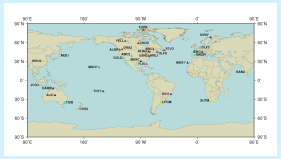


Real-time Network and Products Session

-----position paper

Mark Caissy

Natural Resources Canada

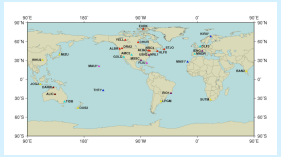
Carlos Garcia

European Space Agency

Georg Weber

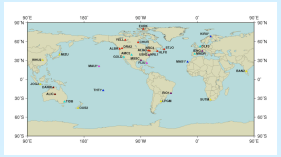
Bundesamt für Kartographie und Geodäsie

IGS Workshop -- May 8-11, 2006 Darmstadt/ESOC



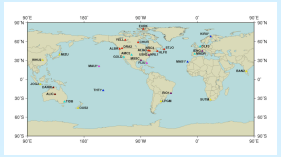
Outline

- Vision
- Real-time Working Group Mandate/Strategy
- Status of Real-time Prototype
- The IGS Real-time Pilot Project
  - Call for Participation
  - NTRIP and RTCM-3.0
- Recommendations



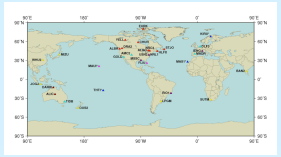
IGS Vision For Real-time

- Seamless access to the global reference frame in real-time
- The availability of raw data and satellite clock and orbit information openly and in real-time
  - an enabler for precise point positioning in real-time
  - an enabler for multidisciplinary near/real-time services -- timing, integrity monitoring, natural hazards, weather prediction, etc …



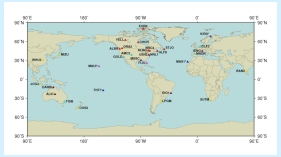
The IGS RTWG

- Mandate
  - To build a functional and scaleable prototype for the real-time delivery of raw data to real-time analysis centers and the dissemination of products to real-time users
- Strategy for success
  - Leverage existing experience
  - Integrate rather than transform
  - Develop tools to facilitate involvement of agencies not involved in real-time



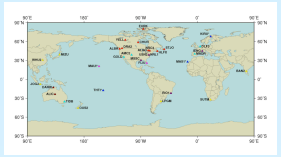
The Prototype Design

- Design goal
  - Maximize data availability
  - Minimize data latency
- UDP protocol
- Message structure supporting any data type and any data format
- Distributed data sharing for robustness
- Regional reliability through redundancy

