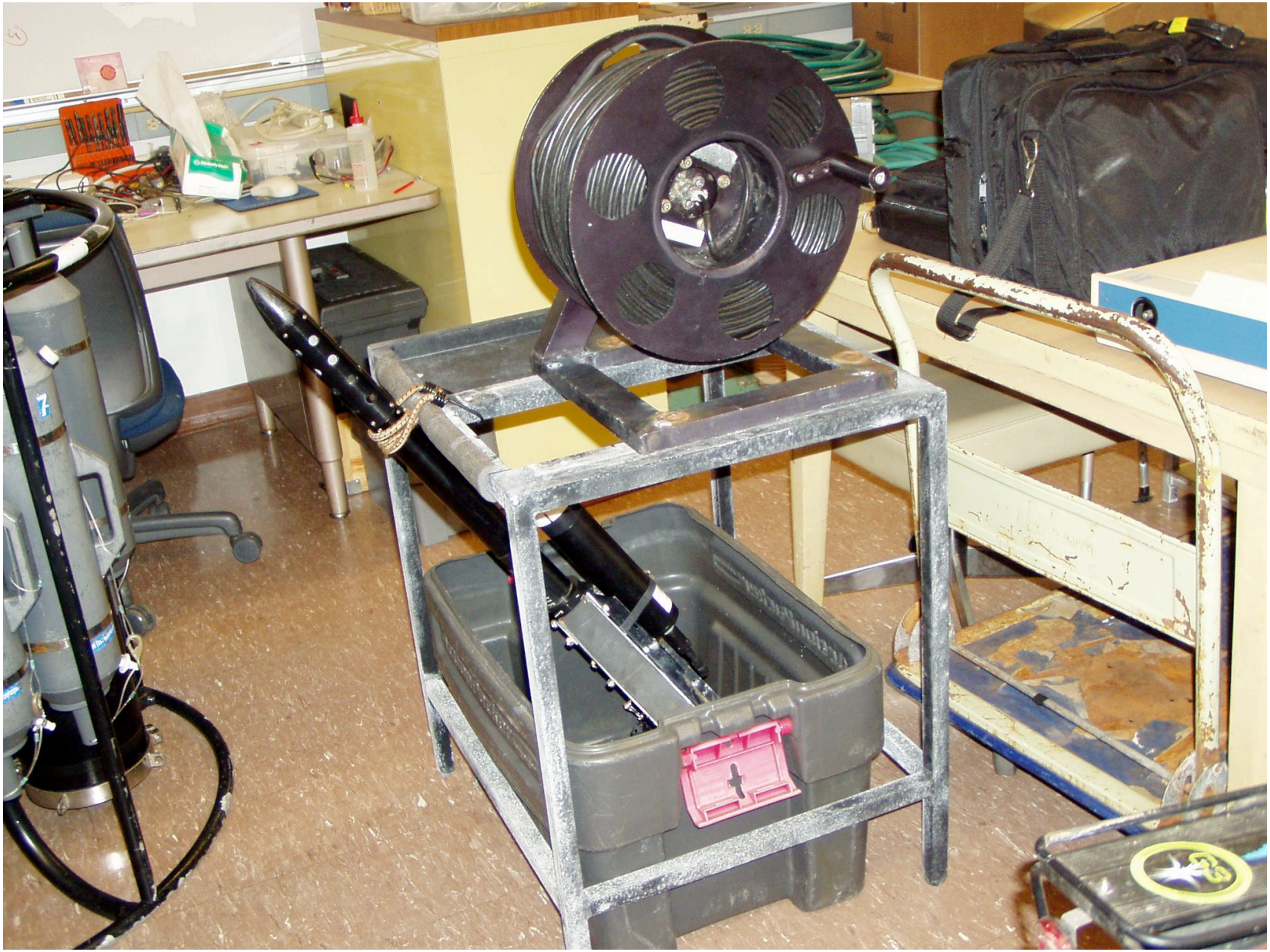
Temperature Effect on Dark Offsets with Satlantic uPro II

UCSB Satlantic uPro II

- Meridianal transects across ocean basins showed surface temperatures from 0 to 30 deg C.
- Irradiance and Radiance channels showed significant changes in dark offsets due to temperature of the photodiodes.
- Delrin material of optical heads yields slow change of photodiode temperature as measured by each array temp sensor.

