

IGS Tutorial
Data Centers
and
Data Access

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IGS DATA CENTERS

- **Data Centers supporting the flow of IGS data and products are divided into three categories:**
 - Operational
 - Regional
 - Global
- **Hierarchy of data centers allows for**
 - Redundancy and backup
 - Reduction in network traffic
- **Operational data centers download data from tracking stations**
- **Regional data centers provide access to data from a geographic region (e.g., Australia, Europe)**
- **Global data centers provide access to data and products to IGS and user community in general**

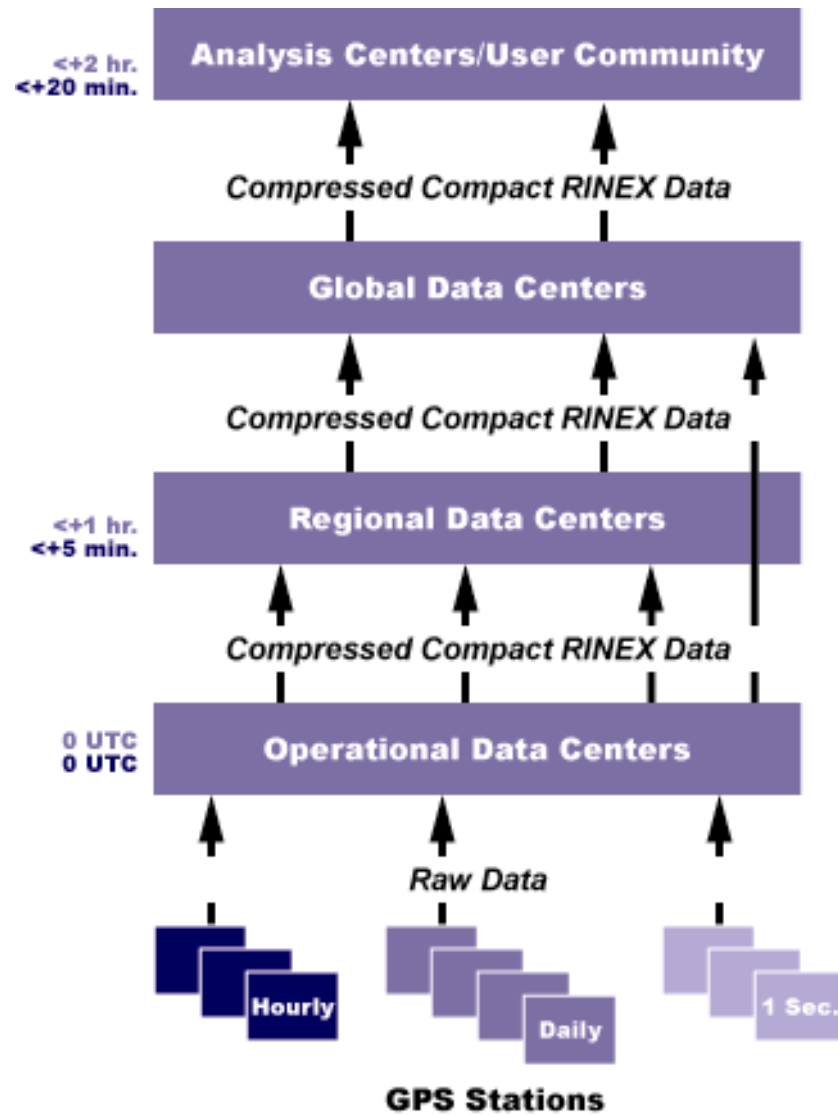


IGS DATA CENTERS (Continued)