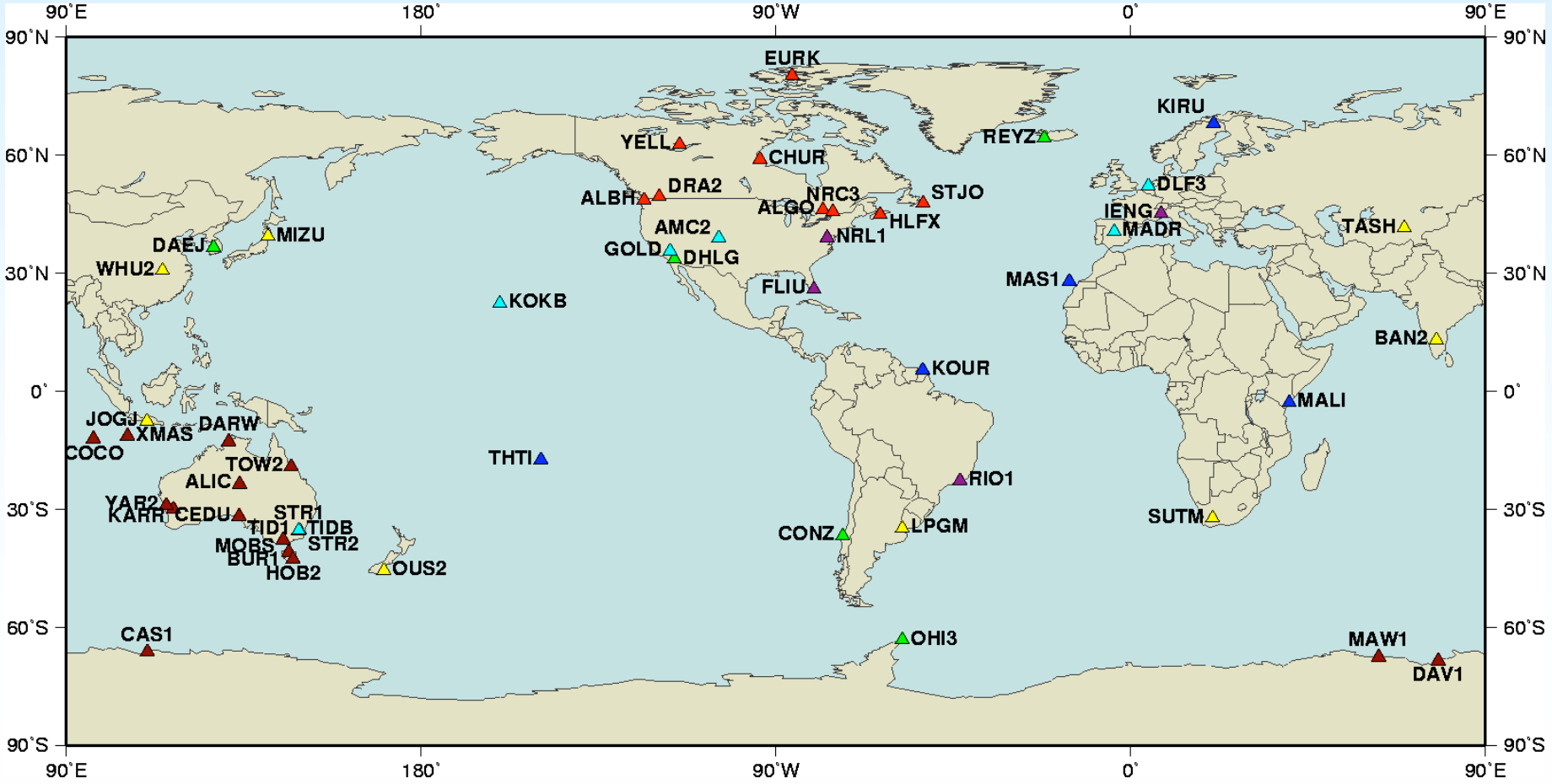


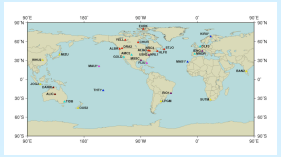
RTIGS Software Tools

Application	Purpose	Deployments
UdpRelay	Routes data/products to analysis centres, global data centres and end users.	JPL, GFZ, NRCan, ESA, GA, IEN, COSMIC
RTIGSA	Creates files based on RTIGS observation data .	NRCan, BKG, UCAT, NOAA (SEC), TUV, CDDIS, KASI, GOPE
RTIGSMR	Reads and decodes RTIGS data messages provides a frame work for real-time application development	TUV (custom application for IGU quality assurance)
Ashtech, Benchmark, Javad/Topcon	Raw receiver data to RTIGS data messages. Optional scripts for data management.	IEN, NGS, NRL, ROB, ESA