Minimizing thermal changes

- A water bath with surface water for instrument equilibration prior to cast.
- Minimum sun exposure between removal from water bath and start of profile.
- Upon recovery, cover arrays with dark caps and return to water bath.
- Log complete cast (down, up, dark)

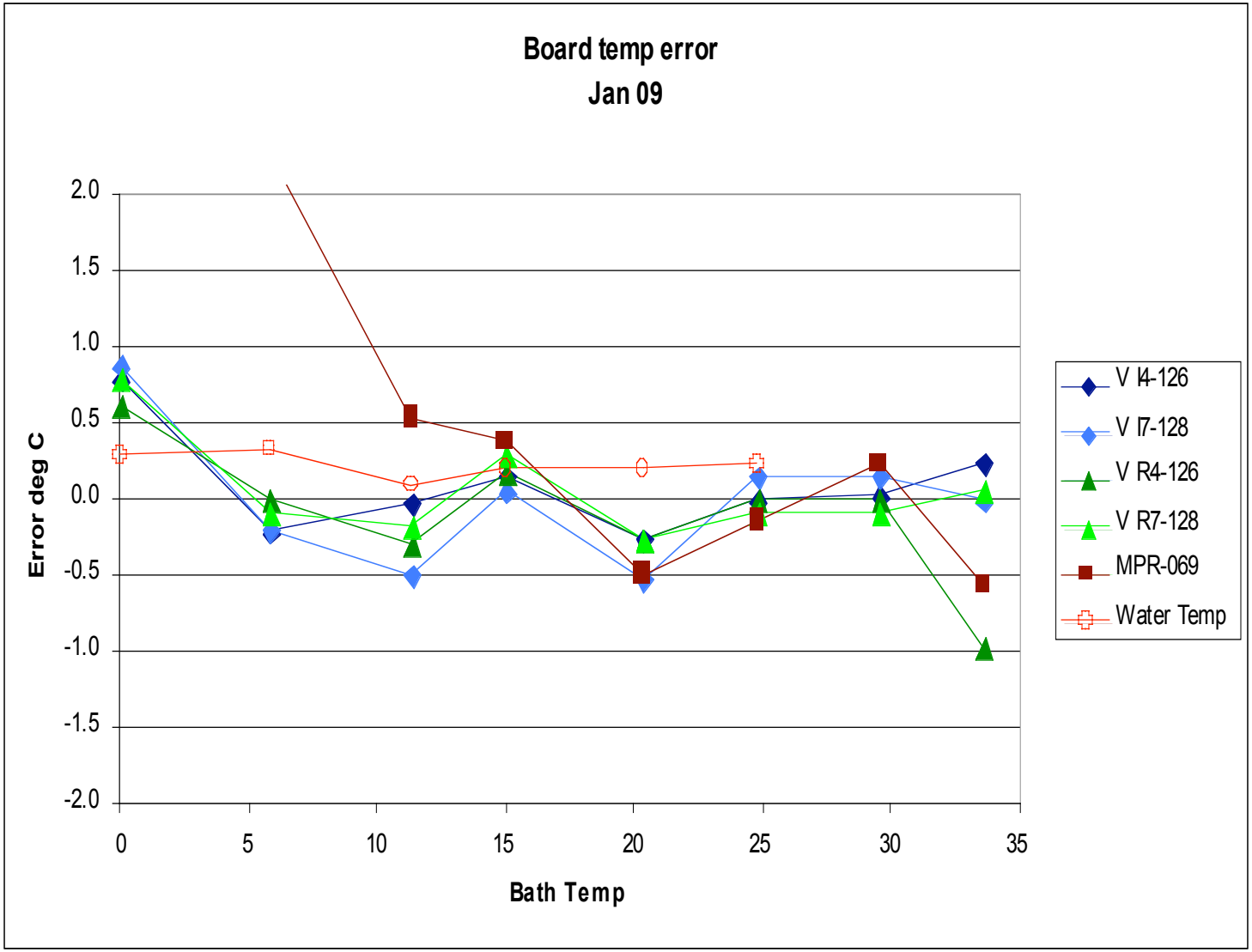


Lab Experiments

- Well stirred water bath to completely immerse all underwater optical arrays (dark caps installed)
- Monitor array temp values (only 0.5 deg resolution)
- Measurements every 5 deg (0 -35)
- Allow 10-15 min. for each temperature equilibration then record 20 sec of data

