



Hugo Repeater data July 2016 to Nov 2017

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Hugo system



Overview

- Data recorded from 2 Xtera repeaters in the Hugo system
- Data logs recorded every hour
 - Repeater temperature
 - Zener temperature
 - Internal air pressure
 - Current consumed by the electronics
- Other information has also been recorded
 - Zener voltage and line current confirm a constant power dissipation
 - Pump powers and internal voltages are also logged but are not useful for environmental monitoring.
- The repeater measurements were designed for monitoring the health of the repeater and telecom system not for environmental monitoring.
 - The Hugo repeaters have performed flawlessly
 - Some environmental information can be extracted from the logs



Analysis of the Data

- Notes

- R1 is on the sea bed in a gravel area
- R2 is partly or fully buried in a sandy area

- Problems

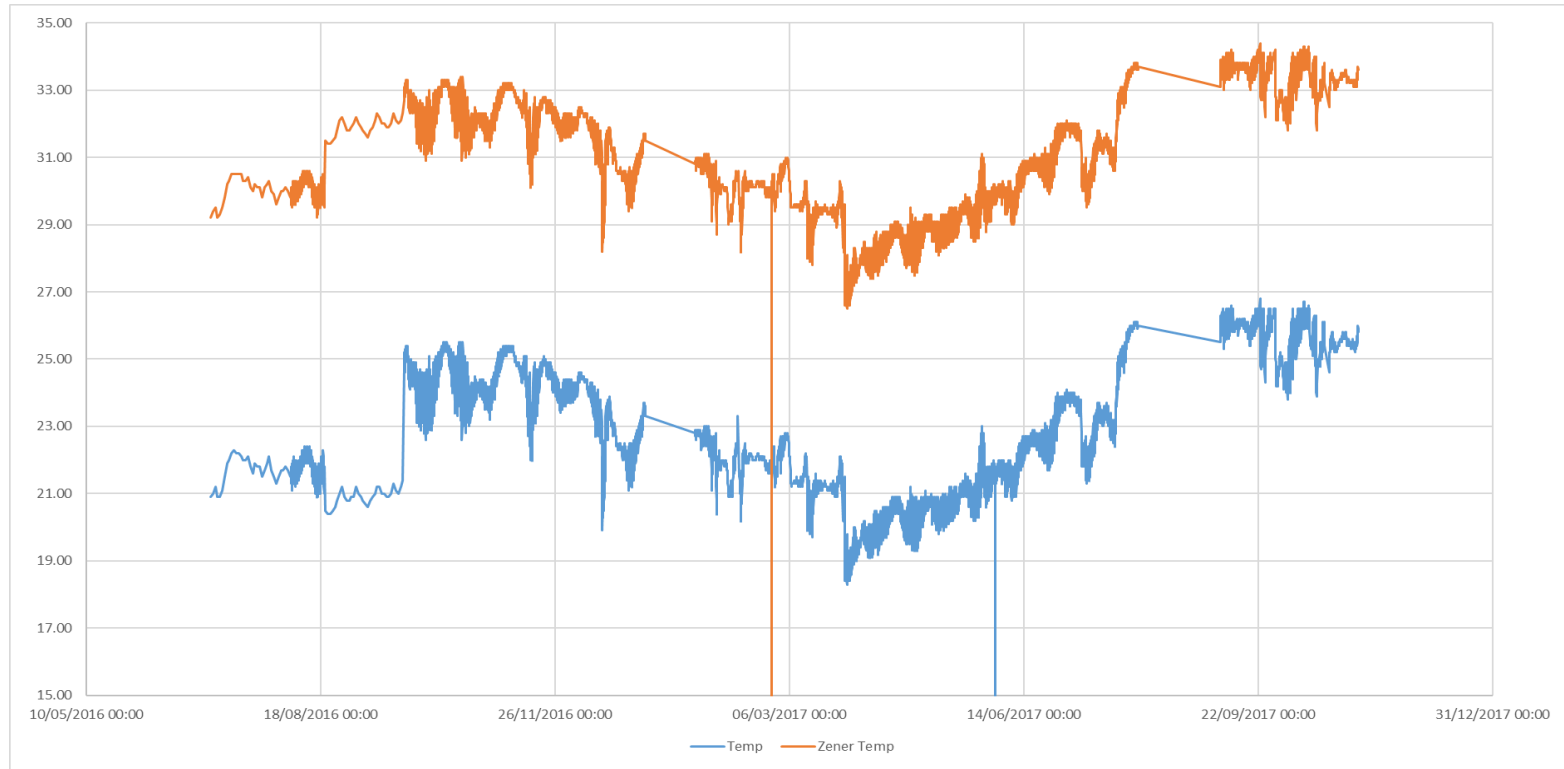
- Some logs forgotten to be downloaded.
- Some wrong logs downloaded
- Some logs downloaded with 1 day intervals rather than 1 hour
- SLTE shelf controller crashed causing logs not to be recorded.
- Only a few corrupted measurements recoded.