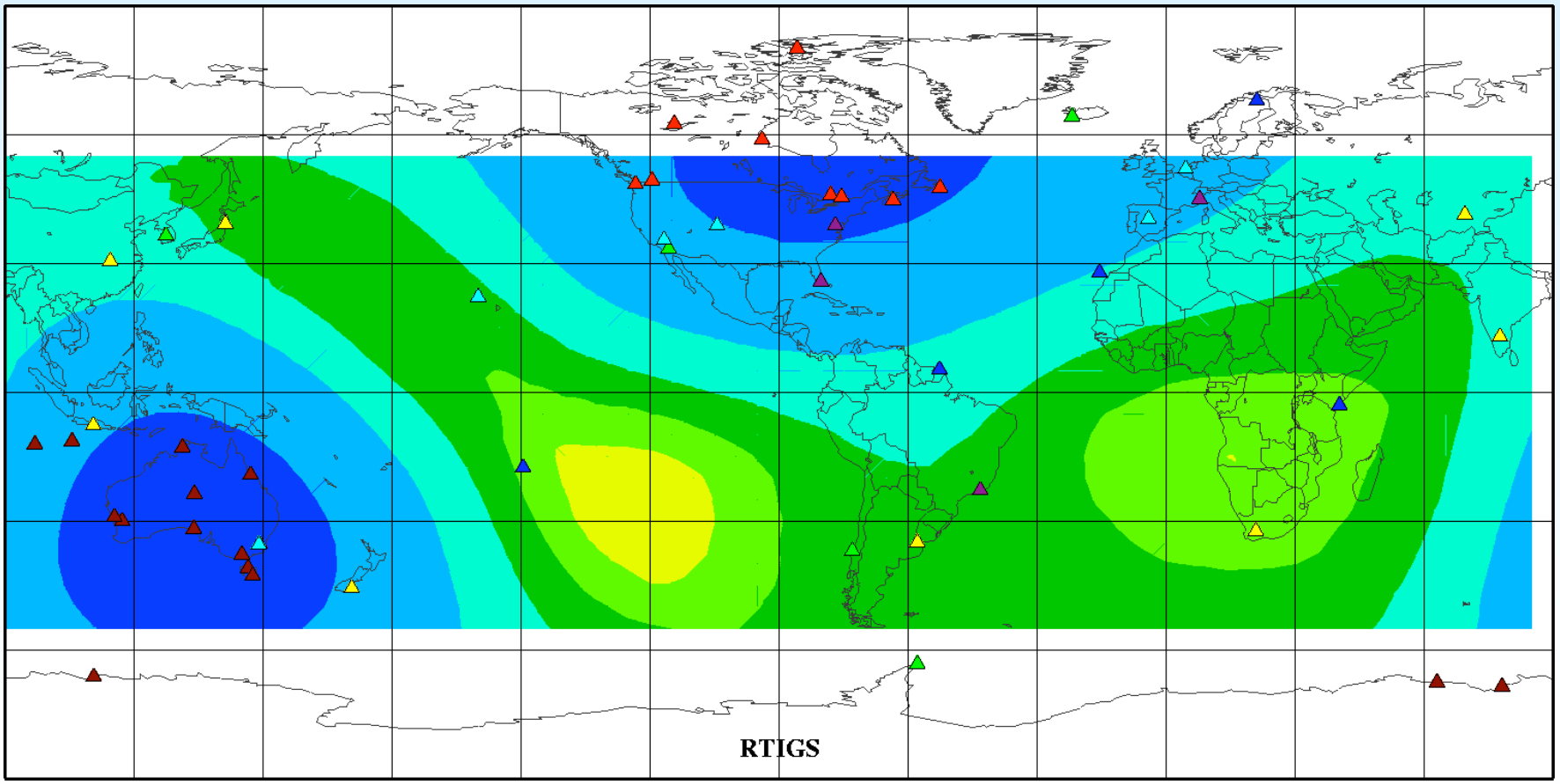


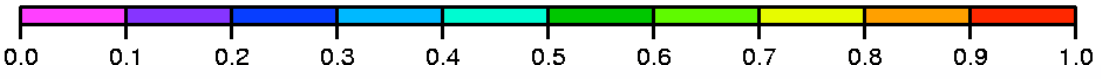
Network for Start of Pilot Project (60+)





