United Nations
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Межправительственная
океанографическая
комиссия

Progress Report for GLOSS

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Why Measure Sea Level ?

- Practical applications e.g define vertical datums, safe navigation, constrain models, predict flood risks
- Coastal management e.g. sea level used to understand past and future changes in shelf and ocean conditions

Maldives

(curtesesy Yann Arthus Bertrand/Earth from Above/UNESCO)

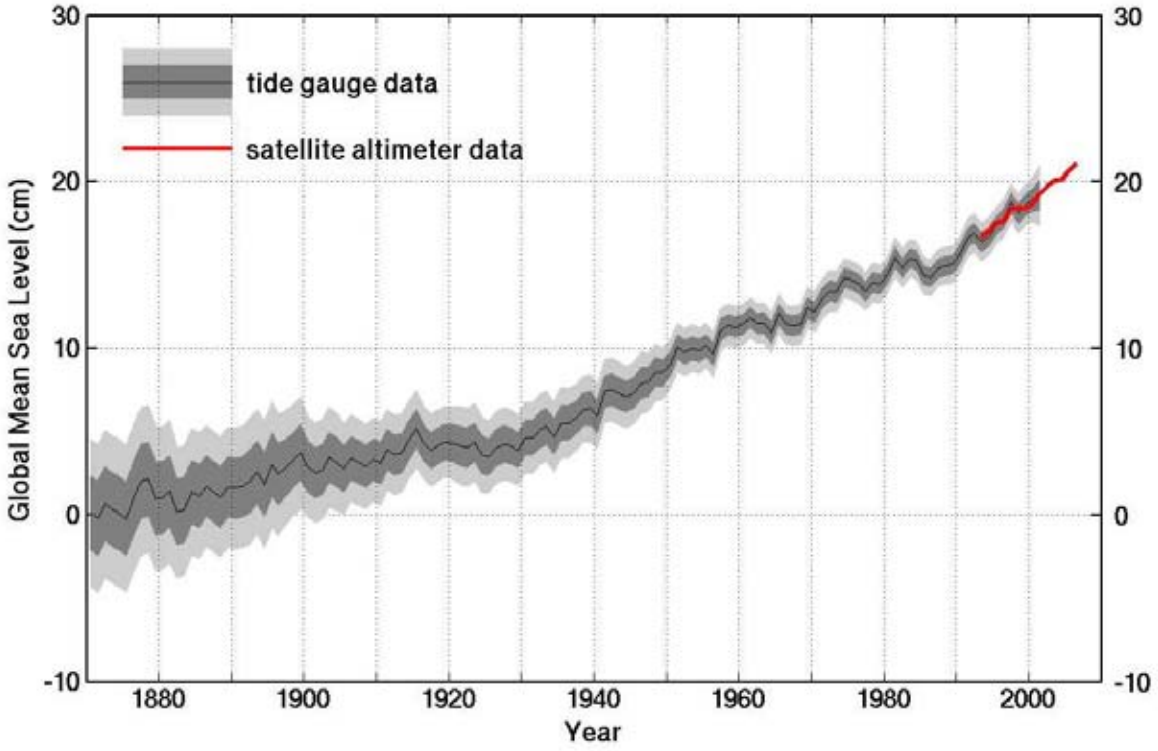
Time-Scales and Causes of Sea Level Change

- Seconds to minutes: waves, tsunamis
- Hours to days: tides and surges
- Seasonal: surface heating and freshwater input
- Interannual: ENSO, NAO
- Long term trends: climate variability and change, vertical crustal movement (e.g. GIA)

What is GLOSS?

- Established by IOC in mid-1980s to improve quantity and quality of sea level data sent to PSMSL and other sea level centres.
- Original aim: Develop GLOSS Core Network of 300 sea level stations for practical and ocean/climate science applications. Now: Additional strong operational dimension (Altimeter cal/val; GCM val; tsunami monitoring, ..)
- Global array of gauges spaced 500-1000 km apart. Geographically balanced. Open ocean locations. Best technology.

