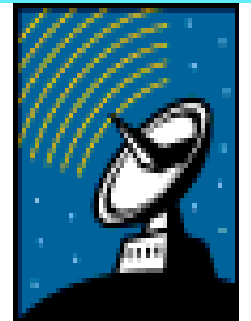
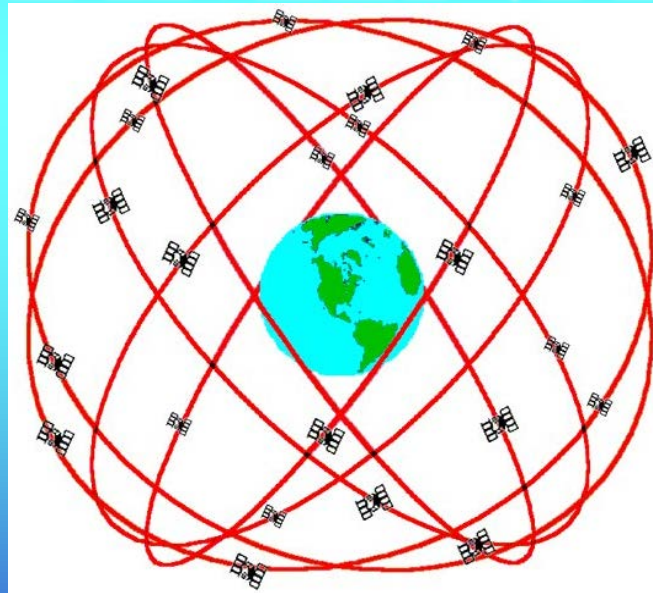


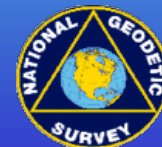
# NGS GPS ORBIT DETERMINATION



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National Ocean Service

National Geodetic Survey



# NGS ORBIT PRODUCTS

## I. Constrained Precise GPS Orbit:

- Up to 53 constrained IGS fiducial tracking sites in the IGS 2000, epoch 1998.0 reference frame
- Available – 3 to 6 days from the date of observation
- Contact – <http://www.ngs.noaa.gov/GPS/NGSorbs/precise>
- Accuracy – approximately 3 - 6 centimeters



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# NGS ORBIT PRODUCTS

## (CONTINUED)

### II. Minimally Constrained Precise GPS Orbit:

- A consistent minimally constrained weekly solution in the IGS 2000, epoch 1998.0 reference frame
- Available – 4 to 10 days from date of observation
- Contact – <ftp://gracie.grdl.noaa.gov/dist/cignet/Ngsorbits>
- Accuracy – approximately 4 – 7 centimeters



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# NGS ORBIT PRODUCTS

## (CONTINUED)

### III. Rapid GPS Orbit:

- Up to 53 constrained IGS fiducial tracking sites in the IGS 2000, epoch 1998.0 reference frame
- Available – 16 hours from last observation
- Contact – <ftp://www.ngs.noaa.gov/cors/orbits/rapid>
- Accuracy – approximately 4 - 7 centimeters



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# NGS ORBIT PRODUCTS

(CONTINUED)

## IV. Ultra-Rapid GPS Orbit:

- A constrained estimated/predicted solution in the IGS 2000, epoch 1998.0 reference frame
- Available – within 2 to 3 hours from last observation
- Contact – under development
- Accuracy – approximately 20 - 40 centimeters



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# NGS ORBIT PRODUCTS

(CONTINUED)

## V. Earth Rotational Parameters:

- Rapid and precise polar motion values
- Available – 16 hours from the date of the last observation
- Recipients – Bureau International de L'Heure (BIH), United States Naval Observatory (USNO), International GPS Service (IGS)
- Accuracy – approximately 0.25 milli-arcseconds



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# NGS ORBIT PRODUCTS

(CONTINUED)

## VI. Tropospheric estimates in the Zenith path delay (ZPD) correction:

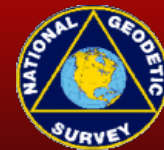
- Available – 4 to 10 days from the date of observation
- Recipient – Geo Forschungs Zentrum, Potsdam, Germany  
International GPS Service (IGS)
- Accuracy – approximately 2-5 millimeters



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# NGS ORBIT PRODUCTS

## (CONTINUED)

### VII. GPS Broadcast Orbital Parameters:

- Globally collected daily GPS broadcast parameter file
- Available - 24 hours from the date of the last observation
- Contact – by request
- Accuracy – approximately 5 meters



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# GPS is a satellite navigation system which consists of three parts:

## I. Space Segment



## II. Control Segment



## III. User Segment



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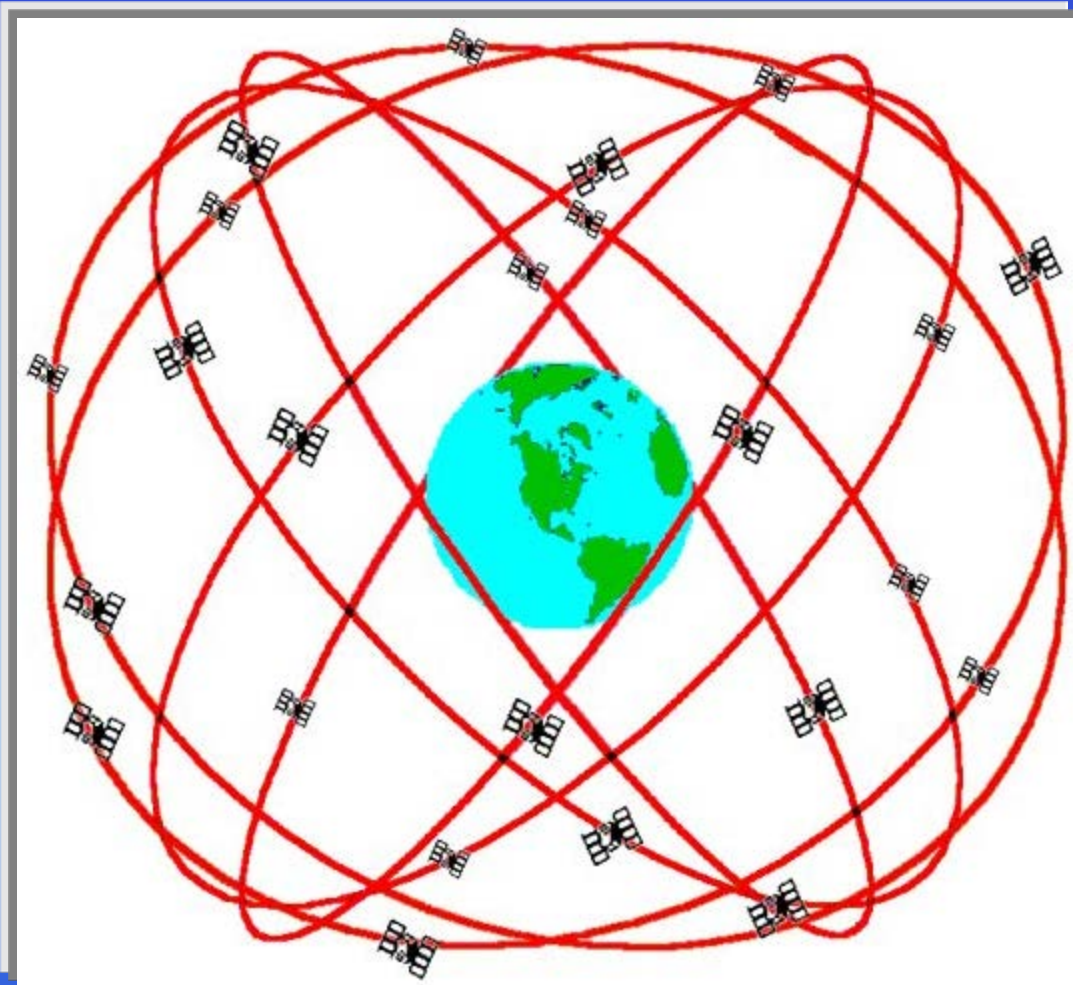
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# I. SPACE SEGMENT



**GPS Nominal Constellation**

**28 Satellites in 6 Orbital  
Planes**

**4 Satellites in each plane**

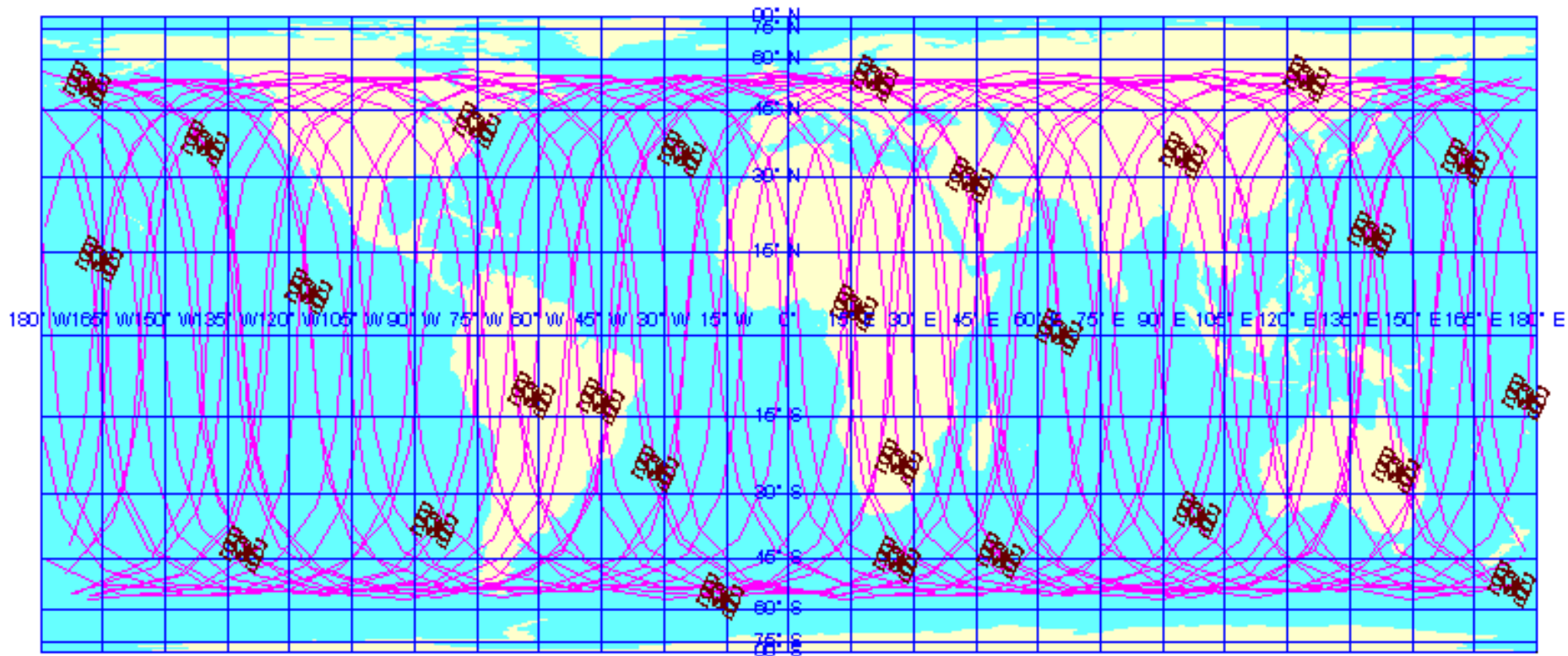
**20,200 km Altitudes, 55  
Degree Inclination**