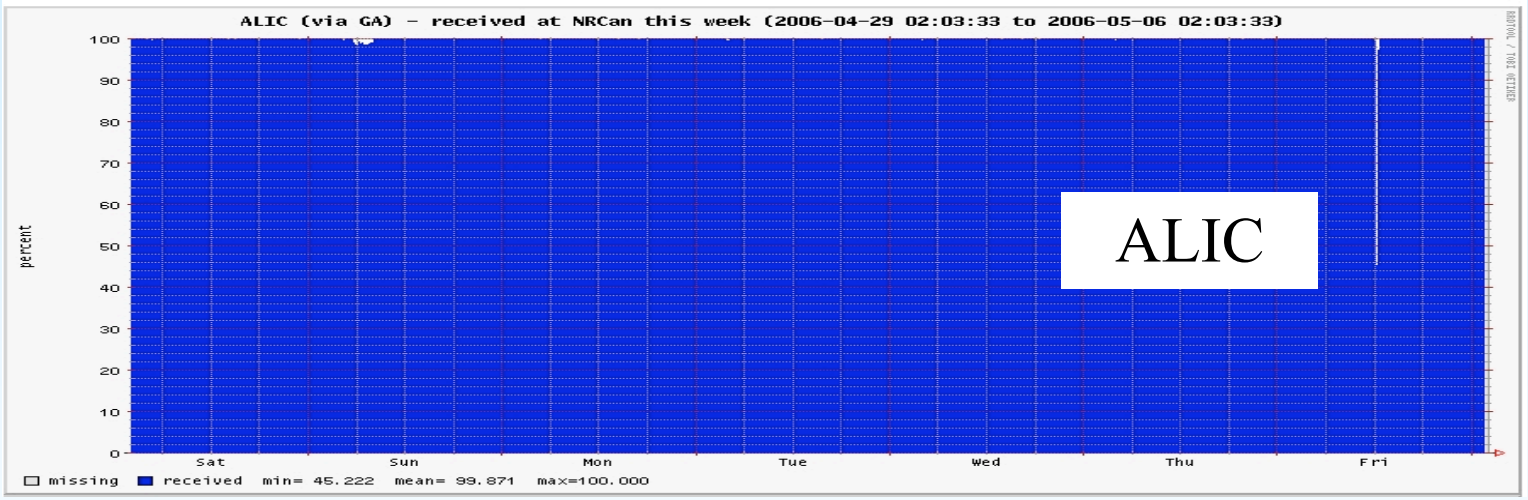
Satellite Clock DOP Estimates



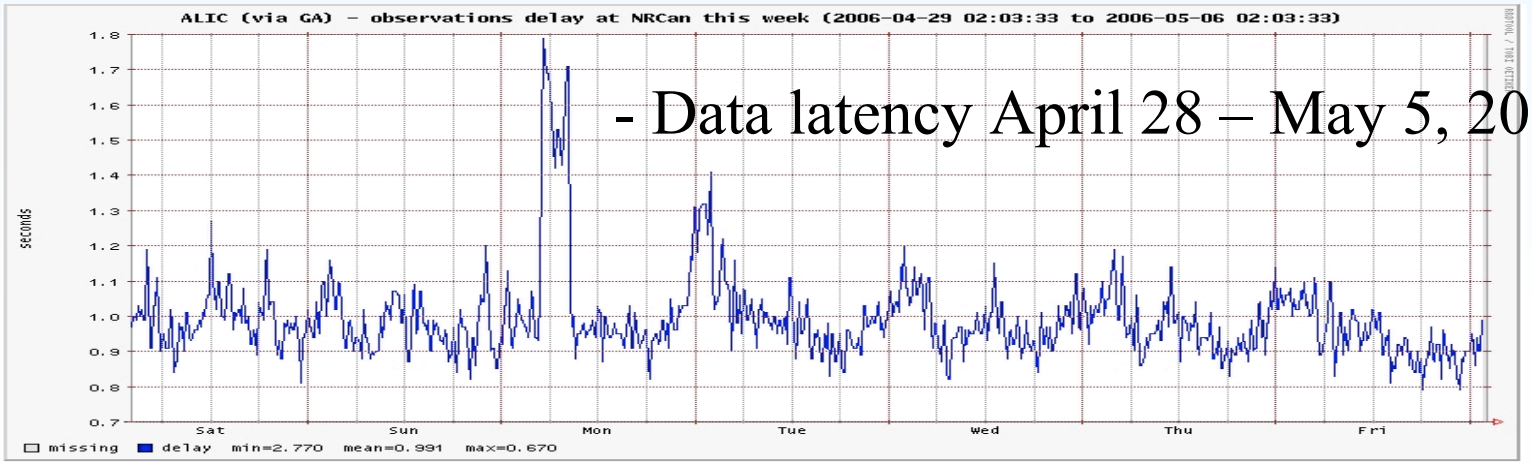


Performance Monitoring

--Data Availability April 28 – May 5, 2006



99.9%

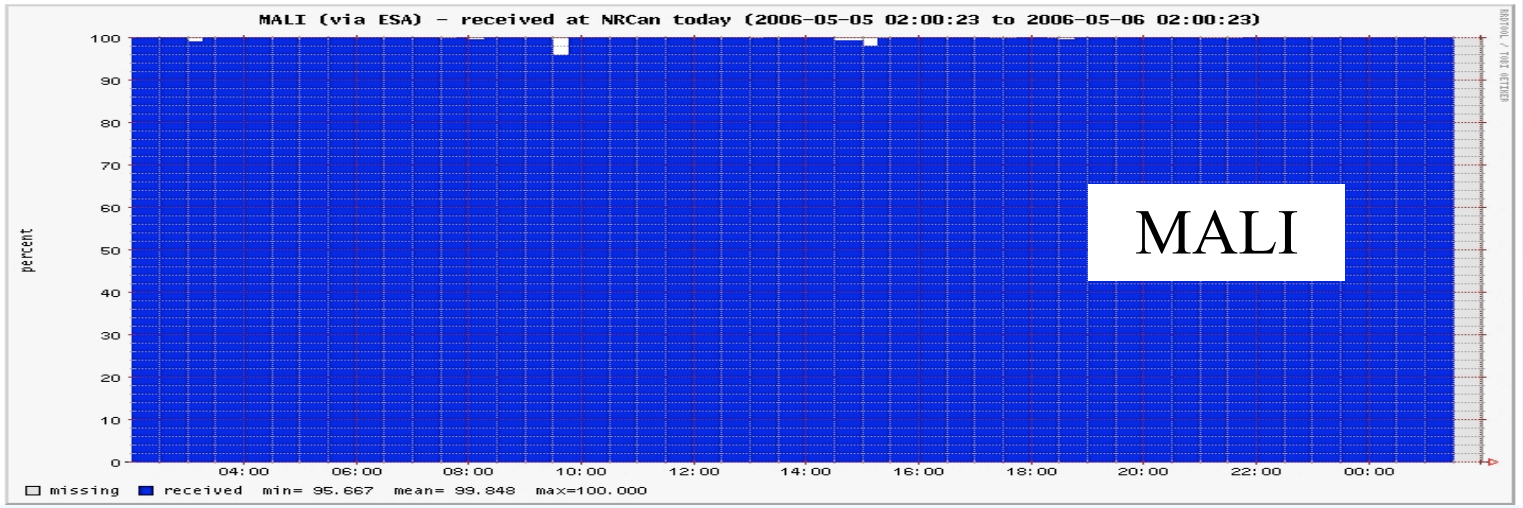