Experiment Results

- Use SatCon to obtain raw results from each diode array
- Build a spreadsheet with average dark count values for each photodiode channel and for the array temp sensor in each array.
- Plot results and determine regression for each optical channel


Board temp error
Jan 09
Error deg C
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
0
5
10
15
20
25
30
35
Bath Temp
V I4-126
V I7-128
V R4-126
V R7-128
MPR-069
Water Temp

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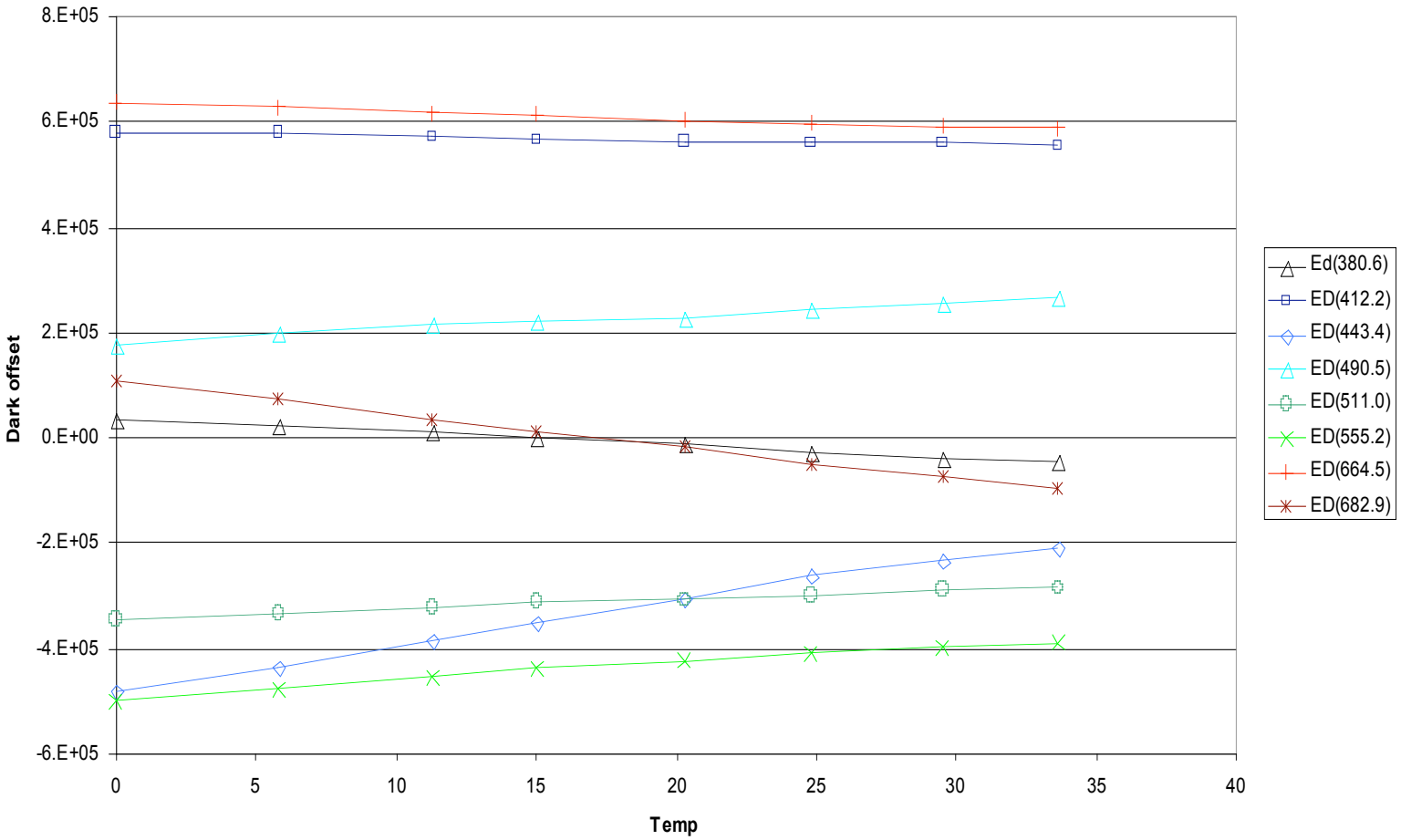
Dark offset change vs Temp
Lab Data Jan 09



