

Update: Thermal Imaging long term measurements

WILLIAM HEIDORN, JIE YU
IOWA STATE UNIVERSITY
ISU WEEKLY STAVE QA MEETING
DECEMBER 6, 2017



Motivation

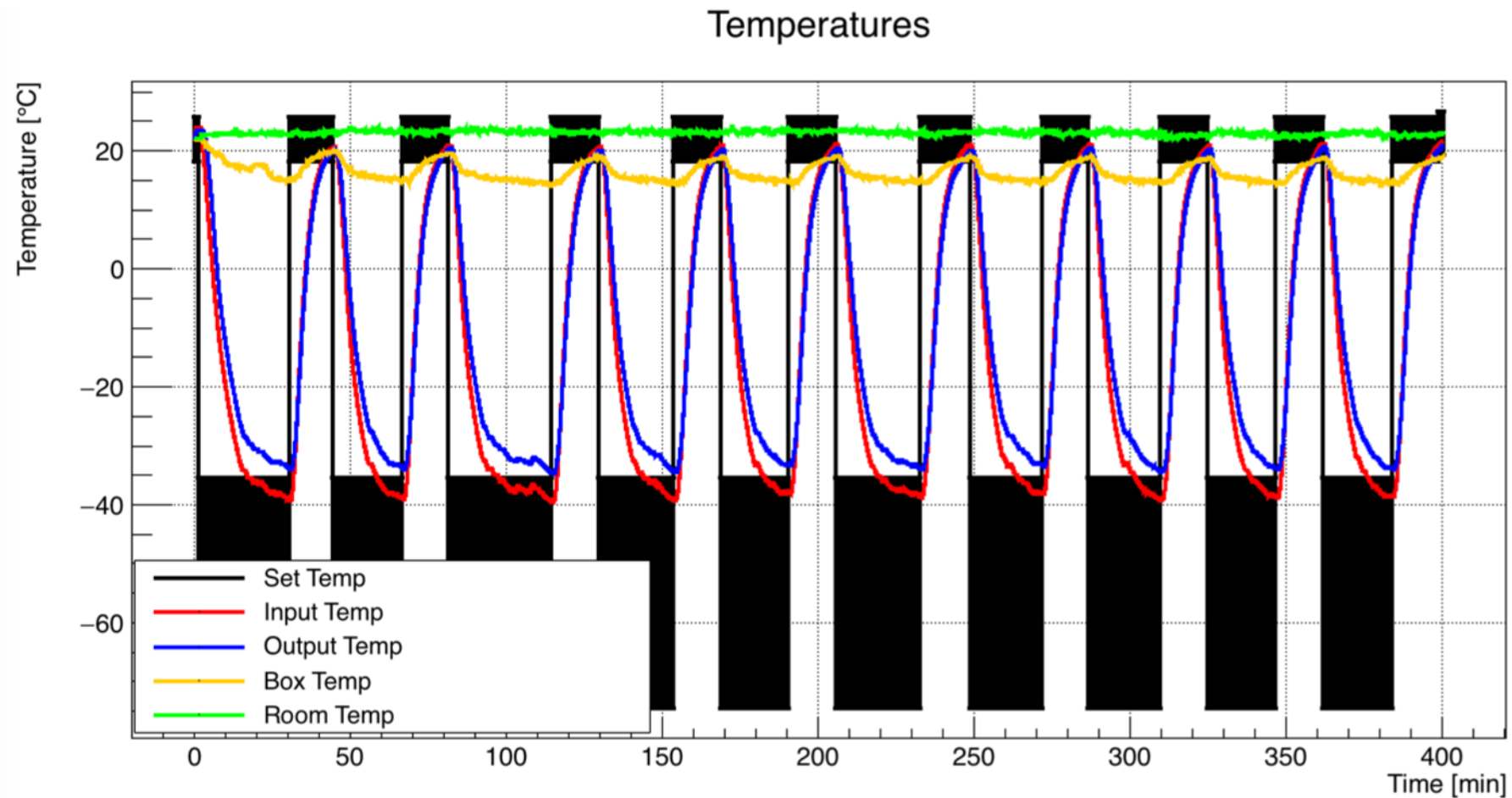
- ▶ The motivation of this project is to see if there are any effects upon the physical structure and defects in **stave 2r** by cycling it between room temperature and low temperature 100 times.
- ▶ Both before and after cycling, the stave defects will be measured using both detection methods: Laser Scanning and Thermal Imaging
- ▶ We will get a good measurement on fluid use and effects of repeated thermal changes on the stave structure