- Useful information

- Annual repeater temperature variation of about 11°C
- Temperature change seen between spring and neap tides
- Spring and autumn step change in temperature at R1
- Temperature change due to individual tides seen at R1, possibly a double tide.



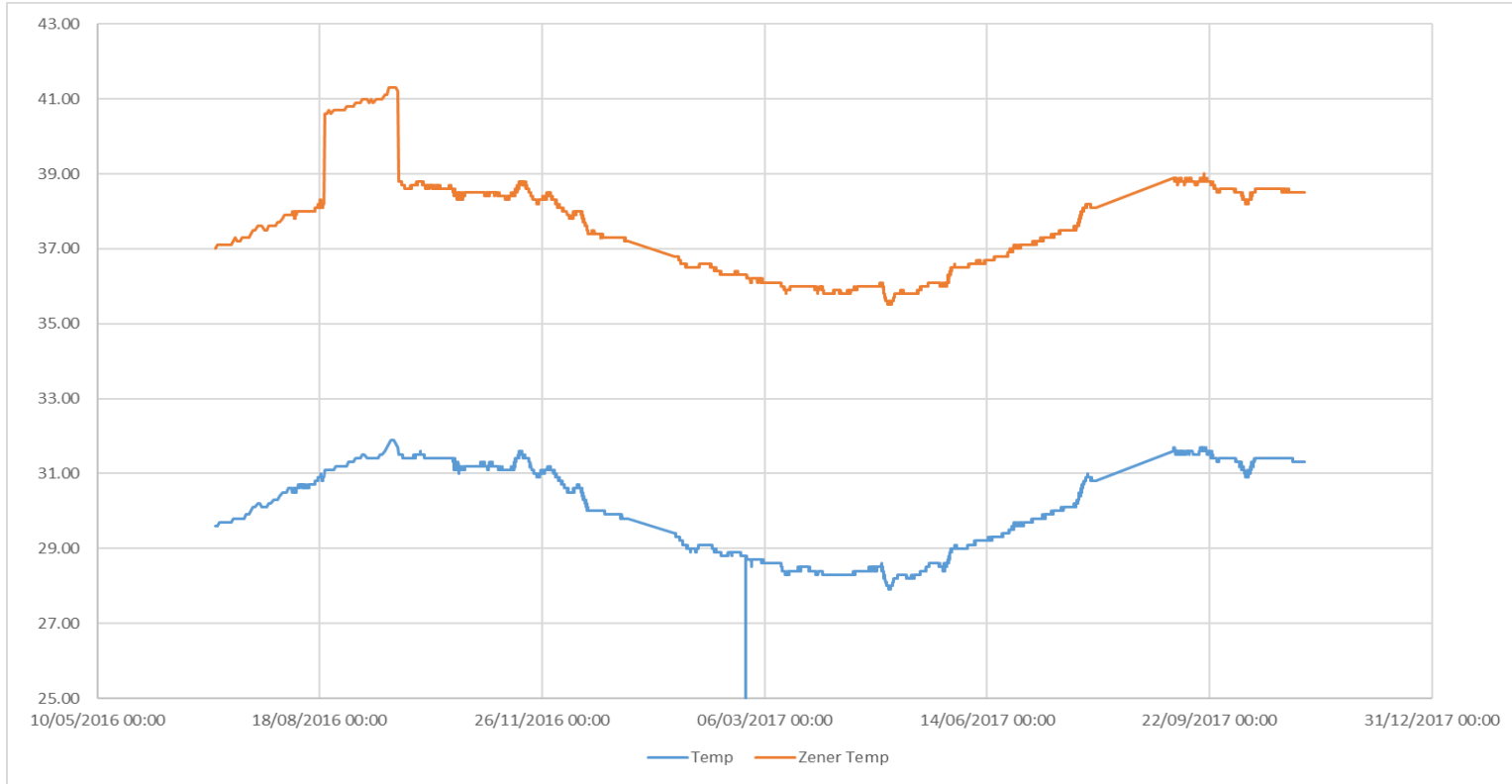