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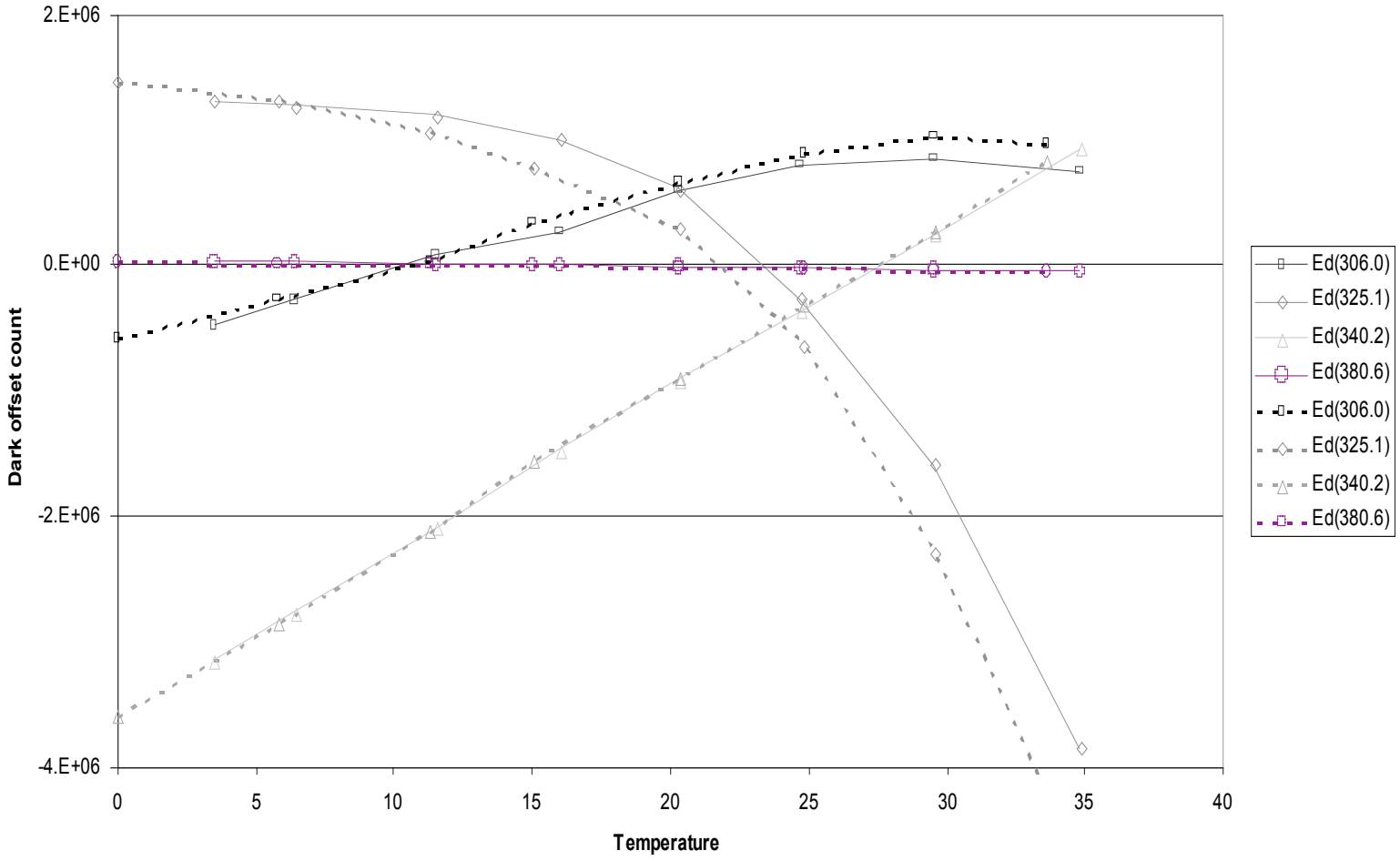