100 Loops

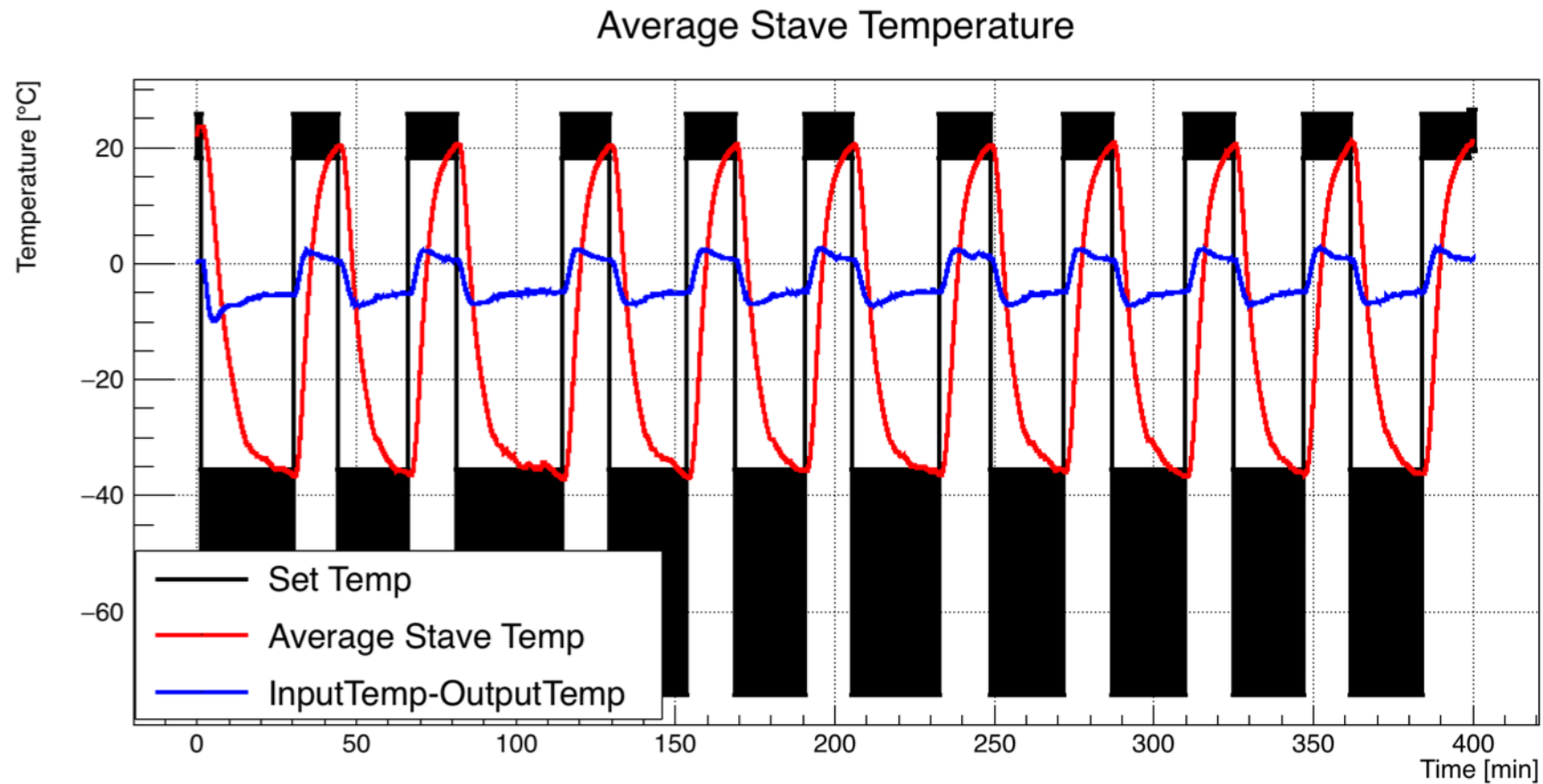
- ▶ Three measurements were done during this experiment: a test run with 10 loops, 80 loops (stopped for the weekend), 10 loops after the weekend.
- ▶ Each loop set the chiller to -55 C then 22 C. The program would wait for the average stave temp to get to -35.5 C and 18.3 C respectively, and then if the stave temperature did not change by more than 1 C, it would move to the next temperature in the cycle