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# I. SPACE SEGMENT (CONTINUED)



Global Positioning System Satellites and Orbits  
for 27 Operational Satellites on September 29, 1998

Satellite Positions at 00:00:00 9/29/98 with 24 hours (2 orbits) of Ground Tracks to 00:00:00 9/30/98



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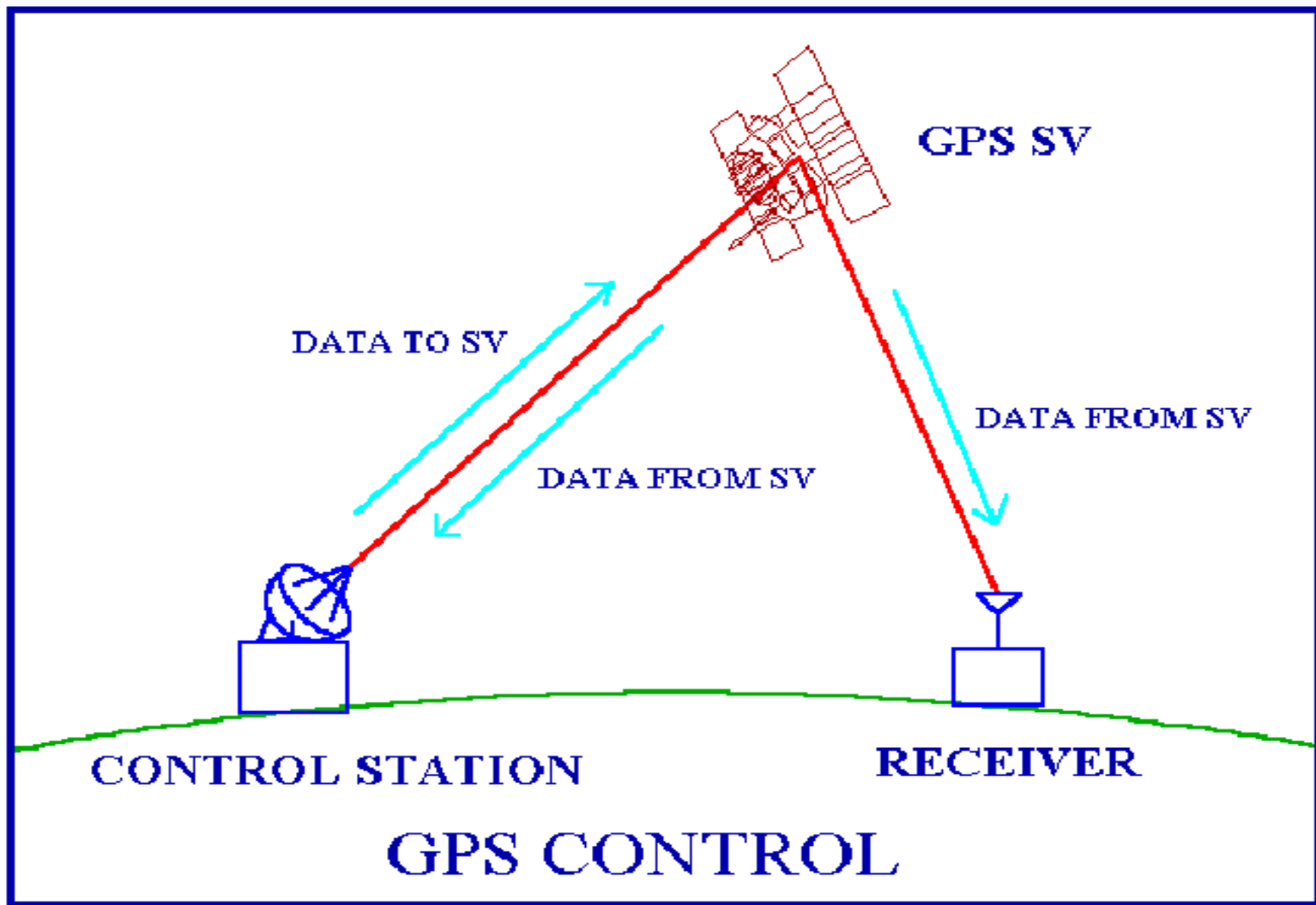
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# II. CONTROL SEGMENT