- Data latency April 28 – May 5, 2006

1.0 sec

Performance Monitoring

--Data Availability May 4, 2006



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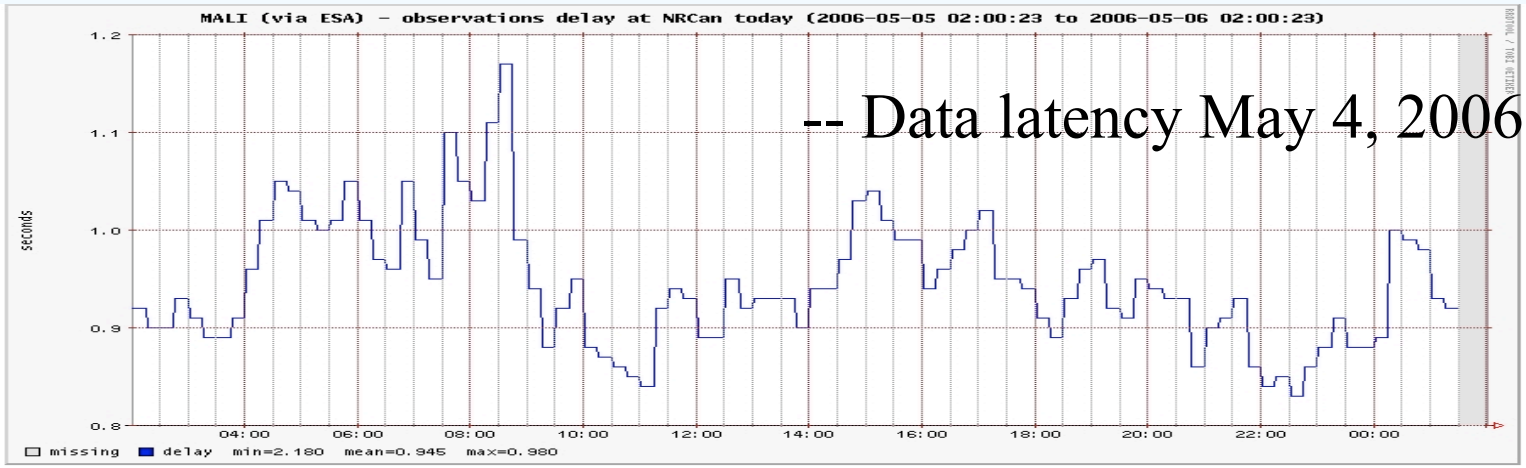