N Loops	Start Date	Start Time	RunTime [min]	LoopTime [min]	Shortest-Longest LoopTime [min]	Room Temp [C]	Leak Rate [L/hr]
10	Nov 28	10:42 AM	400.57	39.8+/-3.7	37.1-48.1	23.05+/-0.39	NO
80	Nov 29	10:12 AM	3067.05	38.3+/-2.2	34.1-43.1	22.35+/-0.52	0.008
10	Dec 4	10:03	401.2	40.0+/-3.4	36.0-45.1	22.12+/-0.45	0.015
Total			3868.82	38.6+/-2.5	34.1-48.1		

Observations (Loops 1-10)

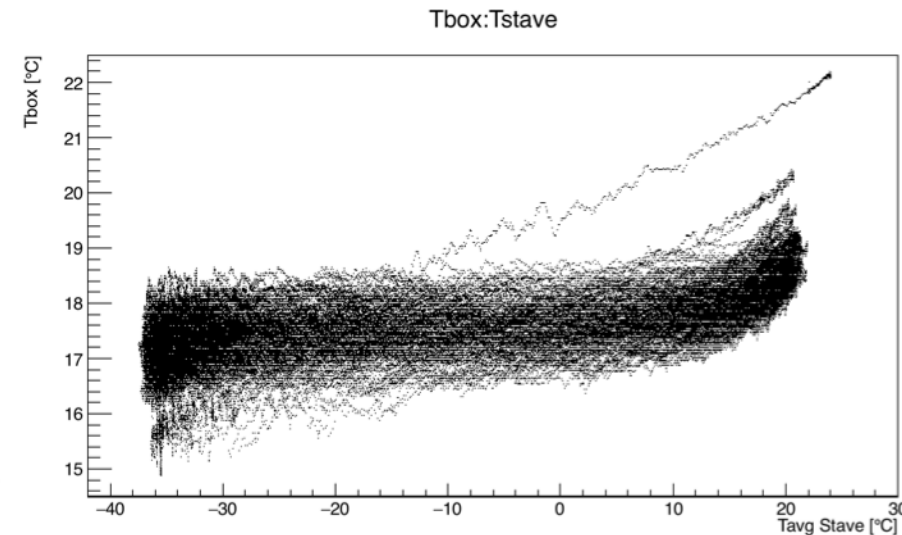
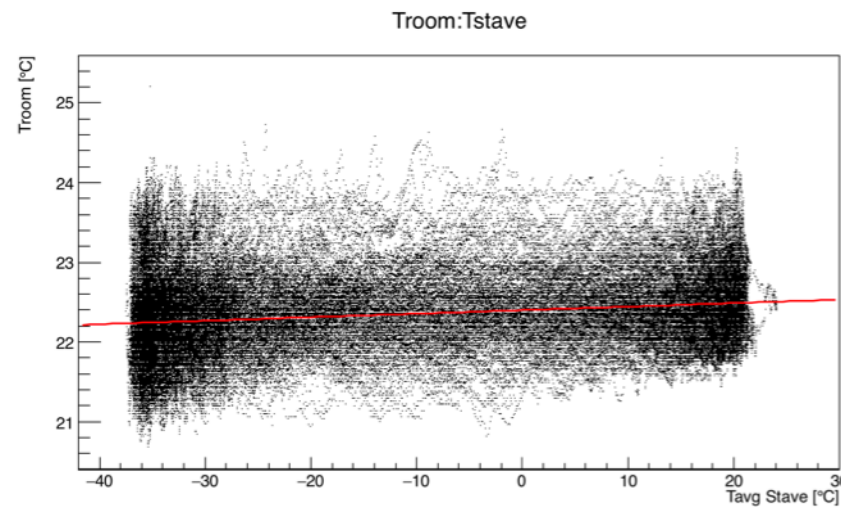
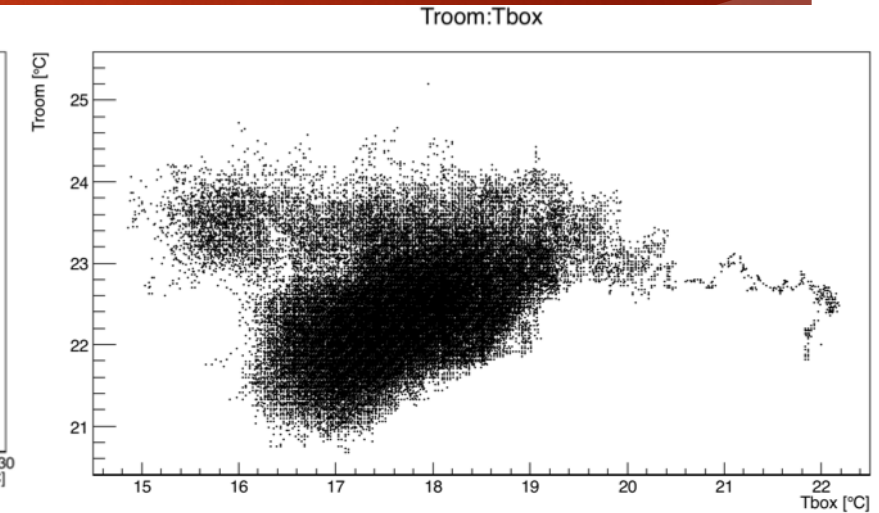
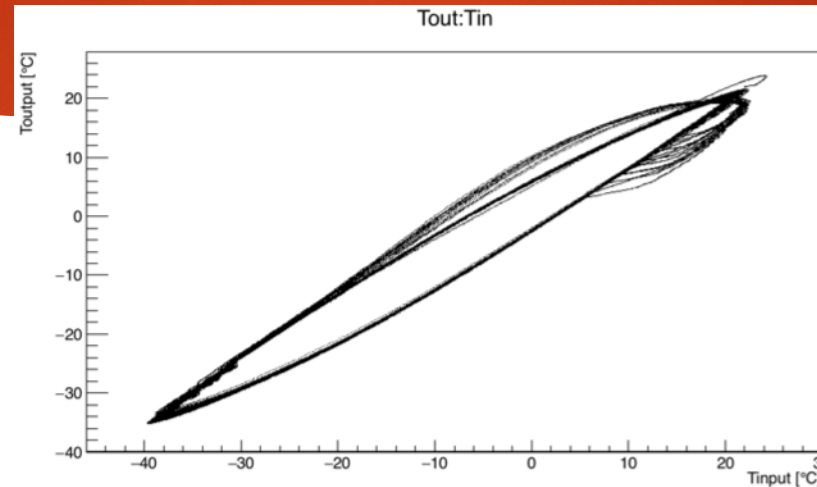


Observations (Loops 1-10 cont.)