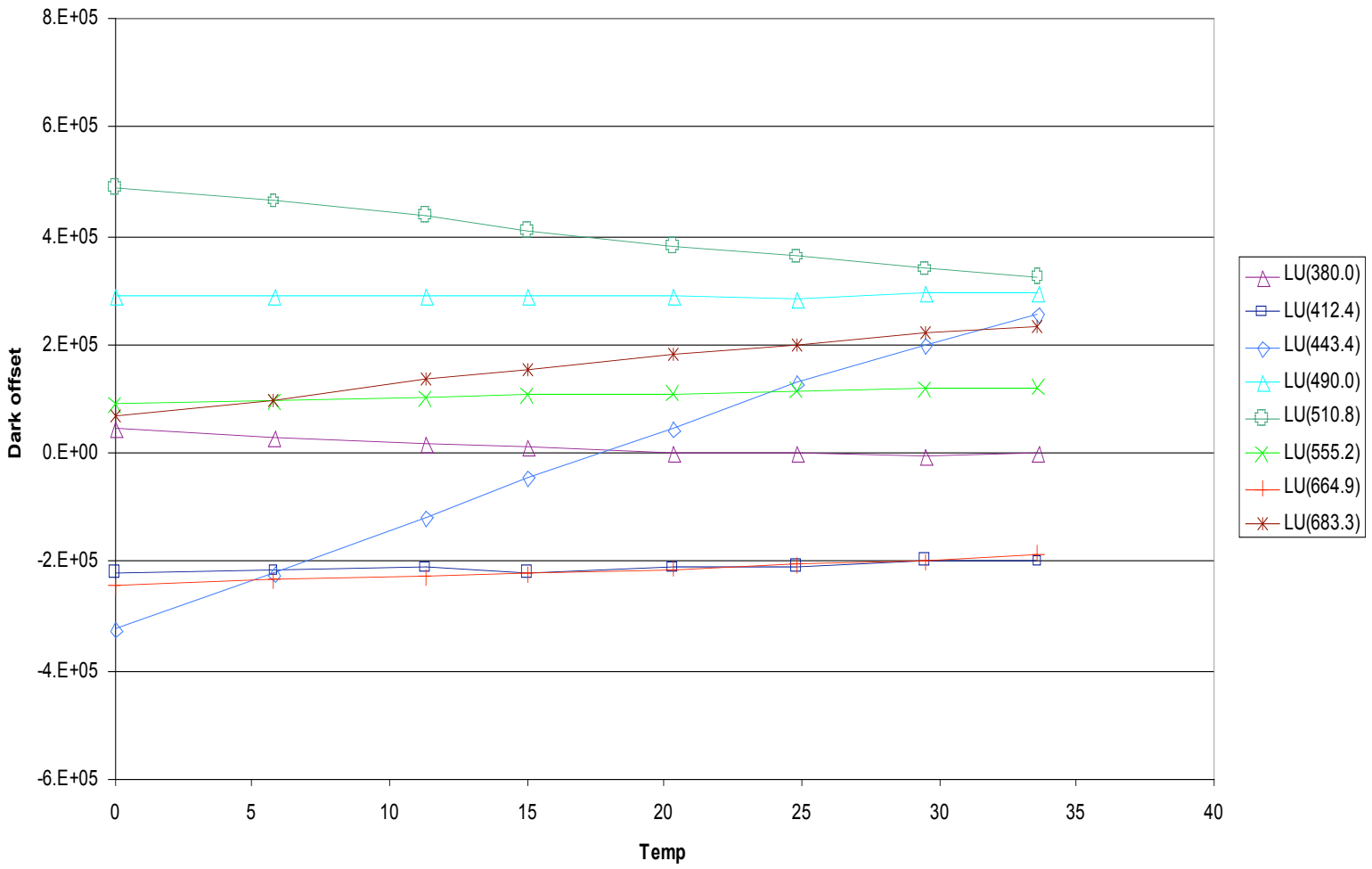
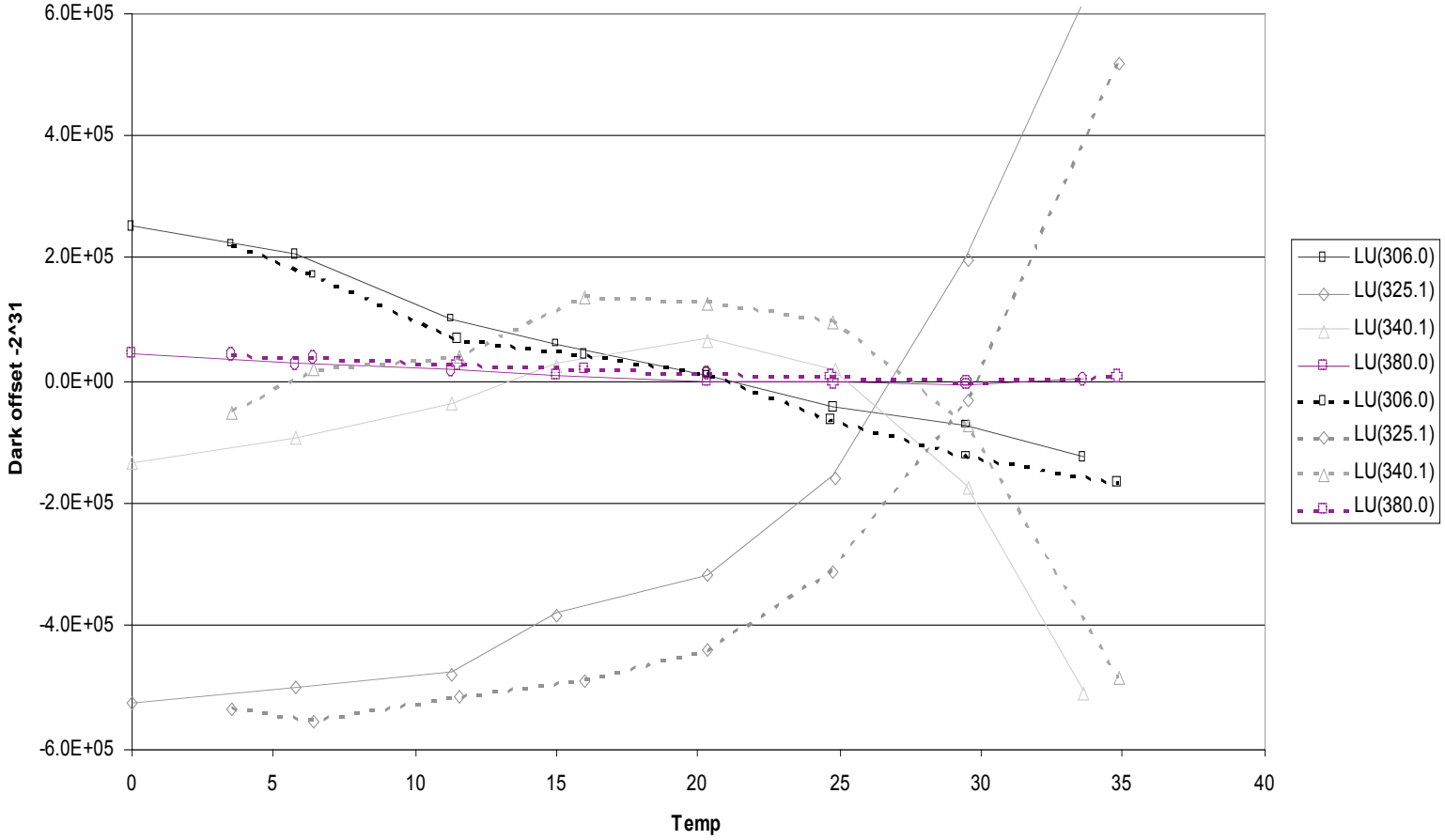
Dark offset change vs Temp
Lab Data May 07 (solid)
Lab Data Jan 09 (dashed)