Repeater and Zener temperature R1



- Good correlation between the measurements



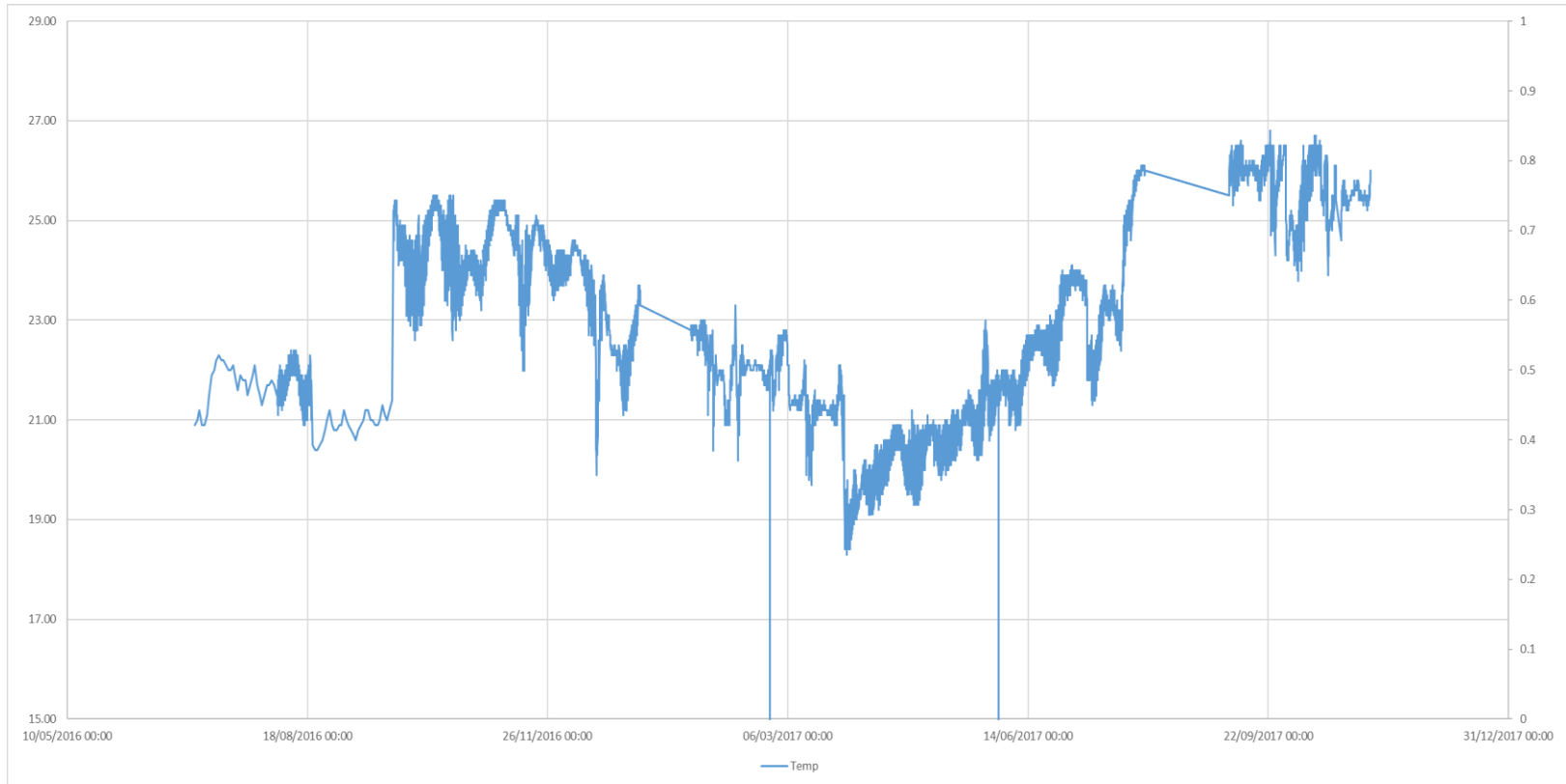
Repeater and Zener temperature R2



- Good correlation between the measurements, less short term variation than R2, R2 is warmer than R1
- Unknown cause of step in the zener temperature in August '16



