

RINEX

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RINEX – a resounding IGS Data format success!!

- ▶ RINEX format thanks to Werner Gurtner (AIUB), Gerald Mader (NGS), Lou Estey (UNAVCO), Ken MacLeod (NRCan)
- ▶ Helping to exchange GNSS data since 1990.
- ▶ Adopted by receivers and by commercial and scientific software as an international standard.
- ▶ RINEX format maintained jointly in the RTCM/IGS RINEX WG to engage industry and scientific community to encourage early and wide adoption.
- ▶ The RTCM/IGS RINEX WG aims to maintain accuracy and precision in GNSS observations as signals evolve, and alignment with streaming data formats .

RINEX – Content & Evolution

- ▶ The workhorse format for GNSS data;
 - ▶ Stores measurements to all GNSS satellites; code, phase, SNR, doppler
 - ▶ Used for Precise Orbit Determination, Precise Point Positioning, Geodesy, Ionosphere, Time transfer, etc
 - ▶ 3 different RINEX file types; Observation, Navigation, Meteorological
- ▶ RINEX format has evolved over time to accommodate the observations of all GNSS systems RINEX 2.XX (1990)→ 3.XX (2007)
- ▶ RINEX format navigation data format is evolving to keep pace with modernized GNSS navigation messages RINEX 3.XX (2020)→ 4.XX (2021)

RINEX 4.00 – So What is New?

- ▶ New QZSS Observations added, some header lines declared optional, new FAIR data header lines added, clarified and simplified document.
- ▶ Navigation Message Taskforce finalized RINEX 4.00 with;
 - ▶ Old & new navigation messages in traditional matrix form – fully identified; LNAV, CNAV, CNAV2, INAV, FNAV, FDMA, D1, D2, CNV1, etc.
 - ▶ Navigation “data record” concept; **EPH, ION, EOP, STO**
 - ▶ **EPH** - traditional satellite ephemerides data
 - ▶ **ION** - Ionosphere model coefficients into full messages, from single header lines
 - ▶ **STO** - Time Offset full messages, previously contained as optional header lines
 - ▶ **EOP** - Earth Orientation Parameters system messages

RINEX 4.00 – In summary

- ▶ Observation files **are** backward compatible to RINEX 3.0X
- ▶ Navigation files **are not** backward compatible, but the legacy navigation message blocks remain as in RINEX 3.0X so very easy to continue reading those with small adjustment, also;
 - ▶ Navigation messages from any station are not unique, many other stations will have the same messages, so no loss of data.
 - ▶ IGS merged navigation files will remain available for the foreseeable future (brdcDDD0.YYn in RINEX 2.11, BRDC00IGS in RINEX 3.0X, etc)
- ▶ Meteo files **are** backward compatible to RINEX 3.0X

RINEX – Participation and Feedback

- ▶ RINEX WG is open to all IGS Associate members and to RTCM SC104 members.
- ▶ Early RINEX format adoption and testing is necessary and encouraged.
- ▶ Feedback from the GNSS community helps keep the format 'fit for purpose', please use the new website form;

<https://igs.org/wg/rinex/#feedback>

RINEX

The IGS Receiver INdependent EXchange (RINEX) Working Group (RINEX-WG) was created to develop and maintain the RINEX format to meet the needs of the IGS and the GNSS Industry. Since the RINEX format is a standard, it should be jointly managed by the IGS and Radio Technical Commission for Maritime Services (RTCM). The working group consists of both IGS and RTCM-SC104 industry members. Documentation and a consensus-based approach and majority voting will be used if a consensus cannot be reached. The RINEX format will be freely distributed both by the IGS and RTCM-SC104.

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RINEX WG Feedback

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European Space Agency



Thank You

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