GGOS

Global Geodetic Observing System

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(on behalf of GGOS)

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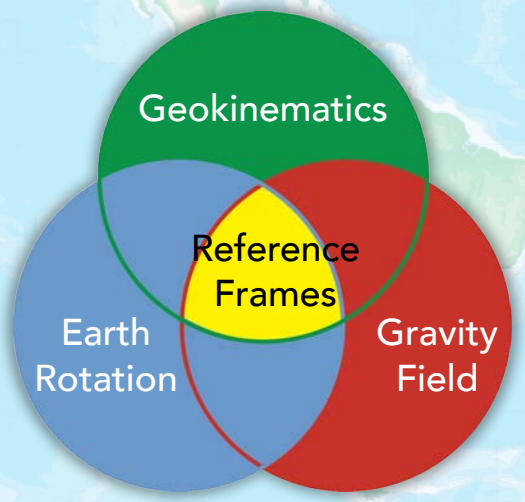
Global Geodetic Observing System

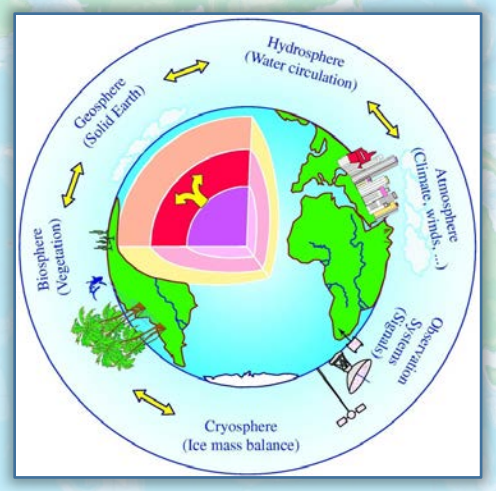
- Observing System of the International Association of Geodesy (IAG)
- Vision: Advance our understanding of the dynamic Earth system by quantifying our planet's changes in space and time
- GGOS works with IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and for global change research
- Partner member of WDS since January 2016
  - Extensive cooperation with other WDS network members (IGS, ILRS, IVS, IDS, etc.) and regular members (e.g., CDDIS)

Geodesy 101

- Geodesy measures:
  1. Shape/geometry of the Earth
     - Topography, bathymetry, ice surface, sea level
  2. Orientation of the Earth in space
     - Polar motion, Earth rotation, nutation, precession
  3. Gravity field of the Earth
     - Gravity, geoid

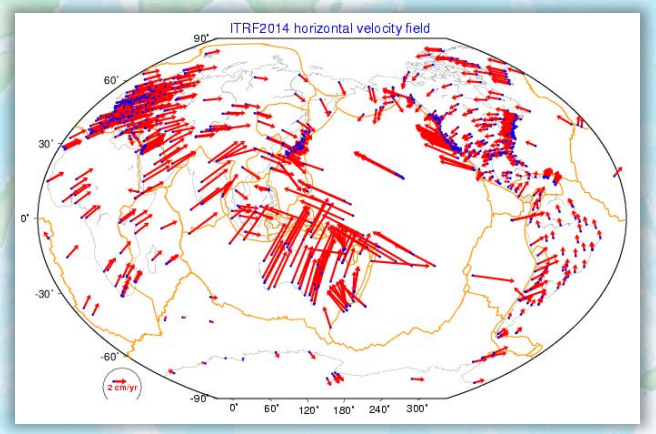


- Space geodesy:
  - Making these measurements between ground-based instruments and objects in space
  - Geodetic techniques observe the components of the System Earth:
    - Solid Earth (deformation, gravity)
    - Atmosphere (signal travel time)
    - Hydrosphere (gravity, altimetry)
    - Cryosphere (laser/radar scanning)