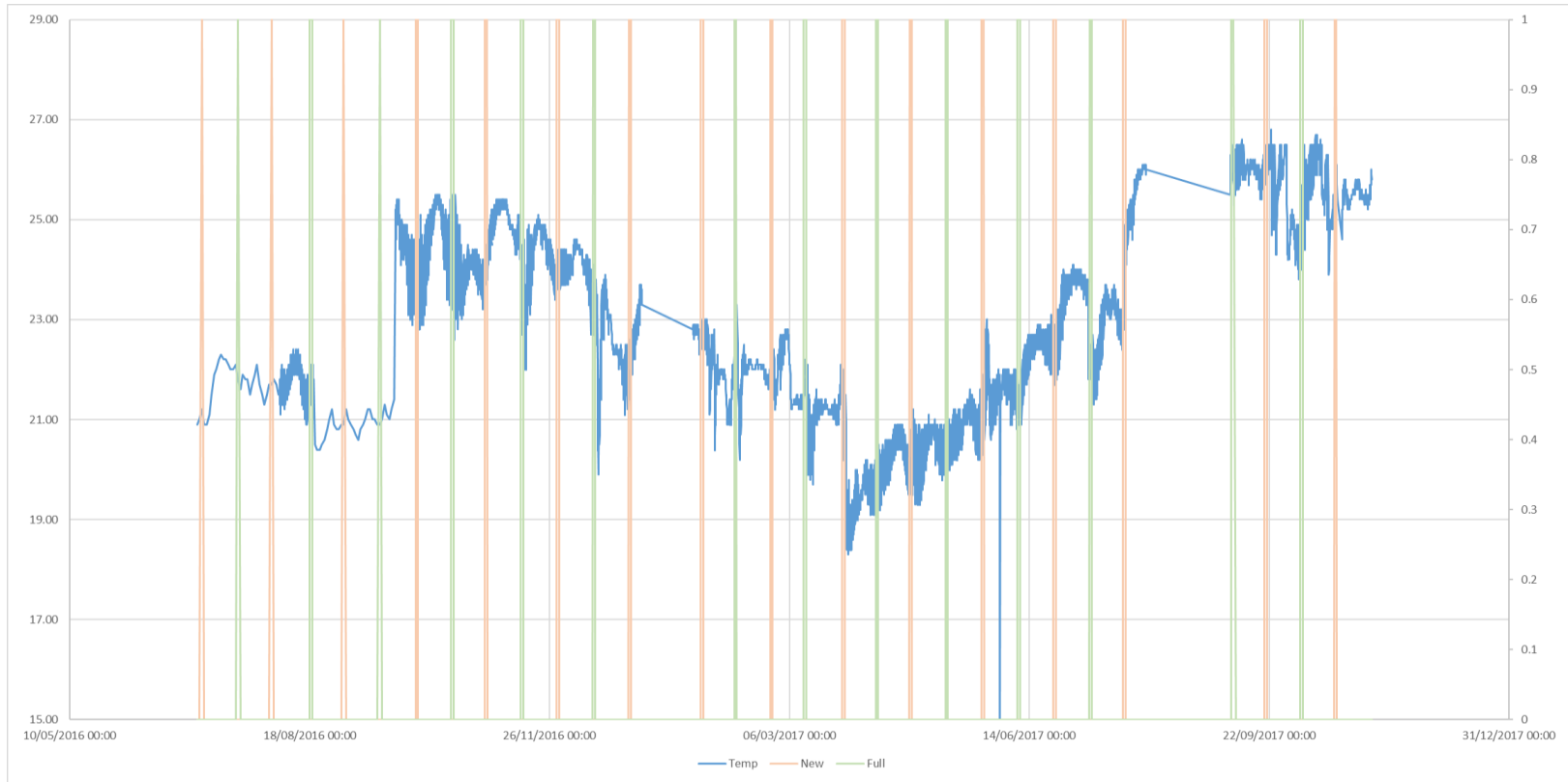
Cooling of R1 due to tides



- Temperature variation with tide cycles



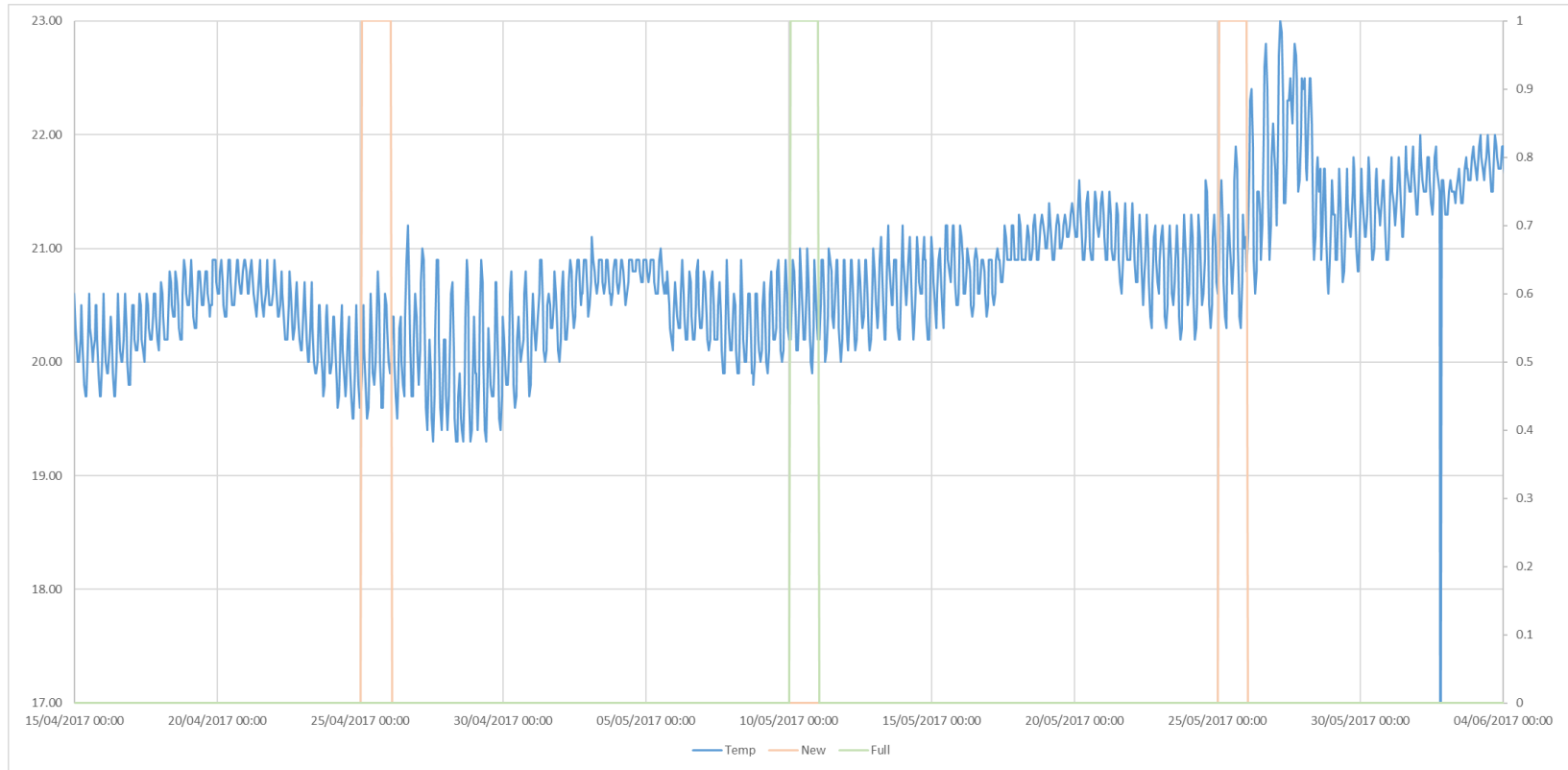
Cooling of R1 due to tides



- Spring tides (green and pink) cool the repeater more than neap tides. Full view