Long Sea Level Records Underpin Science and Plots Such As …



Global averaged sea levels from 1870 to 2006 as inferred from tide-gauge data (black, with 66% and 95% confidence limits given in dark and light shading) and satellite altimeter data (red).
(curtsey John Church and Neil White, CSIRO)

What Data Streams Does GLOSS Generate?

1. **Delayed mode: QC'd mean sea levels to Permanent Service for Mean Sea Level (PSMSL)**
2. **Delayed mode: QC'd higher-frequency data (e.g. hourly) to GLOSS Data Centre (PSMSL, Univ of Hawaii Sea Level Centre)**
3. **Fast data: High frequency data to UHSLC altimeter/model cal/val**
4. **Real time data: Flanders Marine Institute and International Tsunami Warning Centers**
5. **GPS data to TIGA Centre at Potsdam (Germany) & University of La Rochelle**

What does GLOSS provide?

1. Coordination mechanism for global sea level observations (e.g. GLOSS Group of Experts)
2. Global data standards and archiving facilities, QC of data
3. Technical manuals and training material
4. Technical advice and special workshops on technical issues
5. Training courses on analysis and uses of sea level observations
6. Limited provision of hardware (e.g. tide gauges, GPS, transmitters)


Intergovernmental Oceanographic Commission
Workshop Report No. 89
IOC Workshop on Sea-Level Measurements in Antarctica
Leningrad, USSR, 28-31 May 1990
Intergovernmental Oceanographic Commission
Manuals and Guides 14
MANUAL ON SEA-LEVEL MEASUREMENT AND INTERPRETATION
Volume I - Basic Procedures
Intergovernmental Oceanographic Commission
Workshop Report No. 108
UNESCO-IHP-IOC-IAEA Workshop on Sea Level Rise and the Multidisciplinary Studies of Environmental Processes in the Caspian Sea Region
Paris, France
9-12 May 3 995
Intergovernmental Oceanographic Commission
Workshop Report No. 91
Joint IAPSO-IOC Workshop on Sea Level Measurements and Quality Control
Paris, 12-13 October 1992
50
Global Sea Level Observing System (GLOSS) Implementation Plan - 1997
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
77
IOC/JCOMM Training Course for the Global Sea Level Observing System (GLOSS) on Sea Level Observation and Analysis
9 - 20 February 2004
Kuala Lumpur, Malaysia
Intergovernmental Oceanographic Commission
Workshop Report No. 193
WORKSHOP ON NEW TECHNICAL DEVELOPMENTS IN SEA AND LAND LEVEL OBSERVING SYSTEMS
Paris, France
14–16 October 2003
FORUM
Measuring Progress of the Global Sea Level Observing System
Global Ocean Observing System
IOC Group of Experts on the Global Sea Level Observing System (GLOSS)
Seventh Session
Honolulu, USA
26-27 April 2001
GOOS Report No. 116
GCOS Report No. 72
GLOSS
Manuals and Guides 14
UNESCO 2004
Global Sea Level Observing System
Manual on Sea Level Measurement and Interpretation
Volume IV: An Update to 2006

GLOSS – Selected progress highlights

- The 11th session of the GLOSS Group of Experts meeting was convened 13-15 May 2009 back to back with meeting on Workshop on Precision Observations of Vertical Land Motion at Tide Gauges, 11-12 May 2009
  - The GLOSS GE reviewed program implementation progress (incl. ~ 30 regional and national reports), technical developments with respect to radar gauges and BGAN based tide gauges, and links with other organizations and programmes (incl. IHO & TWLG)
  - The workshop focused on:
    - Why put continuous global positioning system (CGPS) equipment near tide gauges?
    - What is the present geodetic network status?
    - What are the current geodetic issues with respect to sea level monitoring?
    - What are the technical issues for operators and users?
    - What processing and data centres are needed for GPS data and products?
    - What should the future network be?
    - What future actions are needed?