Space geodesy: Motivation

- Everything is moving!
- Earth processes can have a devastating impact on our society and our economies (earthquakes, rising sea level, floods, drought, storms, tsunamis, etc.)
- Geodesy monitors the Earth system, e.g.,
  - Plate motions
  - Solid Earth loading phenomena (ice, ocean, atmosphere)
  - Earthquakes …
- Space geodesy networks are fundamental to monitor and understand Earth processes for both ground and space measurements



http://itrf.ign.fr

GGOS: Cooperative operation

- GGOS relies upon cooperation and participation of the IAG services
  - Networks of observing stations, providing data
  - Analysis centers, generating products
  - Data centers, archiving data and products
  - User community, utilizing data and products for research and applications
- Data and derived products managed by long-term archives
  - Several both network and regular members of WDS
  - Open data policy
  - Utilize ISO standards where applicable

International geodetic services

- IAG established international, cooperative partnerships to facilitate research
- Services function as "cooperating federations" dedicated to a particular type of data
- Provide data and products on an operational basis to geodesy analysts as well as a broader scientific community
- Examples of a successful model of community management:
  - Develop standards
  - Self-regulating
  - Define and deliver products using pre-determined schedules
- Successful operation through cooperation of many international organizations who leverage their respective limited resources to all levels of service functionality