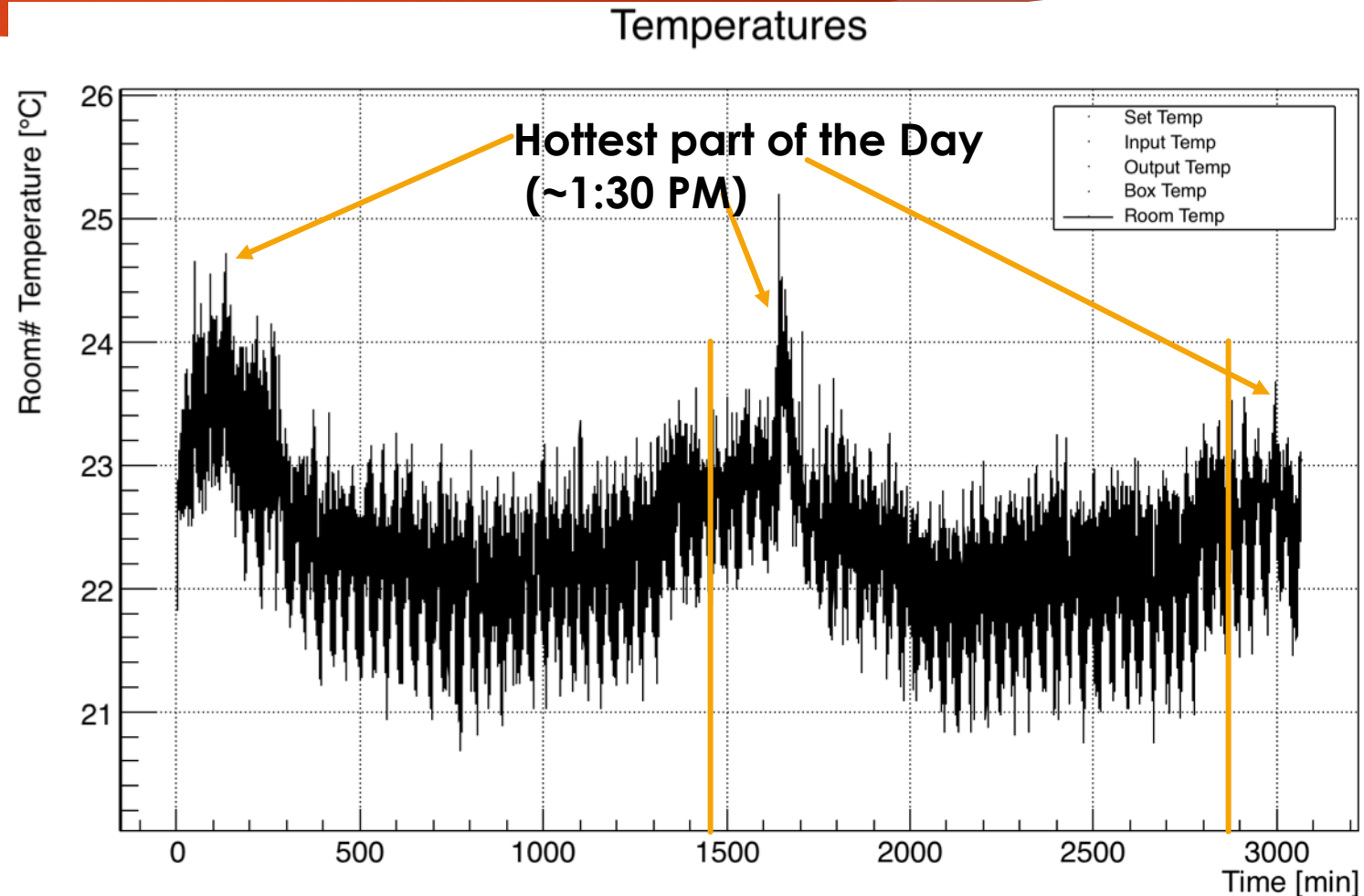
Observations (Loops 11-90)

- ▶ Input and Output Temperatures are highly correlated...
- ▶ Stave temperature does not seem to have much of an effect on the room temperature
- ▶ Stave temperature does not have much effect on the enclosure temperature at temperatures below 15C. It will be interesting to see how high temperatures effect this
- ▶ The temperature of the room and the box are related in some way... but the room is kept quite constant



