

Possible consequences of the GPS „Week number roll-over“ on April 7, 2019, for data recorders of the Geophysical Instrument Pool Potsdam (GIPP)

GPS satellite raw data contain (among others) the week number (week 0 started on January 6, 1980), Historically, the week number counter is limited to values between 0 and 1023. This can cause malfunctions of data recorders using the GPS information when the week number becomes too large (so-called „week number roll-over“, WNRO). This happen (again) on April 7, 2019.

The last roll-over occurred on August 22, 1999. At that time the GPS receiver of Kinematics' Q380 recorder had to be replaced. For the RefTek72A the ROM of the Trimble-GPS-receiver had to be updated. Newer GPS receivers use an extended week counter, however, they have to "know" in which epoch they are operating. Usually this information is taken from the data of the firmware. Possible errors depend on the used protocol (NMEA, TAIP, TSIP) and firmware bugs. Trimble receivers show WNRO-related problems since 2016. Depending on the specific problem, errors might be corrected afterwards, however, if the data are meaningless or if the receiver does not receive the GPS signal this correction is not possible.

At the Geophysical Instrument Pool Potsdam (GIPP) we have Data Cube recorders (DIGOS/Ominrecs) and EDR-210 recorders (Earth Data) in use. Furthermore, we still use a number of older PR6-24 recorders (Earth data).

Data Cube and EDR-210 recorders use the Trimble Lassen-iQ-receiver or newer modules (e.g., Copernicus-2) in connection with the TAIP-protocol (Trimble-ASCII). **No serious problems are expected** for these recorders at least until 2022. According to the Lassen-iQ manual only a short interruption of the position information is expected for April 7, 2019 for firmware 1.10. There should be no problems for newer firmware.

On the Data Cube recorder in which the GPS information is just injected to the data stream, only the validity is checked in real-time. On the EDR-210 recorder the whole data processing is done in real-time in order to write MSED format. In case of problems with the GPS receiver it might become necessary to update the firmware. We are in contact with Earth Data and will be notified in this case. As soon as we receive such information we will inform the GIPP users.

The situation is worse for the older **PR6-24** recorders (EDL) because they use the older Trimble Lassen-LP-receiver. According to Trimble no problems are expected for April 2019, however, **after May 8, 2020 they will not work properly anymore** (older models after June 4, 2019). In order to continue to use PR6-24 recorders after May 8, 2020 we are working on a hardware modification and are also in contact with Earth Data.

Independently from the information listed here we will monitor the behavior of all our recorder types on April 7, 2019, and will inform the GIPP users in case of problems.

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Disclaimer: Every effort has been taken to avoid errors in this document, however, we cannot accept responsibility for the accuracy of any statement and the information contained.