IGS

International Laser Ranging Service

IVS

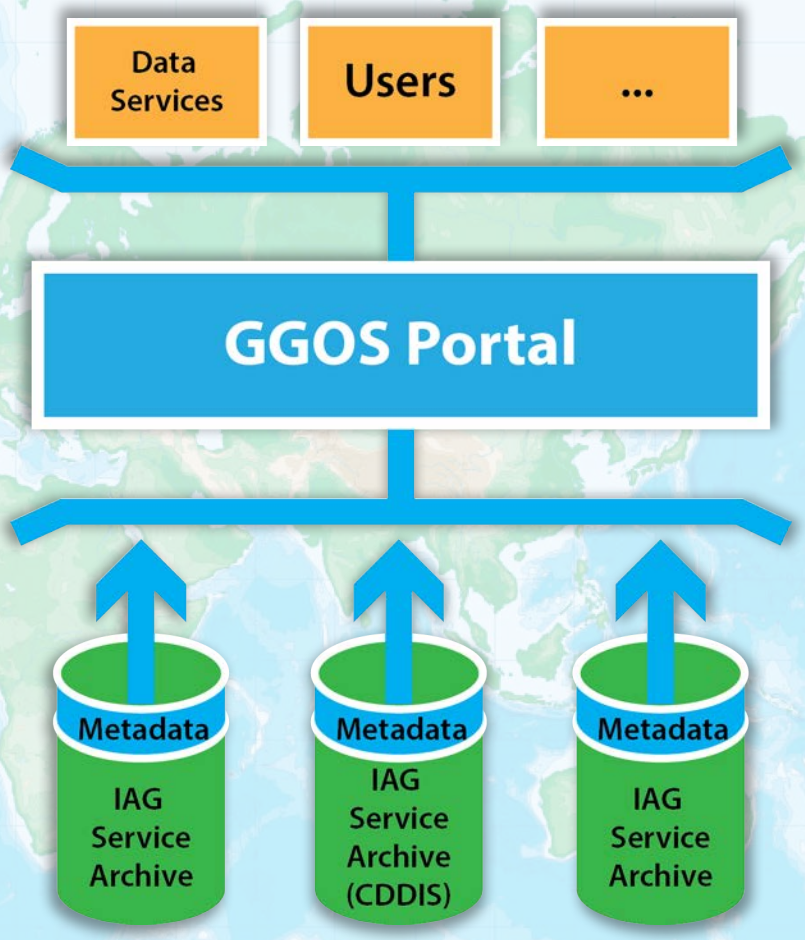
IDS

All are network members of →

ICSU WORLD DATA SYSTEM

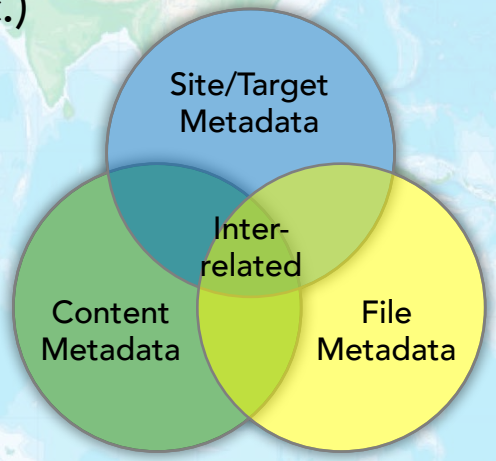
GGOS Portal: Data discovery

- GGOS information
  - GGOS focus areas
  - Science topics
- Access
  - Discovery: search data/product catalogs
  - Map viewer: display data
  - Applications: data mining of GGOS products



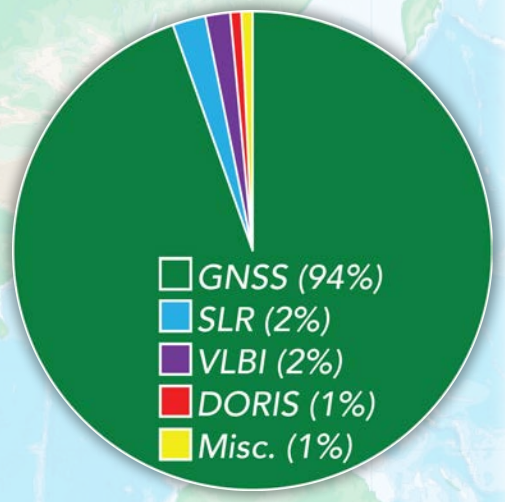
GGOS: Metadata efforts

- Efforts within Standing Committee on Data and Information (part of GGOS Bureau of Networks and Communications)
  - Establishing a Metadata Working Group to help formulate a plan for GGOS metadata and advise on implementation
- Metadata implementation essential to GGOS Portal and will focus on data products and descriptive information
- Developing a proposal for a "GGOS Metadata Schema" for review within the MWG and the services
  - Compatible with standards (ISO 19115, EOSDIS, etc.) and new efforts (eGeodesy)
- Incorporate additional metadata required by IAG services
  - Station, target, … information



GGOS archive example: CDDIS

- One of the data centers supporting the IAG services and thus a contributor to GGOS
- Regular member of WDS
- Archive consists of data and derived products from over 1500 observing sites from about 1000 locations around the world, going back in time as far as 1975
  - File size is typically <2-10 Mb/data or product granule
  - Total archive size: ~15.7Tb
  - Ingest rate: ~9.5Gb (90K files)/day
  - Distribution rate: ~475Gb (~4.4M files)/day
  - Multi-day, daily, hourly, sub-hourly
  - Varying latencies (minutes, hours, days)
  - Archive is updated with new data/product files on varying time scales, dependent on the data type, from a sub-daily basis to weekly basis



CDDIS Crustal Dynamics Data Information System

EOSDIS

NASA

Successes/Challenges/Best Practices

- Successes:
  - Cooperation with global institutions to further scientific research through geodesy infrastructure
  - Expansion of cooperating network
  - Inclusion of additional measurements
- Challenges:
  - Inclusive metadata schema to address data discovery requirements
  - Disparate services have different requirements
- Best practices:
  - Open data policy
  - Collaboration among contributing services in various areas:
    - Data archiving
    - Metadata
  - Creation of bureaus to focus on common topics
    - Network development/observations
    - Product development

Thank you!

- For more information:
  - GGOS: http://ggos.org
  - GGOS portal: http://www.ggos-portal.org
  - IAG: http://www.iag-aig.org
  - IAG services:
    - International GNSS Service (IGS): http://www.igs.org
    - International Laser Ranging Service (ILRS): http://ilrs.gsfc.nasa.gov
    - International VLBI Service for Geodesy and Astrometry (IVS): http://ivscc.gsfc.nasa.gov
    - IDS: http://ids-doris.org
  - CDDIS: http://cddis.nasa.gov
  - EOSDIS: http://earthdata.nasa.gov