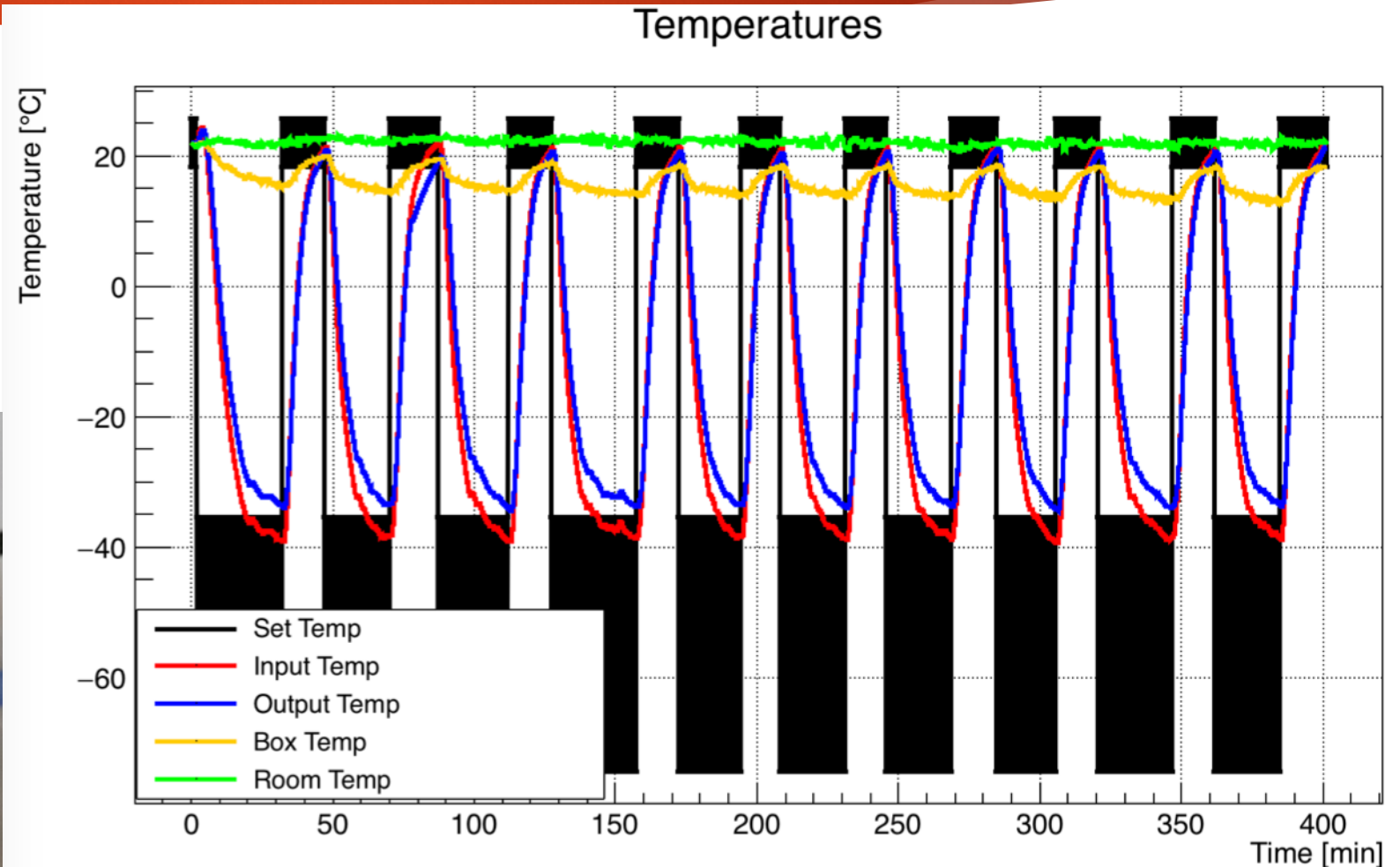
Observations (Loops 11-90 cont.)