- **Operational Data Centers**
 - ASI Italian Space Agency
 - AUSLIG Australian Surveying and Land Information Group
 - AWI Alfred Wegener Institute for Polar and Marine Research, Germany
 - CNES Centre National d'Etudes Spatiales, France
 - DSN Deep Space Network, USA
 - DUT Delft University of Technology, The Netherlands
 - ESOC European Space Agency (ESA) Space Operations Center, Germany
 - GFZ GeoForschungsZentrum Germany
 - GSI Geographical Survey Institute, Japan
 - ISR Institute for Space Research, Austria
 - JPL Jet Propulsion Laboratory, USA
 - KAO Korean Astronomical Observatory
 - NGI National Geography Institute, South Korea
 - NIMA National Image and Mapping Agency, USA
 - NMA Norwegian Mapping Authority
 - NOAA National Oceanic and Atmospheric Administration, USA
 - NRCan Natural Resources Canada
 - RDAAC Regional GPS Data Acquisition/Analysis Center, Russia
 - SIO Scripps Institution of Oceanography, USA
 - UNAVCO University NAVSTAR Consortium, USA
 - USGS United States Geological Survey
- **Regional Data Centers**
 - AUSLIG Australian Land Information Group
 - BKG Bundesamt für Kartographie und Geodäsie, Germany
 - JPL Jet Propulsion Laboratory, USA
 - NOAA National Oceanic and Atmospheric Administration, USA
 - NRCan Natural Resources Canada
- **Global Data Centers**
 - CDDIS Crustal Dynamics Data Information System, NASA GSFC, USA
 - IGN Institut Géographique National, France
 - SIO Scripps Institution of Oceanography, USA



IGS DATA FLOW





IGS DATA

- **“Classic” GPS data product**
 - Daily (24 hour time span) files (00:00 UTC to 23:30 UTC)
 - 30 second sampling rate
 - Compressed (UNIX), compact (Hatanaka) RINEX format
 - Typically available at Global Data Centers within 1 to 4 hours
 - ~150 stations at CDDIS
 - ~0.3 Mbytes/site/day (compressed Hatanaka format)
- **Near real-time GPS data product**
 - Hourly files (1 hour time span)
 - 30 second sampling rate
 - Compressed (UNIX), compact (Hatanaka) RINEX format
 - Typically available at Global Data Centers within 5 to 15 minutes
 - 40-45 stations
 - Retained for limited time (e.g., 3 days)
 - No QC performed on incoming data



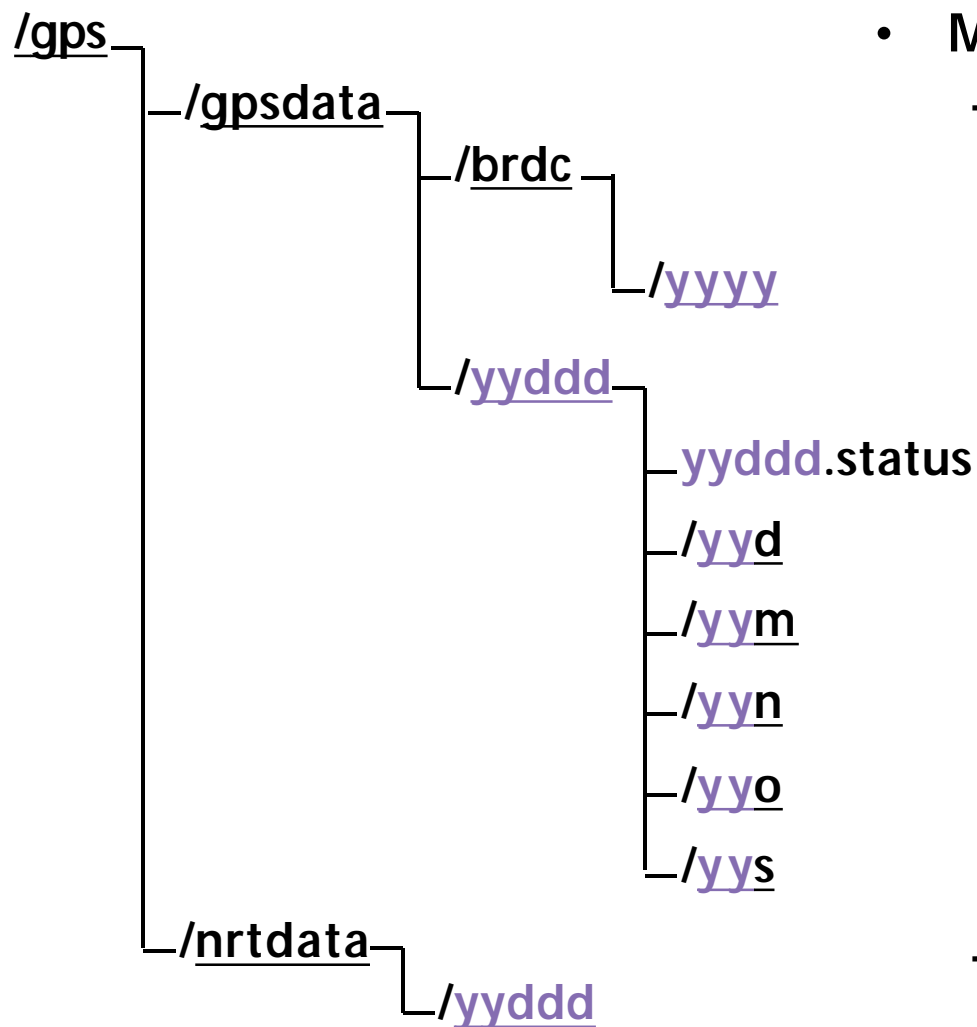
IGS DATA (Continued)