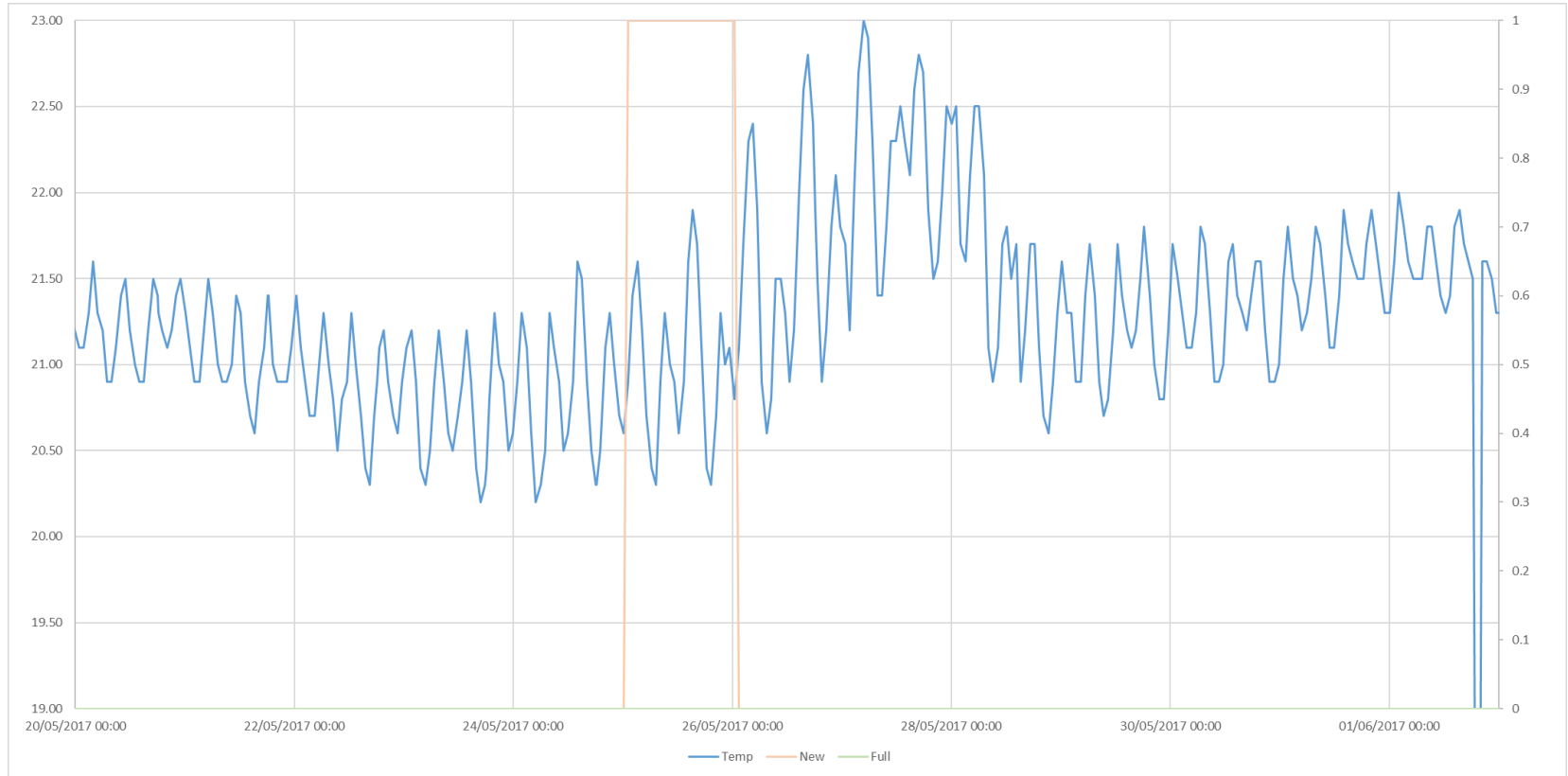
Cooling of R1 due to tides



- Spring tides (green and pink) cool the repeater more than neap tides. Two month view



