Downwelling Irradiance has become a routine measurement.
OCR504 has the issue of Temperature Effect on Dark signal (TED)

- $Ed(\lambda) = \text{Slope} \times (\text{Counts} - \text{Dark}) \times \text{Im}(\lambda)$
- If **Dark** is under-estimated $\rightarrow$ Constant value at depth
- If **Dark** is over-estimated $\rightarrow$ Fast decrease at depth
LAB TEST 1

- Lab Test on OCR-Solo which has an inner temperature sensor to acquire sensor temperature (Ts)
  - Merging the cold sensor (4C) to a warm waters (30C controlled by thermostat)

- TED was confirmed to include three processes
  1. **Dark Current Response (to sensor temperature)**
     \[
     \text{Dark} = A + B \times T_s
     \]
  2. **Delay effect**
     \[
     T_w^*(t) = T_w(t+\Delta t)
     \]
  3. **Heat conduction**
     \[
     \frac{dT_s}{dt} = k^* (T_w^* - T_s)
     \]
1. **Dark Current Response (to sensor temperature)**

\[
\text{Dark} = A + B \times Ts
\]

A and B are different for different channels on the same OCR.

B can be positive or negative, which means dark current could be positively or negatively proportional to the sensor temperature.
2. **Delay effect**

\[ T_{w^*}(t) = T_w(t + \Delta t) \]

\( \Delta t = 60 \text{ sec for OCR-Solo} \)

Assumed to be Constant for the same model of sensor (same materials and same structure)
LAB TEST 1

3. Heat conduction

\[
\frac{dT_s}{dt} = k^* (T_w^* - T_s)
\]

\(k = -0.003 \text{ /s for OCR-Solo}\)

Assumed to be Constant for the same model of sensor (same materials and same structure)
RemA sensors, to obtain an constant delay time coefficient ($\Delta t$) and response coefficient ($k$)
CORRECTION IDEA

1. Fixing delay time coefficient (Δt = 54s) and response coefficient (k = 0.19/min)

2. Retrieving A and B for each channel of each sensor based on night profiles

3. Tracking drift in A over time with near-1000 m data (e.g. drift mode)

3. Applying A, B, Δt, k and Temperature profile to correct all OCR504 dark values.
CORRECTION STEPS

1. Night profiling once a year, preferably at the late summer.

2. Using Depth as the proxy of time (assuming 0.1m/s)

3. \( t_0 = \) when the float starts to ascend, and \( T_s(t_0) = T_w(t_0) \)

4. Estimating the \( T_s \) profile: \( \frac{dT_s(t)}{dt} = k(T_w(t-\Delta t) - T_s(t)) \)

5. Linear regression on \( T_s \) and DC at each channel to retrieve \( A \) and \( B \): \( DC = A + B*Ts \)

6. Use more frequent deep (e.g. drift) measurements to track drift in \( A \)

7. Applying \( A \) and \( B \) to all profiles measured by this float (always estimating \( T_s \) based on Temperature and Depth)
EXAMPLE IN SITU CALCULATION OF A AND B

Using external temperature

Using modeled internal temperature

Color shows time. Some drift apparent.
RESIDUALS OF PREVIOUS FIT ARE TIME-DEPENDENT (I.E. SENSOR DRIFT)

Data from profiles

1000 m drift
EXAMPLE CORRECTED RADIOMETRY PROFILES – GOOD RADIOMETER DATA AT DEEPER DEPTHS

![Graph showing corrected and uncorrected data profiles.](image)