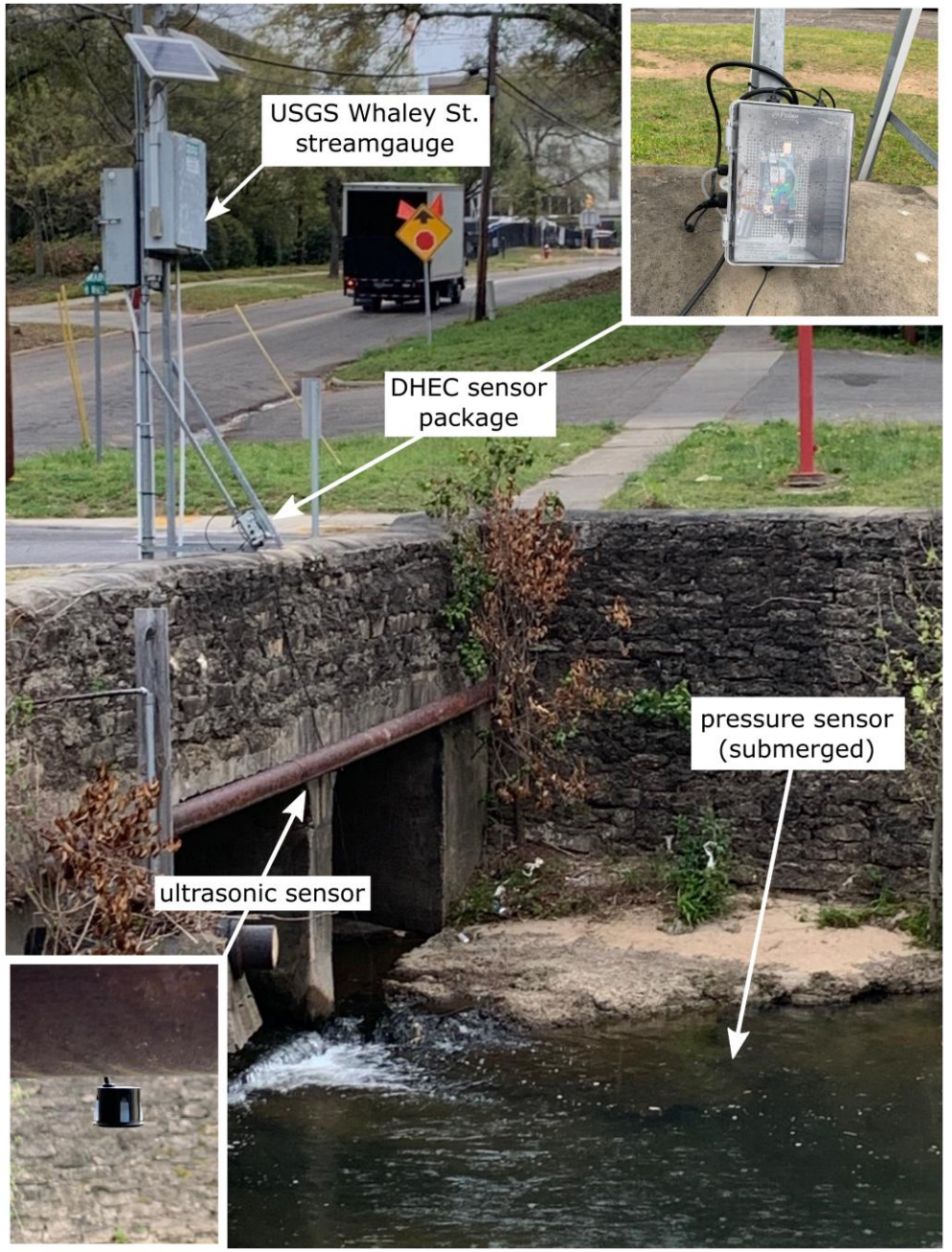
Field Tests

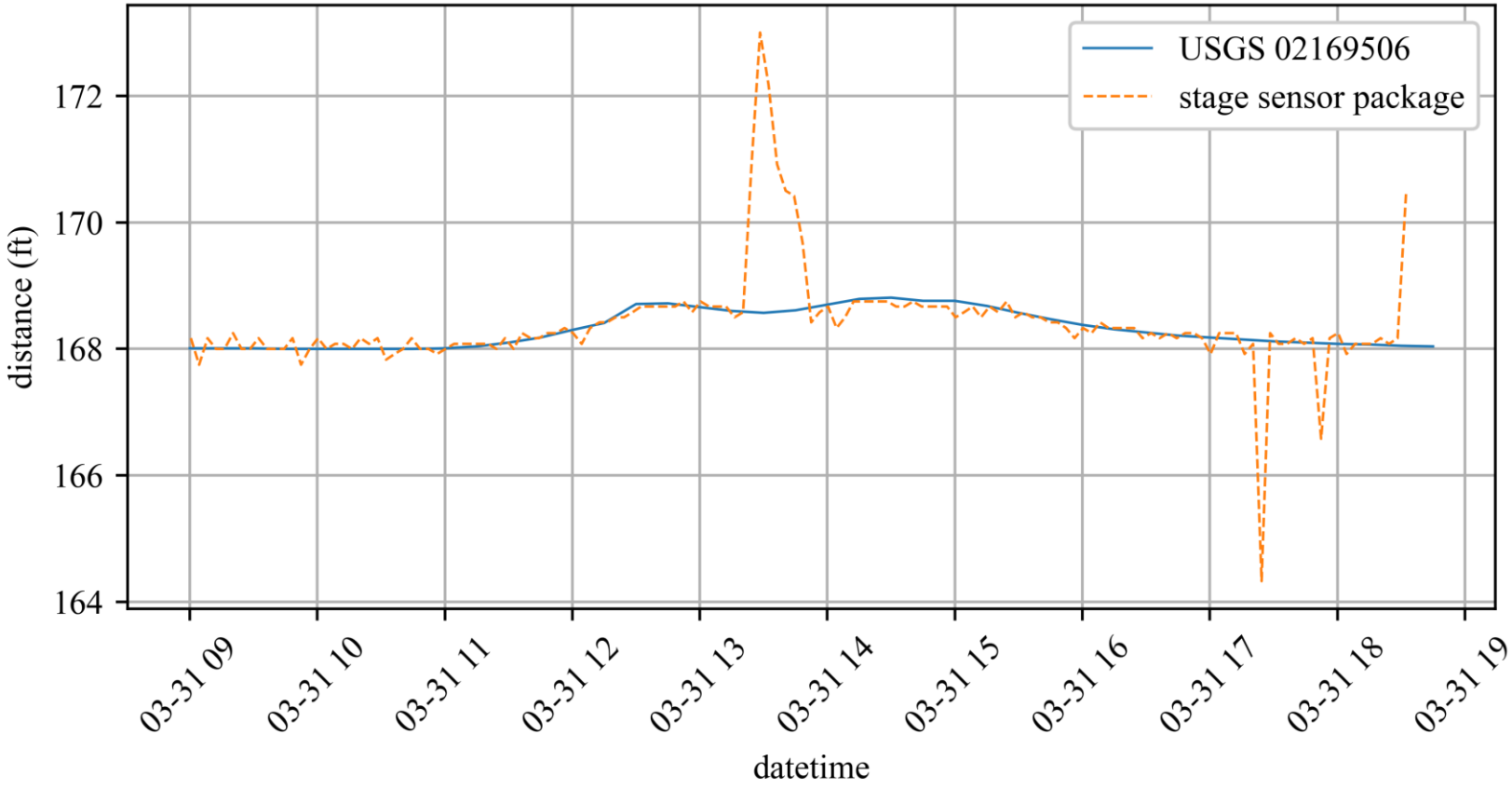
Corinne Smith

3/31

- Fixed on USGS Whaley St streamgage
- Ultrasonic sensor was fixed to the pipe, pressure sensor was not fixed