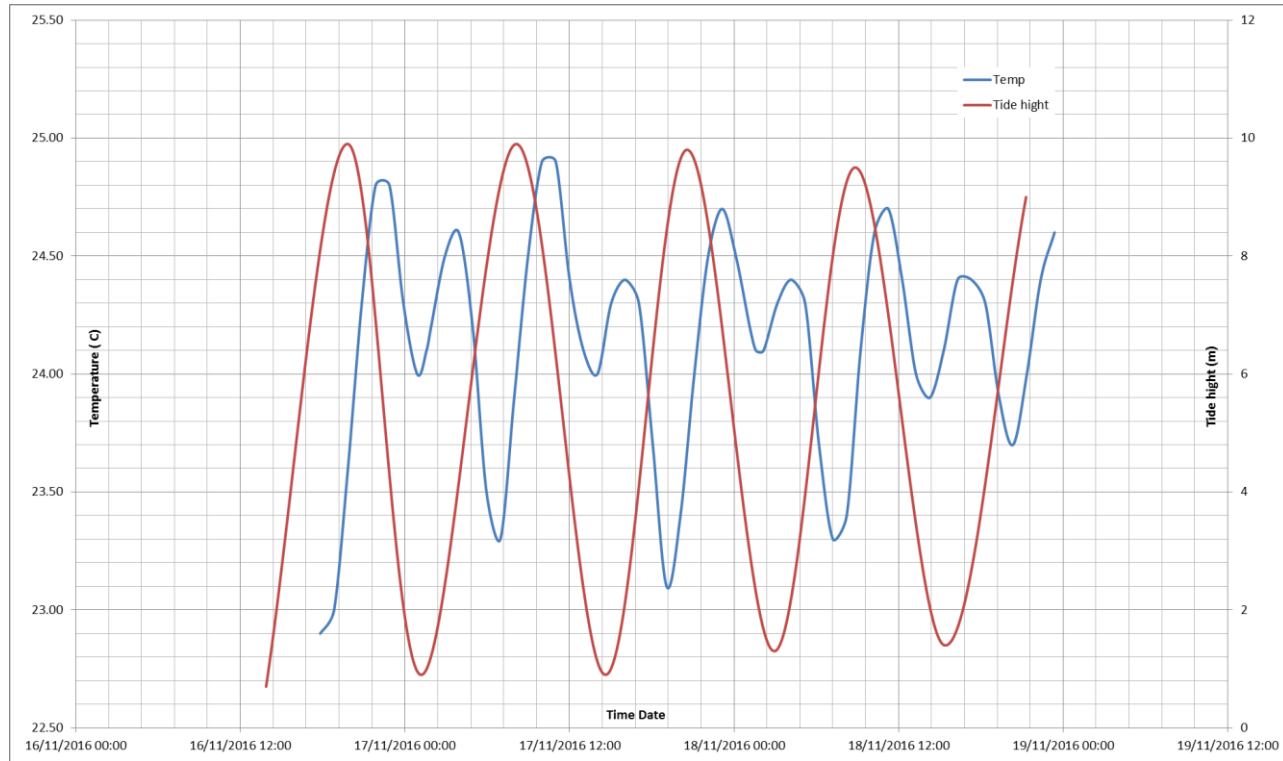
Cooling of R1 due to tides



- Double tides visible, 1 day between pink markers.



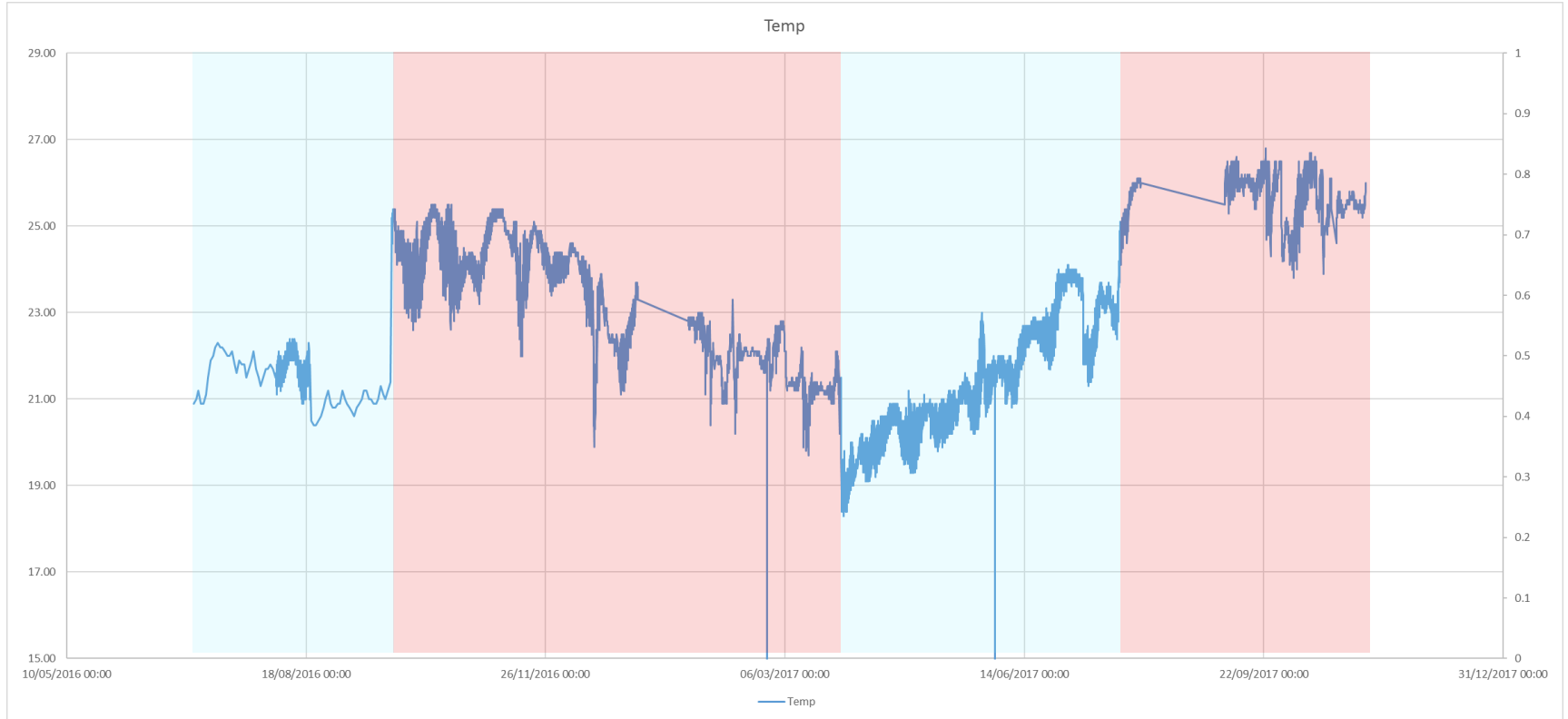
Comparison between tide at St Peter Port and R1