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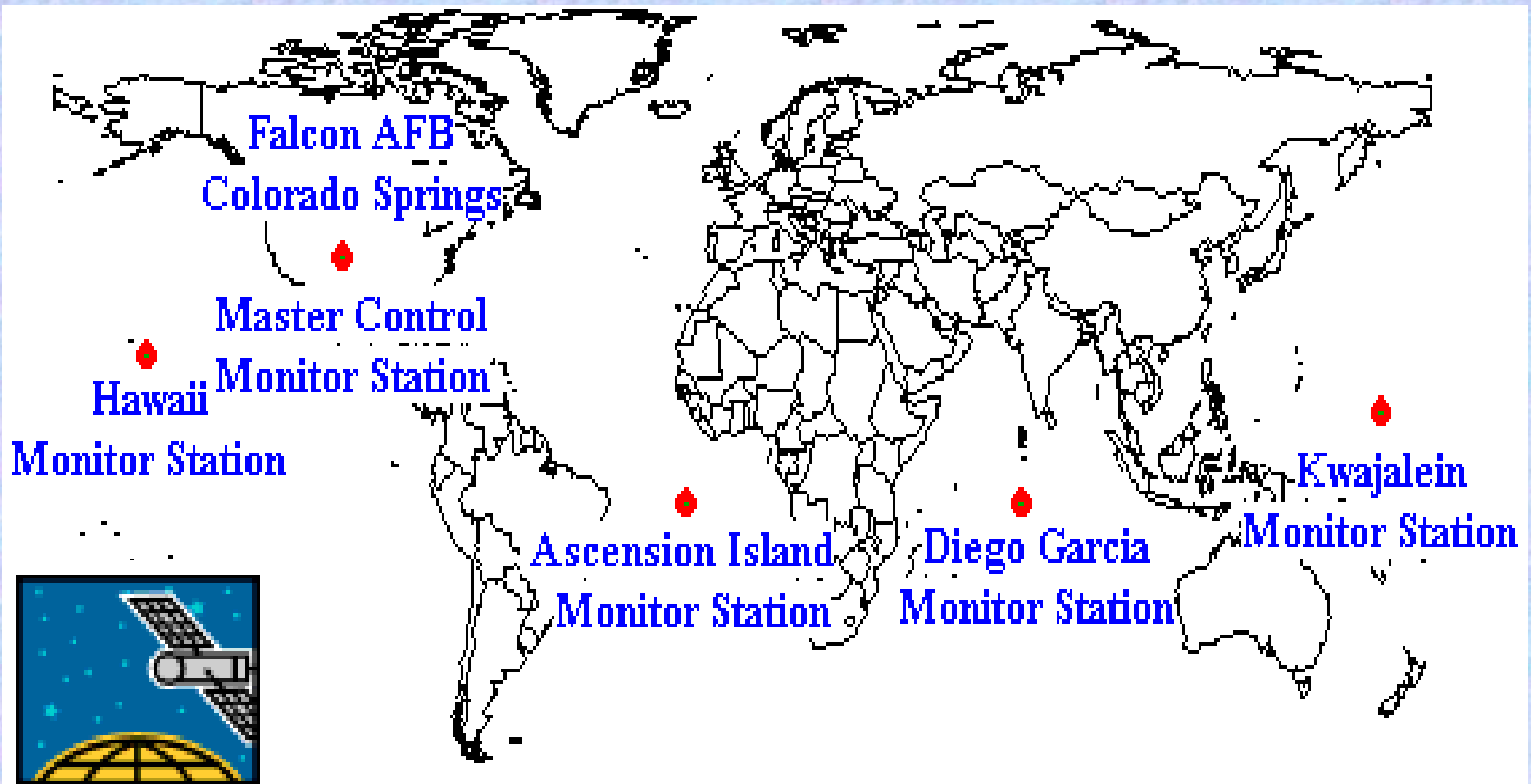
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# II. CONTROL SEGMENT (CONTINUED)



**Global Positioning System (GPS) Master Control and Monitor Station Network**



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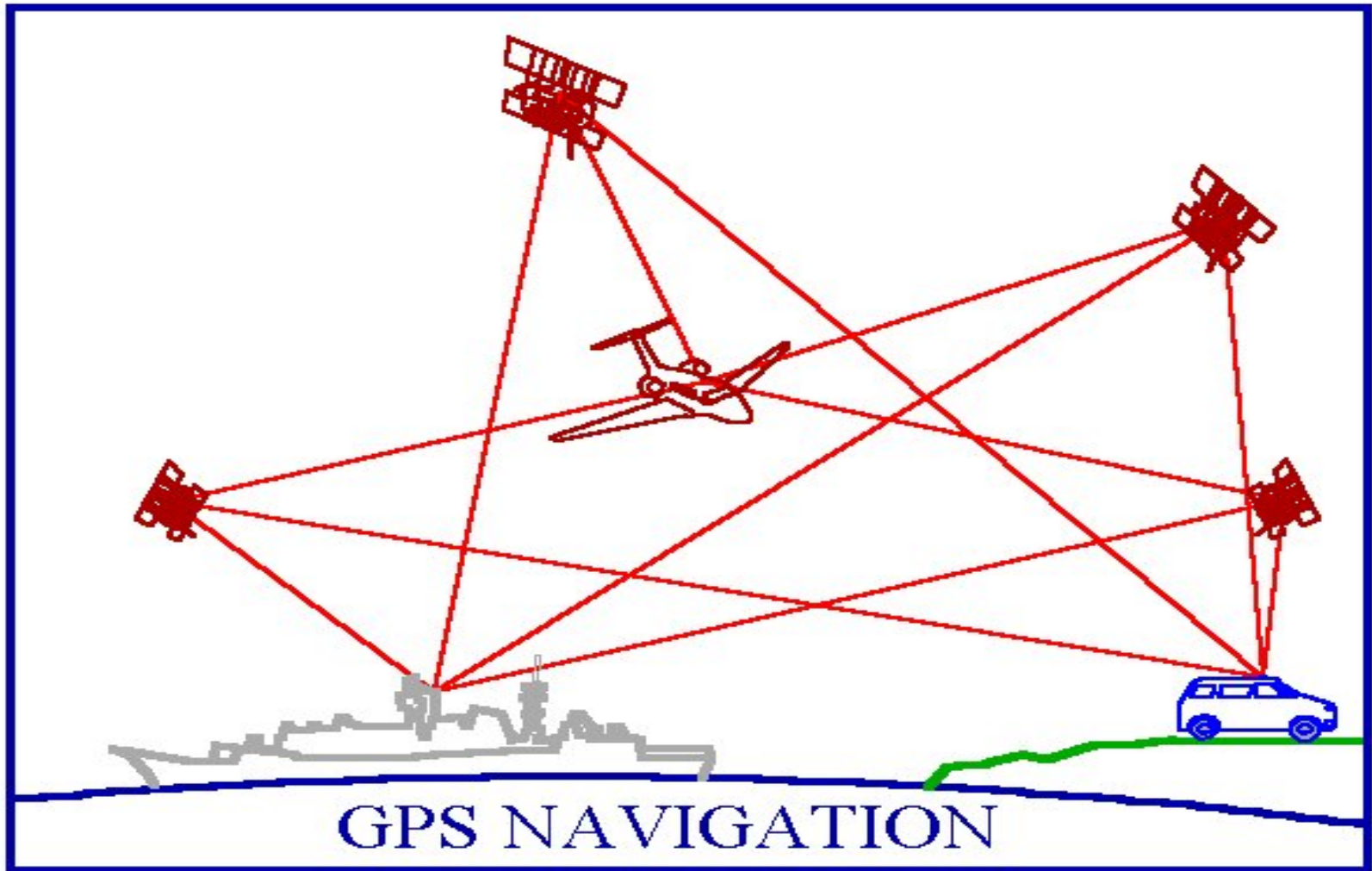
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# III. USER SEGMENT