- ▶ Fluid loss was measured after the long run. A significant amount was lost over the run time. ~1.1cm fluid loss which corresponds to about 1/3L
 - ▶ It could be due to a small slow leak around one of the connections. Dripping was not observed... but afterwards discoloration is visible at the connection point.
- ▶ Day/Night room temperature cycle is visible

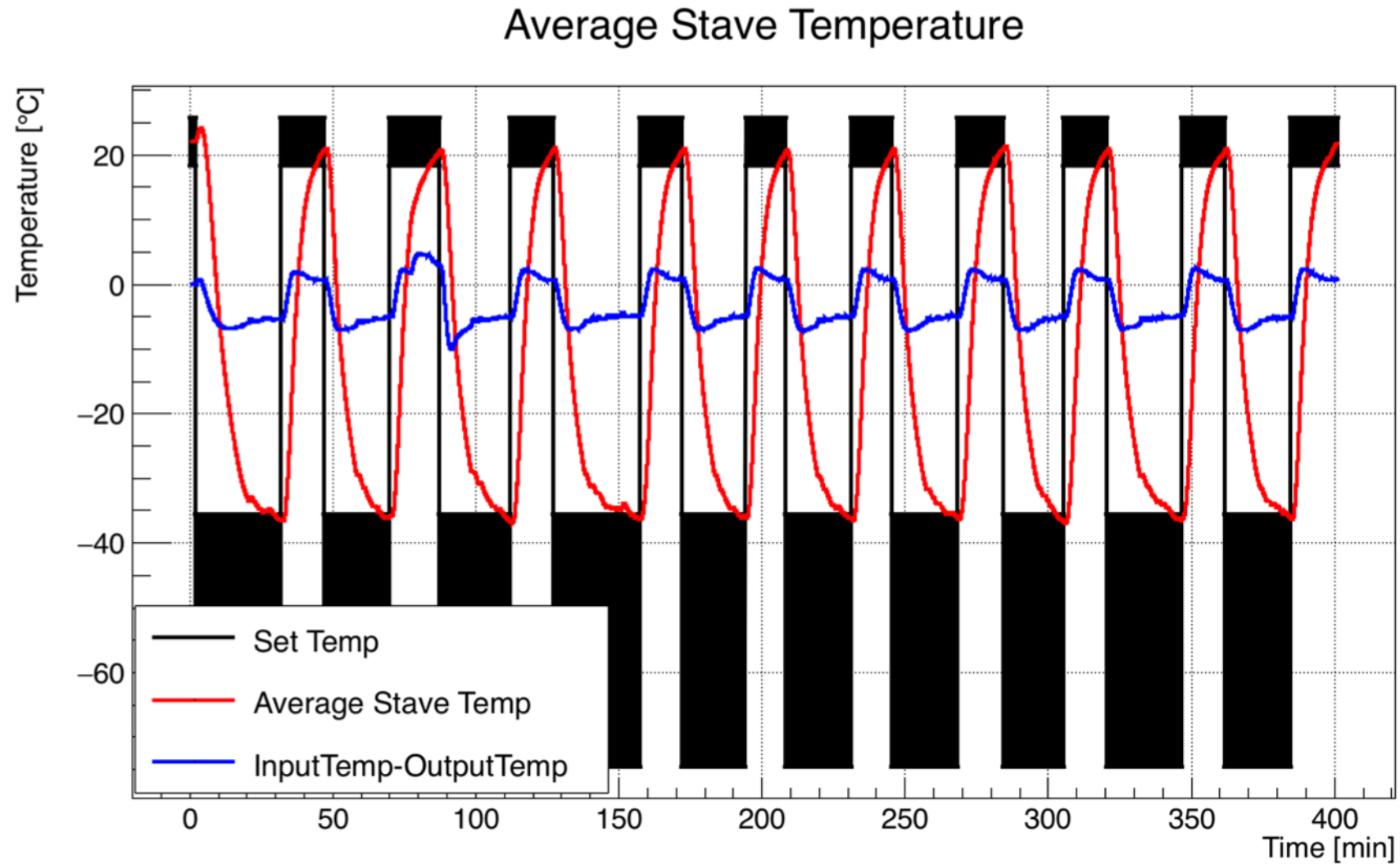


Observations (Loops 91-100)

- ▶ Leak seems to have continued and gotten a bit worse. Discoloration is quite visible around one of the pipe connections.



Observations (Loops 91-100 cont.)



Stave 2r After 100 loops

- ▶ Measurements are being taken this week! Hopefully by the meeting next week, the analysis will have some preliminary results

Backup Slides