- May be possible to use temperature to measure tidal current



Seasonal step change in temperature



- Possible seasonal change in sea current
- First step is coincident with the suspected corrupted data August '16

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Internal air pressure and consumed current

R1

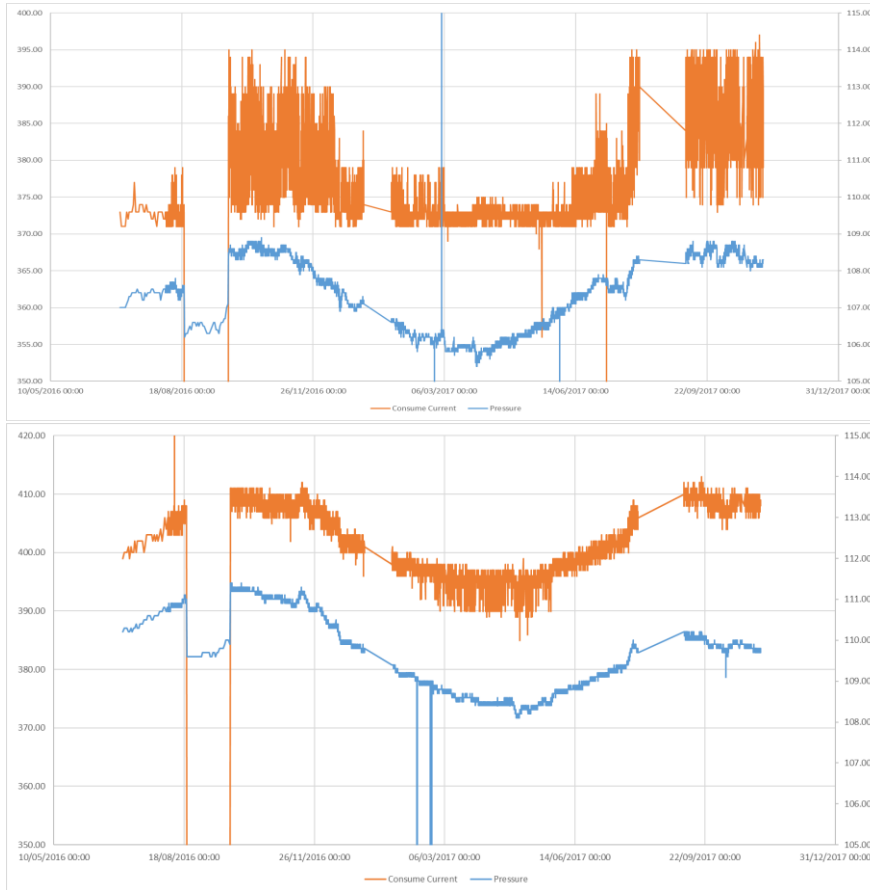
- Current varies between 372mA and 295mA
- Internal air pressure varies between 105.5 kp to 114kp

R2

- Current varies between 411mA and 390mA
- Internal air pressure varies between 108.5 kp to 111.5kp

Note

- Unknown cause of pressure / current step in August '16



Summary

- Measurements

- Both repeaters show seasonal temperature variations
- R2 is buried and is warmer
- Cooling due to currents seen on R1
- Double tide at R1
- Unknown effect presumably seasonal current flow causing a step change in temperature on R1

- Future study

- Change the system line current and thus power dissipation so that the effective thermal conductivity of the repeater can be calculated. That will allow measurements to be corrected to find sea temperature
- The Channel has been extensively studied, it may be possible to compare known current flows with repeater temperatures.
- Record logs every 10 minutes to get a more detail

- Use of measurements

- The repeater was not designed for this purpose and won't meet all the science objectives.
- It is possible to use the logs to study currents and sea temperature but not with high accuracy





Thank you