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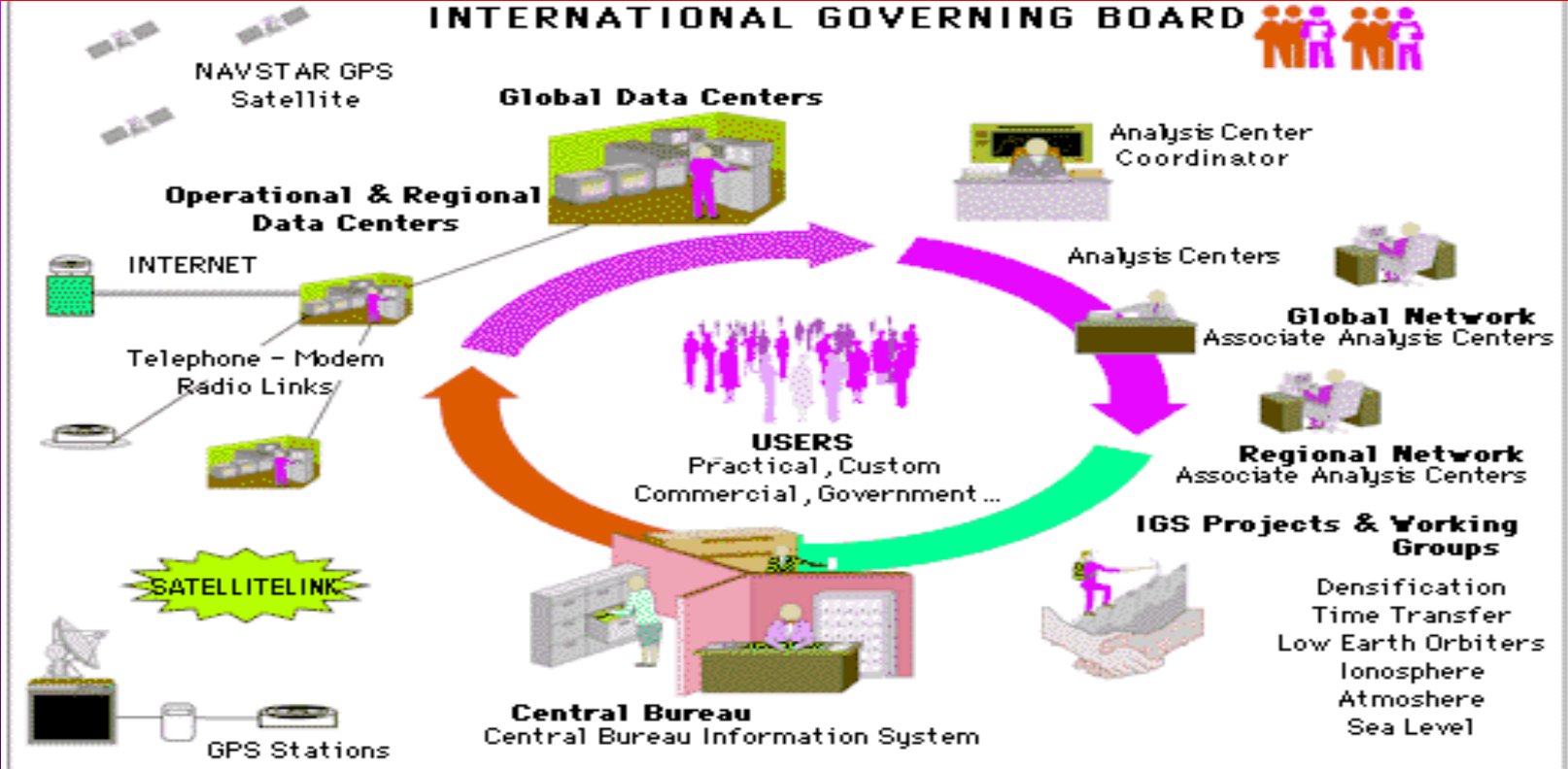
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# INTERNATIONAL GPS SERVICE

*Monitoring Global Change  
By Satellite  
Tracking*

ABOUT IGS ORGANIZATION FAQs FTP ARCHIVES WEBSITE INDEX WHAT'S NEW  
MAIL DATA & PRODUCTS TRACKING NETWORK NEW PROJECTS & APPLICATIONS

## INTERNATIONAL GOVERNING BOARD





# International GPS Service Trivia

- Web Site – <http://igs.cb.jpl.nasa.gov>
- Founded in 1993
- Currently 8 contributing analysis centers
- Organized Global Data Centers (over 360 fiducial tracking sites, Site information logs)
  - Continuously tracking
  - Dual - frequency
  - High quality clocks
  - Internet accessibility
  - Accurate coordinates in the most current ITRF