  (Reports will be available shortly)
- An extended summary of GLOSS status and future plans was also developed into a GLOSS Community White Paper for the Ocean Obs 09 conference (see http://www.oceanobs09.net/blog/?p=422)

GLOSS – Selected progress highlights (cont)

- A GLOSS Manual on Quality Analysis and Control of Sea Level Observations is in final revision and should be published in 2010

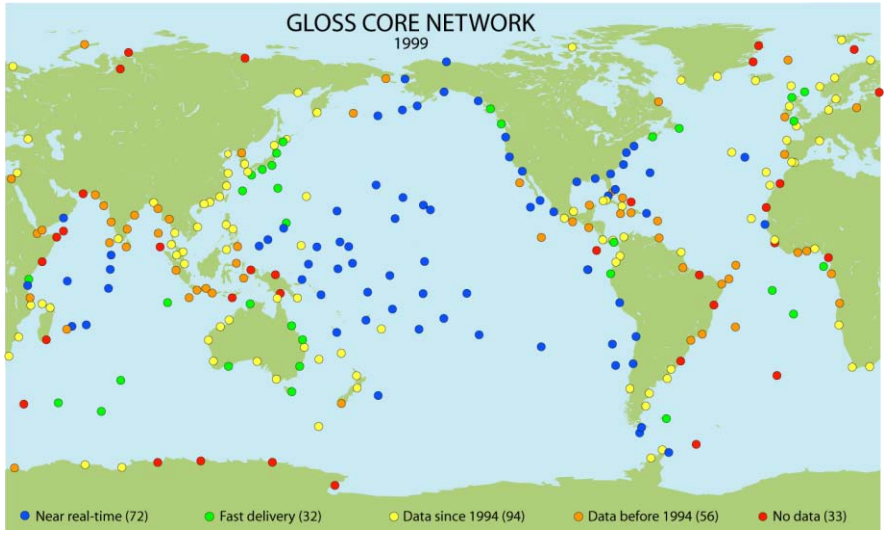
- Proceedings from WCRP workshop “Understanding Sea Level Rise and Variability” (UNESCO/IOC, 6-9 June 2006) will be published in August 2010 by Wiley-Blackwell

GLOSS – Selected progress highlights (cont)

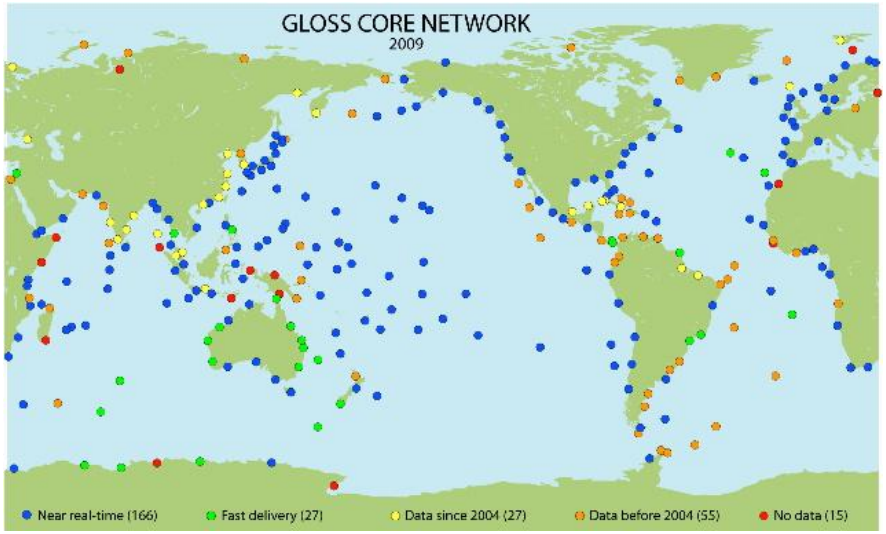
- In addition to contributing sea level observations for science programs, GLOSS contributes extensively to the operational tsunami monitoring sea level networks in the Indian Ocean, Pacific Ocean, Caribbean and Mediterranean & NE Atlantic
- About 375 sea level stations are now being tracked from the IOC Sea Level Monitoring Facility (www.ioc-sealevelmonitoring.org) up from 25 stations in late 2007