UCSB uPRO 069
Dark offset change vs Temp
Lab Data Jan 09
8.E+05
6.E+05
4.E+05
2.E+05
0.E+00
-2.E+05
-4.E+05
-6.E+05
Dark offset
0
5
10
15
20
25
30
35
40
Temp
LU(380.0)
LU(412.4)
LU(443.4)
LU(490.0)
LU(510.8)
LU(555.2)
LU(664.9)
LU(683.3)

UCSB uPRO 069
Dark offset change vs Temp
Lab Data Jan 09 (solid)
Lab Data May 07 (dashed)



Application of Results

- Error due to using *wrong offset* during conversion of raw counts to engineering units is simply corrected if array temp is also stored with processed data.
- Data can be binned prior to temperature correction.
- Compute *correct offset* at average array temp for each binned channel

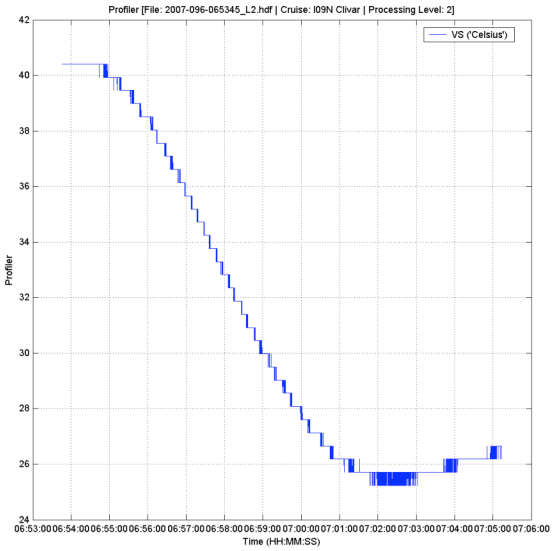
- Determine correction as:

  (correct offset-wrong offset)* slope
- Apply corrections
- Proceed with AOP computations

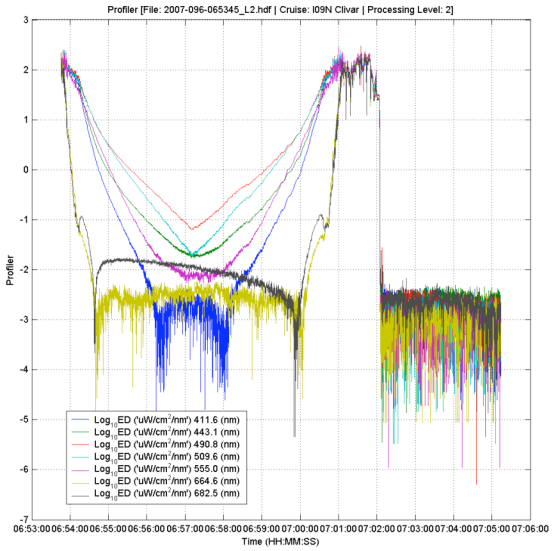
Things to watch out for

- With some data reduction scripts, if eng value is negative, result stored as NA
- Select *wrong offsets* so that eng values will be positive for all temperatures
- Make sure Array Temp is included in the binned data (in ProSoft, have to trick software by calling it TRANS or FLUOR in the .cal file)