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# International GPS Service Trivia (CONTINUED)

## ➤ **Combination Products**

- **Orbits**
- **Satellite and station clock information**
- **Earth Rotation Parameters**
- **Tropospheric information**



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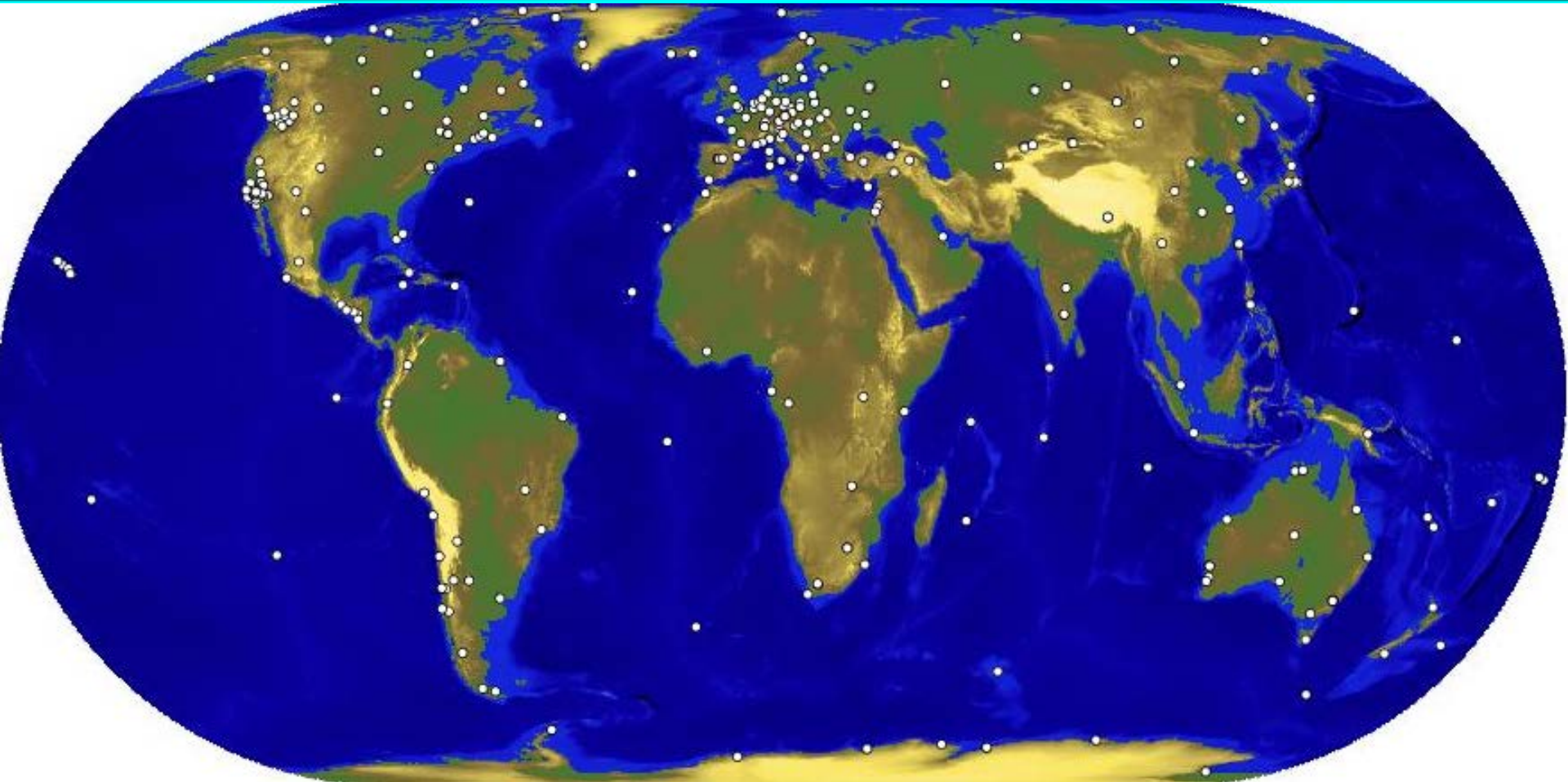
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# IGS Fiducial Site Coverage