- Upgrades of sea level networks are now under way in particular in SW America (following the recent Pacific tsunami) and also in the Caribbean. The upgrades includes re-establishment of stations and/or upgrade to more frequent data transmission (typically from 1-hour transmission to 5 min transmission)

GLOSS Core Network Status
Developments between 1999 and 2009



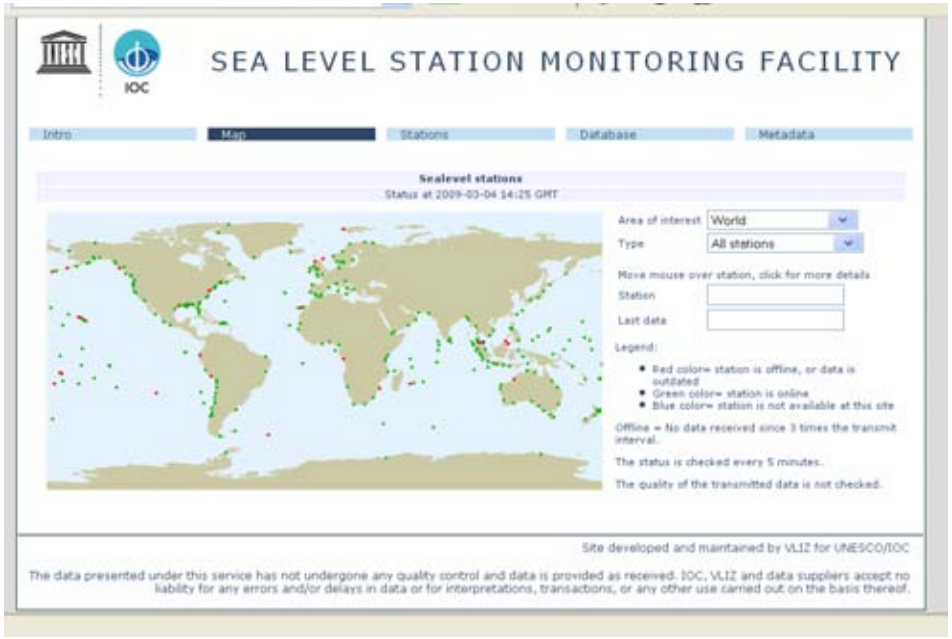
• Primary element of GLOSS is the GLOSS Core Network (GCN) of approximately 300 sea level stations in nearly 90 countries.



• Respectable improvement in GLOSS CN since 1999 and substantial increase in stations that provide data in near-real time - 166 stations in 2009 versus 72 stations in 1999

• in 2009 220 stations (76%) have provided data recently to GLOSS Data Centers

Sea Level Station Monitoring Web-service



- Recently developed web-based global sea level station monitoring service for viewing sea level data received in real time from different network operators through a number of different communications channels.
- Aims
  - to provide information about the operational status of global and regional networks of real time sea level stations;
  - to provide a display service for quick inspection of the raw data stream from individual stations.

- 375 real time stations are presently included on the web-site site

More information at:
www.ioc-sealevelmonitoring.org

Suggested actions for IHO Tidal and Water Level Working Group

- Recommend that IHO member agencies contribute actively to the development and/or sustaining GLOSS Core Network stations and other stations with long records. These stations are of particular importance for the study of both historical and the forecast of future sea-level rise.

- Strengthen efforts to rescue historical paper based sea level data (Further advice “how to” can be obtained from GLOSS)

Suggested actions for IHO Tidal and Water Level Working Group (cont)

- Where possible, upgrade national sea level stations identified in the Implementation Plan for the four regional tsunami warning systems to real time data delivery and participate in data exchange. This is of particular priority for the stations in Southern & Eastern Mediterranean and the Caribbean.

www.ioc-unesco.org

Thank you!