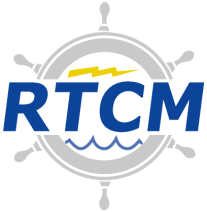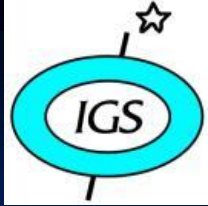# RINEX Working Group Report
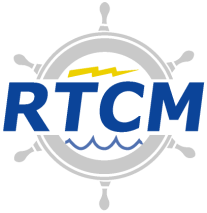
Ken MacLeod
Loukis Agrotis

IGS Workshop
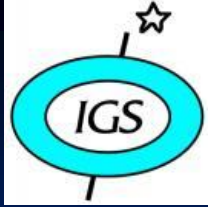Pasadena California, USA, June 23-27, 2014

Overview

- ## RINEX 3.02 Update 1
  - Status
  - Current Issues
  - Software Support and Adoption
  - Plans for RINEX 3.03

- ## Summary of RTCM SC-104 GNSS Observation and Correction Messages
 - IGS/RTCM GNSS Receiver Bias WG Proposed

- ## Summary

RINEX 3.02 Status

- RINEX 3.02 supports: GPS, GLONASS, Galileo, QZSS, BeiDou and SBAS. All signals and standard ephemeris

- RINEX 3.02 Update 1
    - Most changes are editorial or minor corrections
    - More file format examples added to the Appendix
    - Draft 9 circulated among working group, June 13th, 2014 one month for review and update
    - Update 1 to be released after IGS Governing Board and RTCM SC-104 executive approval (expected summer 2014)
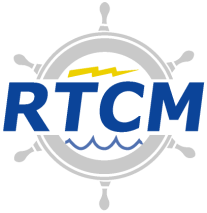
RINEX 3.02 Issues
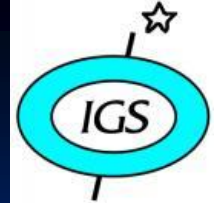
- Mandatory header messages:
  - Phase alignment
  - GLONASS Code-Phase biases

  Some providers find it difficult to populate these fields accurately. Standard does support unknown parameters.

- Work through data format inconsistencies with software providers over the next few months (MGEX Project)

- Daily Broadcast Navigation File containing all constellations and all ephemeris is required. Structure of the file has to be specified and documented

RINEX 3.02 Issues Continued
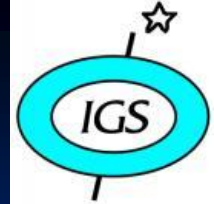
- RINEX 3.02 file naming convention has not yet been widely adopted.

- Sample filenames :
    - ALGO00CAN_S_20141600000_15M_01S_MO.rnx
    - ALGO00CAN_R_20141600000_01D_30S_MO.rnx
    - ALGO00CAN_R_20141600000_01H_30S_MN.rnx

- What do we want to do?

    - Support both names for a transition period by symbolically linking new name to old convention and vice versa????
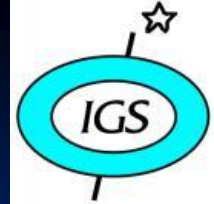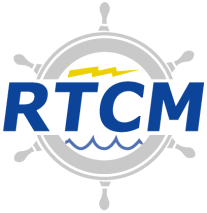
RINEX 3.02 Adoption

- RINEX 3.02 is being supported by many manufacturers software: Javad, Leica, Novatel, Septentrio, Spectra Precision, Topcon, Trimble and by BKG BNC software (for file generation from RTCM MSM streams) and many others

- Analysis/positioning software support is improving. Many IGS partners (ESOC, DLR, BKG) and other GNSS software vendors support RINEX 3.02
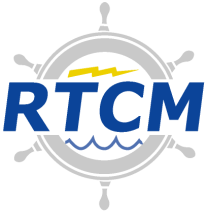
Planned RINEX 3.03 Updates
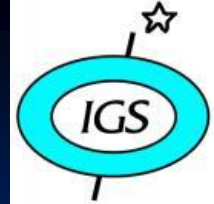
- Add Indian Regional Navigation Satellite System (IRNSS) Constellation Support

- Expand support for broadcast ephemeris formats
  - CNAV – 2 or 3 format and content options are being discussed
  - BeiDou/Galileo updates
  - Should RINEX capture all broadcast ephemeris parameters?
  - How can we accommodate the increasing complexity of ephemeris information into the existing standard?
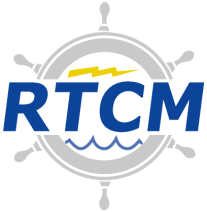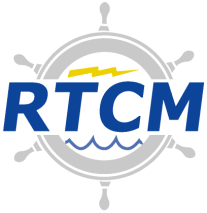
RTCM (3.2)Binary Observation Messages
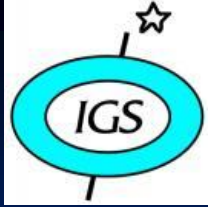
- RTCM-Multiple Signal Messages are fully compatible with RINEX 3.02 (content, phase alignment and measurement precision)

- RTCM-MSM currently supports GPS, GLONASS, Galileo, QZSS and BeiDou

- Other RTCM messages provide most of the information required to write a RINEX header

- GPS, GLONASS, Galileo and QZSS navigation messages supported
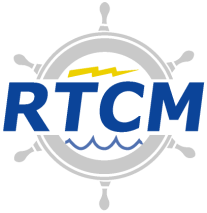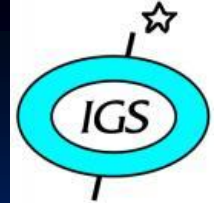
RTCM (3.2) State Space Representation (SSR) Satellite Correction Messages

- GPS and GLONASS orbit and clock corrections and code bias messages are currently supported
- Draft SSR correction messages will support:
  - Galileo, QZSS, SBAS and BeiDou
  - New phase bias messages added for each constellation
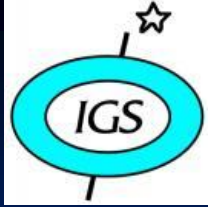 - New ionosphere VTEC message (Spherical Harmonic)
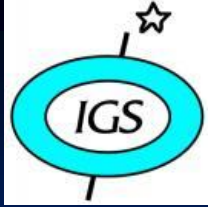
IGS/RTCM GNSS Receiver Bias Working Group Proposed

- Concept:
    - Manufacturers provide GNSS receivers and antennas.
    - NRCan would host antenna on a single monument and receivers would be connected to a signal splitter (8 way).
    - Collected data would be shared with participating companies and IGS Bias Working Group.
- Working Group approved by the RTCM-SC104, May, 2014.

Summary

- Plan to release RINEX 3.02 Update 1 (summer 2014)
    - RINEX 3.02 adoption is encouraging
    - RINEX 3.03 will support IRNSS and C-NAV etc.
- RTCM-SC104 :
    - RTCM-MSM observation format supports all GNSS constellations (except SBAS) and are RINEX 3.02 compatible
    - RTCM State Space Representation messages currently support GPS and GLONASS, being updated to support: Galileo, QZSS, SBAS, BDS and VTEC
    - IGS/RTCM GNSS receiver bias working group proposed