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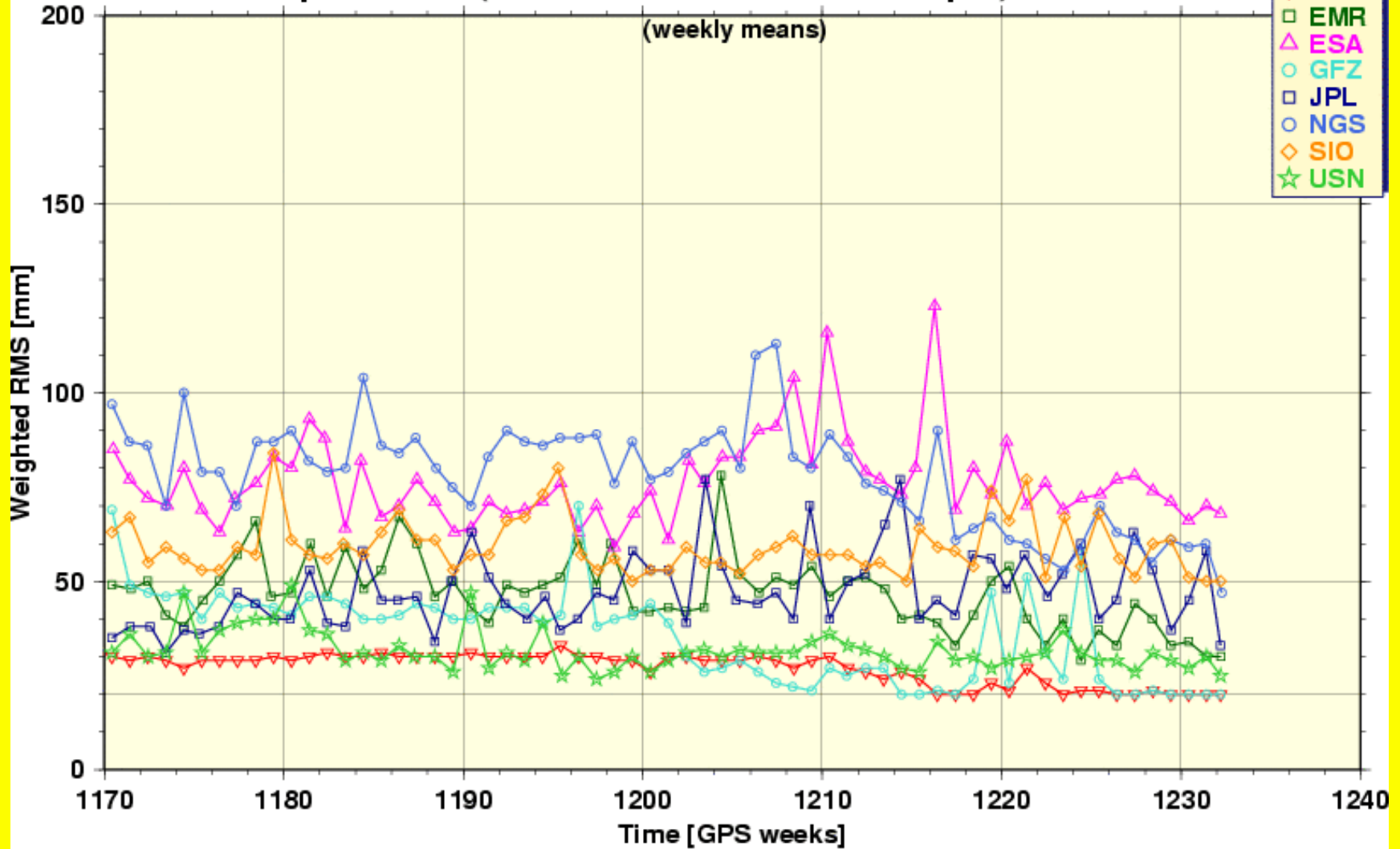
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# Rapid Orbits (AC solutions minus IGS Rapid)



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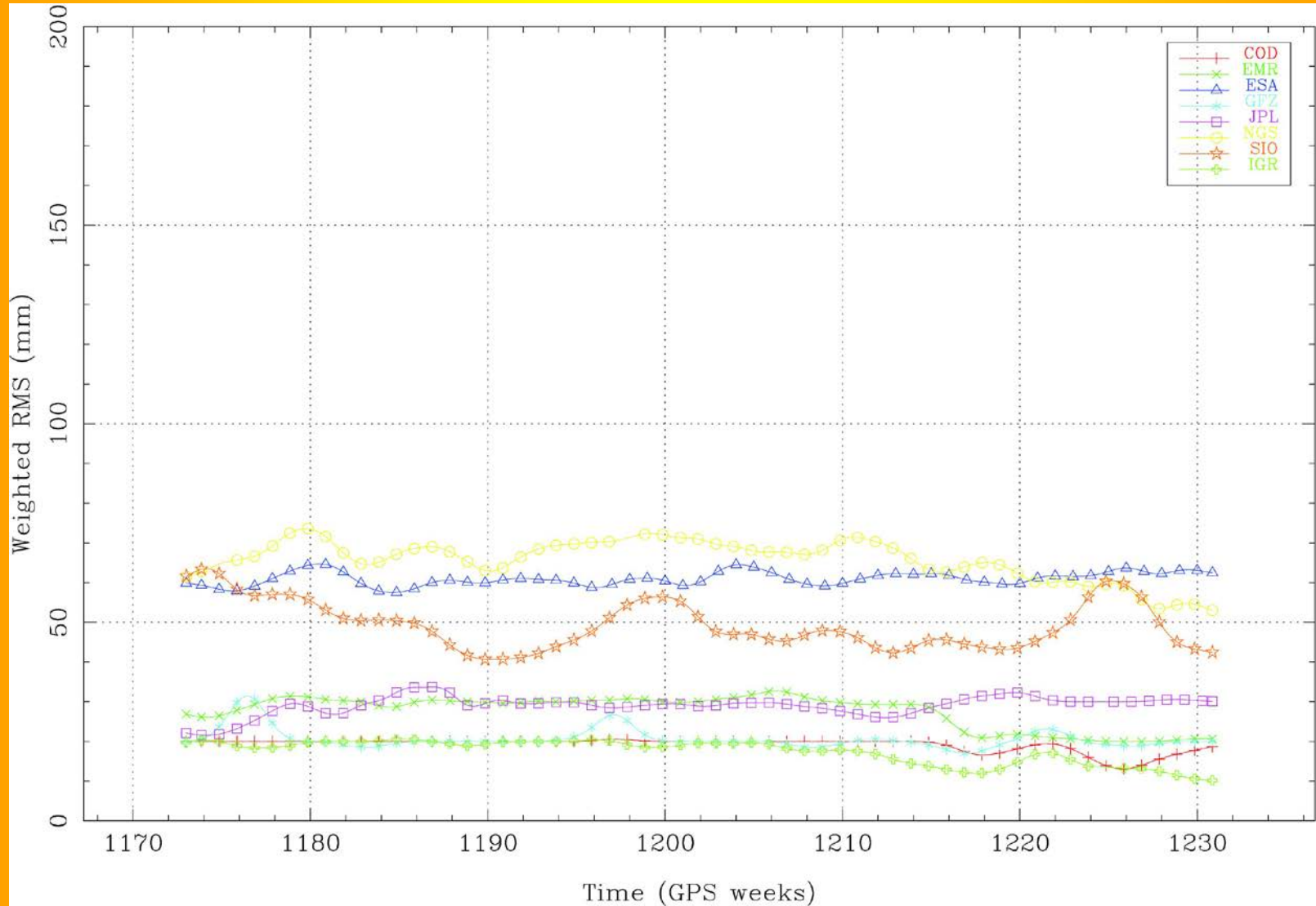
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# Precise Orbits (AC Solutions minus IGS Final)