- File formats
 - RINEX V2 format for observation, navigation, and met data
 - Observation data compacted using Hatanka software (available at IGS CB) and then UNIX compressed
 - Filenames in lowercase (except for the .Z)
- Files named **ssssddd#.yyt.Z** where
 - **ssss** is 4-character monument ID for site
 - **ddd** is 3-digit day of year
 - **#** file sequence number for the day
 - 0 indicates file contains all data for data day
 - 1, 2, ... for partial files of daily data
 - a, b, c, ... x for hourly files
 - **yy** is 2-digit year
 - **t** is file type
 - o is observation file
 - n is GPS navigation file
 - m is meteorological data file
 - s is summary file containing data quality information



GPS DATA DIRECTORY STRUCTURE

(CDDIS Example)



- Main GPS filesystem
 - GPS daily data subdirectory
 - Concatenated broadcast ephemerides
 - Yearly subdirectory (`yyyy` is year)
 - Daily GPS data subdirectories by year (`yy`) and day of year (`ddd`)
 - Daily GPS summary file
 - Compact RINEX observation files
 - RINEX meteorological data
 - RINEX broadcast navigation data
 - RINEX observation files
 - TEOC summary files
 - GPS hourly data subdirectory
 - Hourly GPS data subdirectories by year (`yy`) and day of year (`ddd`)



IGS PRODUCTS

- **Precise orbits, etc.**
 - Seven ACs produce precise orbits, clocks, ERP and station positions
 - Nine AACs produce station positions
 - Combined IGS orbit (10 day delay) and combined IGS ERP (10 day delay)
 - Rapid orbits (17 hour delay)
 - Predicted orbits (1 hour prior to observation day)
- **Ionosphere**
 - Global ionosphere maps of total electron content (TEC) in IONEX format
 - Daily files by analysis center
 - Five ACs currently participating since June 1998
- **Troposphere**
 - Combined zenith path delay (ZPD) calculated by GFZ since January 1997
 - Weekly files by site