Ed with large temp change

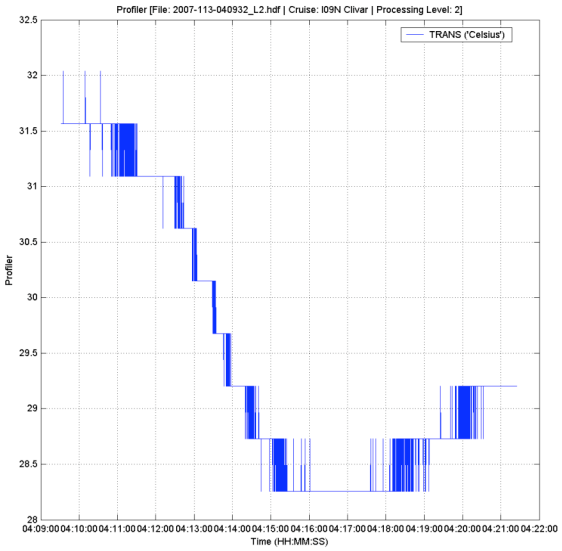


Ed temp from 42 to 26 C

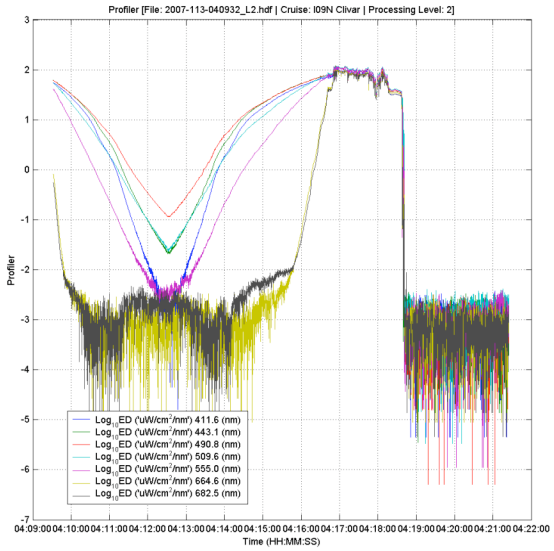


Log Ed Vis vs time

Ed with smaller temp change

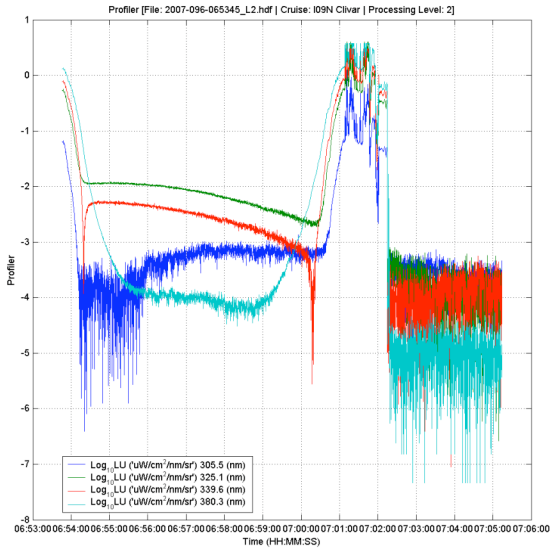


Ed temp from 31 to 28 C

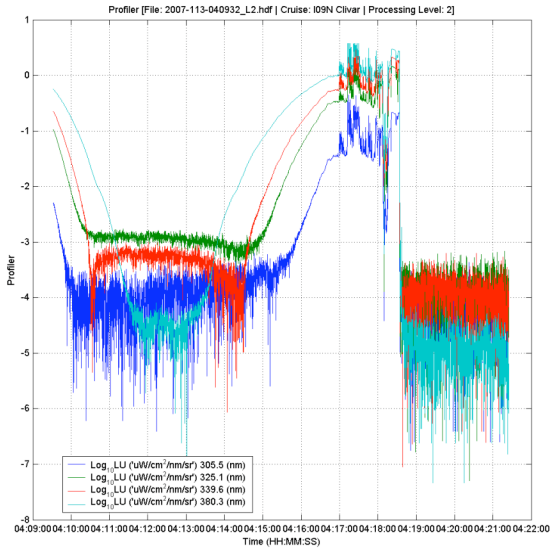


Log Ed Vis vs time

UV Lu with temp change



Lu temp from 42 to 26 C



Lu temp from 31 to 28 C