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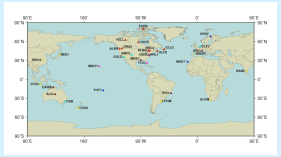
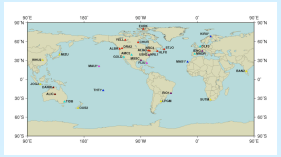


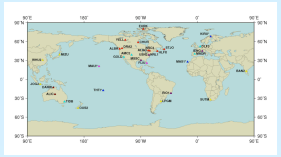
Real-time Pilot Project

- RTWG is active in real-time activities involving regional networks, analysis centers, data centers
- A user community is engaged – timing, atmospheric, integrity monitoring
- Demonstrates a level of preparedness
- Next phase in the development of an official product or service within the IGS



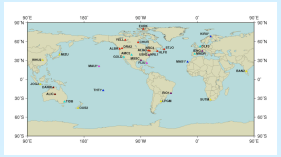
Focus for Real-time Pilot Project

- Expansion of the network (RF) stations
  - greater involvement / raise profile of RTIGS
- Network management (performance, availability, changes – planned and unplanned)
- GDC's involved in providing nrt-HR data
- RT-data made available – priority will be AC's
- Secondary Focus
  - RT-products (IGU integrity / satellite clocks / station clocks / satellite orbits → IGU predictions made available in real-time)



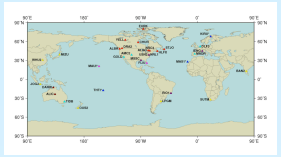
Guiding Principles for Pilot Project

- An open data policy
- Open communications
- Documentation made available
- Source code made available for assisting in reading and decoding data and products



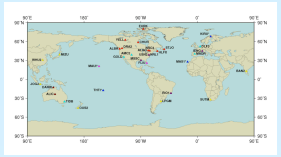
Timeframe

- Complete the Call for Participation
  - Document
  - GB executive approval
  - Call goes out
  - 6 weeks before first submissions are evaluated
- Contributors
  - Networks (reference frame stations), DC's, AC's, Users
  - Management aspects
  - Others (cast net as broad as possible)
- Pilot Project to begin in September / October timeframe



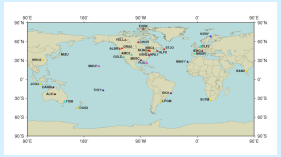
Task for the Pilot Project

- Evaluate NTRIP
  - Industry standard for streaming GNSS data on the Internet
  - As a data delivery mechanism for network augmentation
  - As a means to deliver rt-products (example: clocks and orbits)



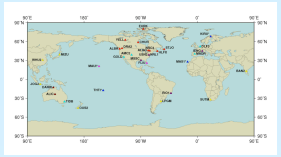
Task for the Pilot Project

- Investigate whether RTCM 3.0 is a suitable candidate to become the RTIGS standard format
  - Other formats? / Binex?
- Specific requirements that must be met
  - All observables at required precision
  - SNR's
  - GPS/Glonass/Galileo capable
  - UDP streaming capability
  - Minimum 1 Hz capability



Recommendations

- That the call for participation in the pilot project be completed as soon as possible.
- That the RTIGS work to complete the planned network in time for the start of the pilot project.
- That the pilot project involves the broadest participation as possible from both within and outside of the IGS community.



Recommendations

- That RTCM 3.0 be investigated for the purpose of determining whether or not it is a suitable format for adoption as the standard for use within the real-time IGS
- That during the pilot project, NTRIP be evaluated as a data and product delivery mechanism.
- That the NTRIP community be encouraged to provide the UDP protocol as an option for the NTRIP server.