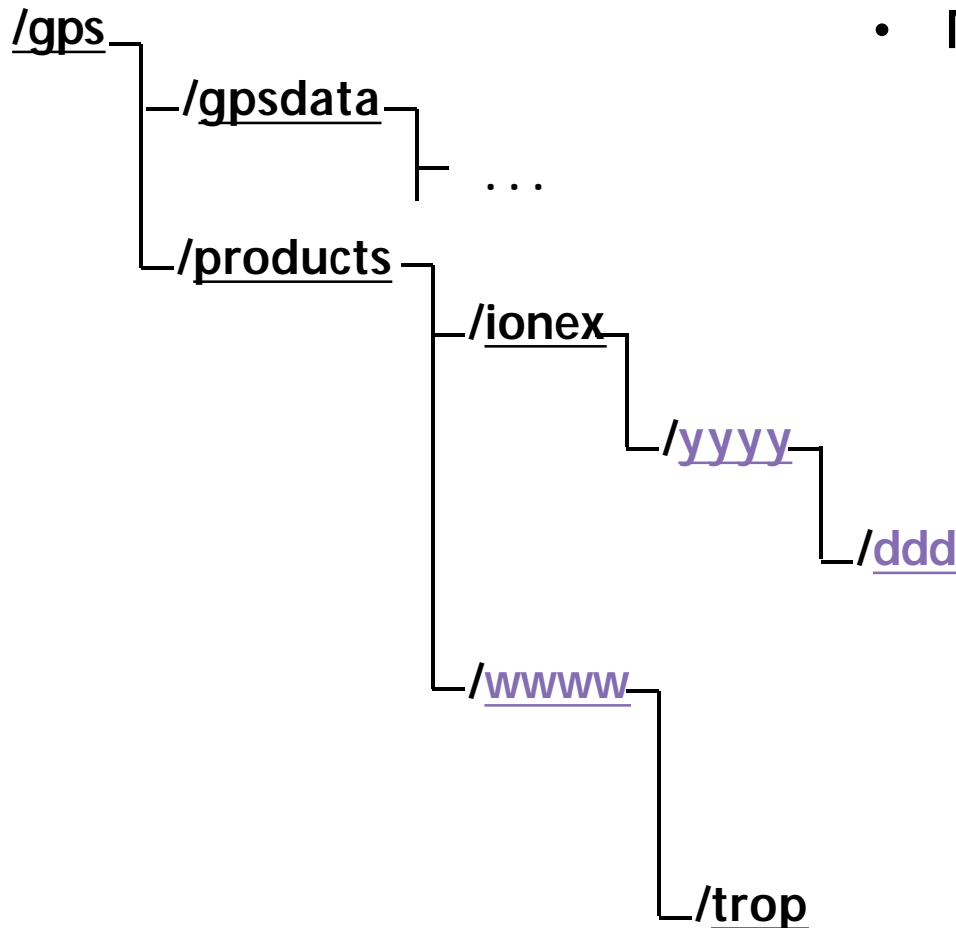
IGS PRODUCTS (Continued)

- File formats
 - SP3 for precise orbit files
 - IGS defined formats for ERP and clock files
 - SINEX for station positions
 - All files UNIX compressed
 - Filenames in lowercase (except for the .Z)
- Solution files named **ssswww#.typ.Z** where
 - **sss** is 3-character source
 - **www** is 4-digit GPS week number
 - **#** day of the week
 - 0 for Sunday, ... 6 for Saturday
 - 7 indicates data spans entire week
 - **typ** is the data type
 - sp3 or eph is an orbit file
 - erp is Earth rotation parameter data
 - clk is a file containing clock data
 - snx is a file containing precise coordinates
 - ssc is file containing precise coordinates without supporting matrices
 - sum is a summary file detailing analysis information



GPS PRODUCT DIRECTORY STRUCTURE

(CDDIS Example)



- Main GPS filesystem
 - GPS data subdirectory
 - GPS product subdirectory
 - Ionosphere products in IONEX format
 - Yearly subdirectory (yyyy is year)
 - » Daily IONEX files by day of year (ddd)
 - Orbit (SP3 format), clock, ERP, and station coordinate (SINEX format) products in subdirectories by GPS week (wwww)
 - Troposphere (zenith path delay, ZPD) product subdirectory



ANCILLARY FILES (CDDIS)

- Summary files to quickly view current data availability
- Daily status files (**yyddd.status**)
 - Contains statistics on data points, cycle slips, etc.
 - Extracts info from RINEX header
 - Equipment
 - Antenna height
 - DOMES number
 - etc.
 - In daily data directories (`/gps/gpdata/yyddd`)
- Data holdings summaries
 - Availability of daily data files
(ftp://cddisa.gsfc.nasa.gov/pub/reports/gpsdata/check_import.cddisa_01)
 - Availability of hourly data files
(ftp://cddisa.gsfc.nasa.gov/pub/reports/gpsdata/check_hourly.cddisa)



USE of IGS DATA and PRODUCTS

- **Pick a data center**
 - Regional vs. global
 - Do I need global coverage? Yes => GDC
 - Do I need data from a particular region? Yes => RDC
 - Access instructions
 - <ftp://igscb.jpl.nasa.gov/igscb/center/data/>
- **Get formats for data and products**
 - <ftp://igscb.jpl.nasa.gov/igscb/data/format/>
- **Get software (e.g., Hatanaka, UNIX compress)**
 - <ftp://igscb.jpl.nasa.gov/igscb/software/>



QUESTIONS?

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