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# NGS ORBIT DETERMINATION SOFTWARE

- **ARC** - Written by MIT – creates a priori orbit
- **STREE** – Selects an independent baseline network
- **MERGEDB** – Creates a processing database from RINEX files
- **REFPRN** – Automated reference satellite selection for double-difference processing



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# NGS ORBIT DETERMINATION SOFTWARE (continued)

- **EDITDB** – Automated double-difference phase data editor
- **BDATA** – Applies editing instructions to a database
- **PAGES** – Program for the Adjustment of GPS Ephemerides
- **GPSCOM** – Combines normal equation files into a weekly combination for a consistent set of station positions



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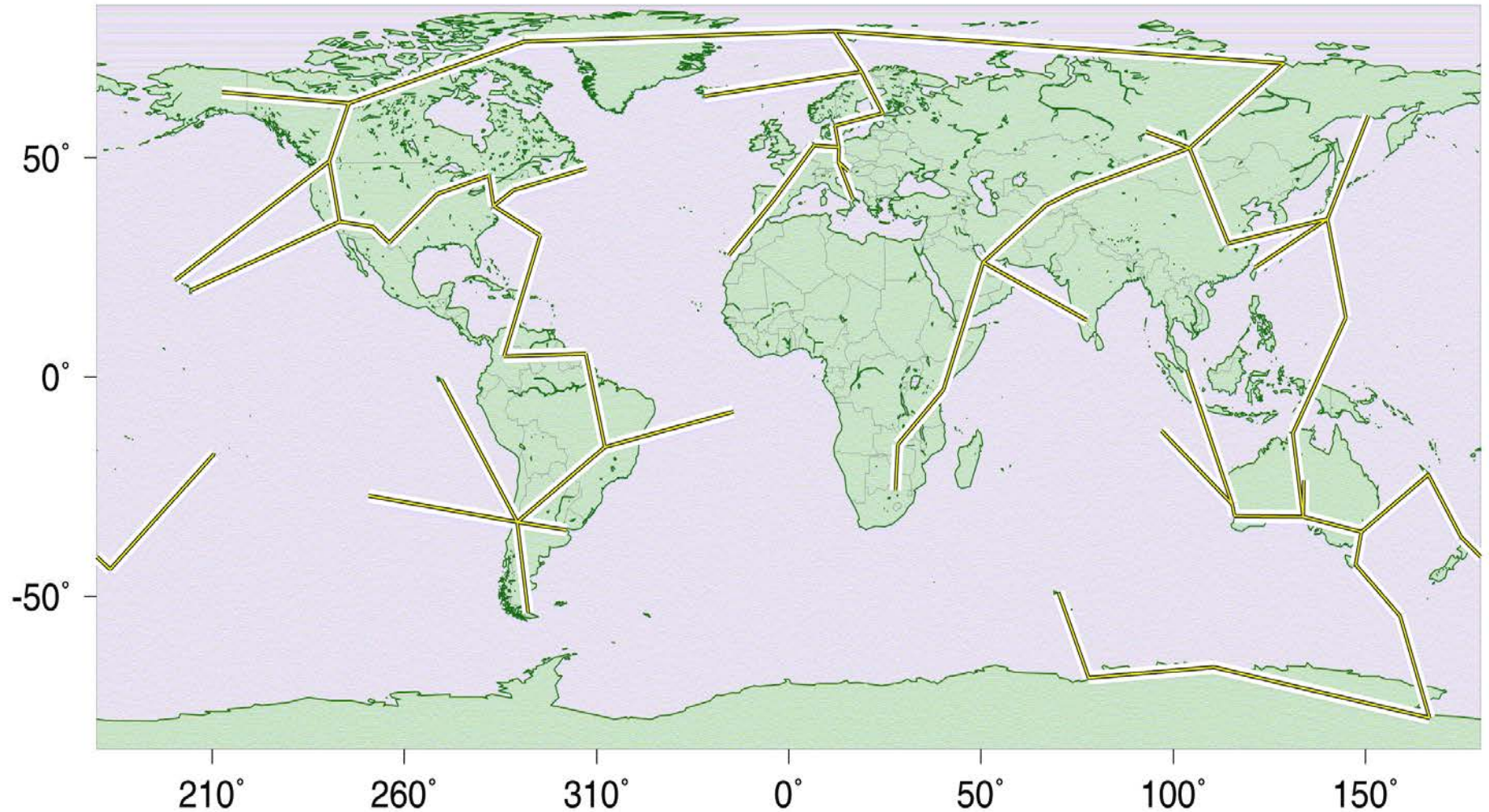
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# Precise Network for 27 August 2003



**PAGES: Processes double-difference, dual-frequency phase data. Determines satellite positions and velocities and radiation pressure scaling factors.**



Earth at Night  
More information available at:  
<http://antwrp.gsfc.nasa.gov/apod/ap001127.html>



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Astronomy Picture of the Day  
2000 November 27  
[/antwrp.gsfc.nasa.gov/apod/astropix.html](http://antwrp.gsfc.nasa.gov/apod/astropix.html)

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