The UP 0 point represents 14.03368 m.



■ NETWORK SOLUTION	EPOCH	EAST (cm)
network-final	2006-275T23:59:45 GPST	0.0 ±0.0
◆ SESSION SOLUTION	EPOCH	EAST (cm)
2006-274-A	2006-275T00:08:44 GPST	-0.1 ±0.0
2006-275-A	2006-275T07:59:02 GPST	0.2 ±0.0



Do we *really* need another OPUS flavor?

The practical answer is probably yes.
The NGS and other groups have a history of project's whose specifications can't be entirely supported by OPUS.

The academic answer is probably yes.
As good as OPUS does, and that is very good, sacrificing simplicity for flexibility can improve results.

OPUS Products

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