  - Caused problems to pressure sensor when the flow rate picked up
  - Solution: deploy pressure sensor to the side of the main flow
- Data session: 9:00 – 18:32
  - Cause of failure: network would not reconnect, so Adafruit IO was completely unresponsive
  - Possibly encountered a Network Denied status
- Ultrasonic had noisy readings between major rainfall periods
  - Possible something was stuck under the sensor that gave false readings



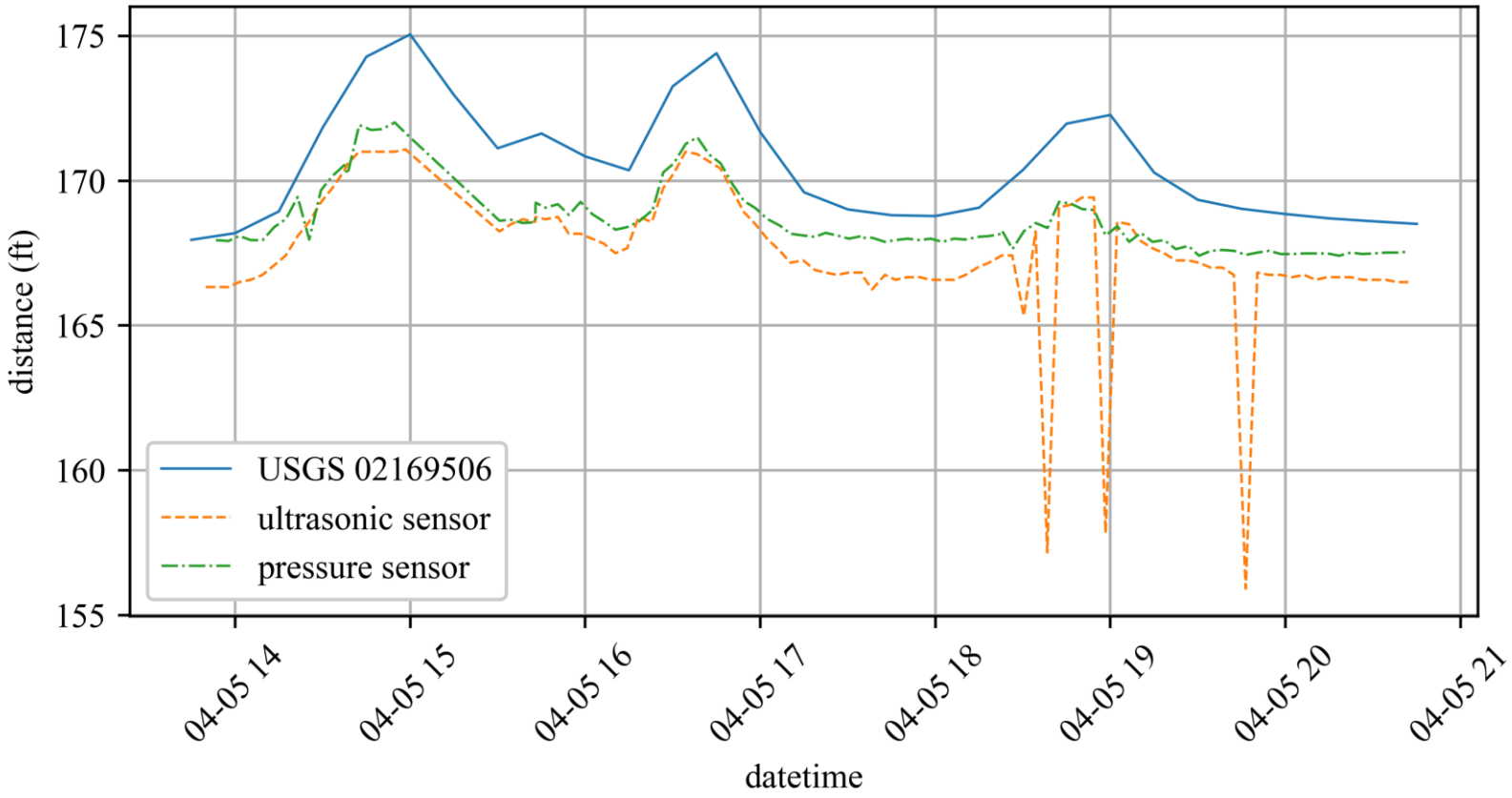
Results

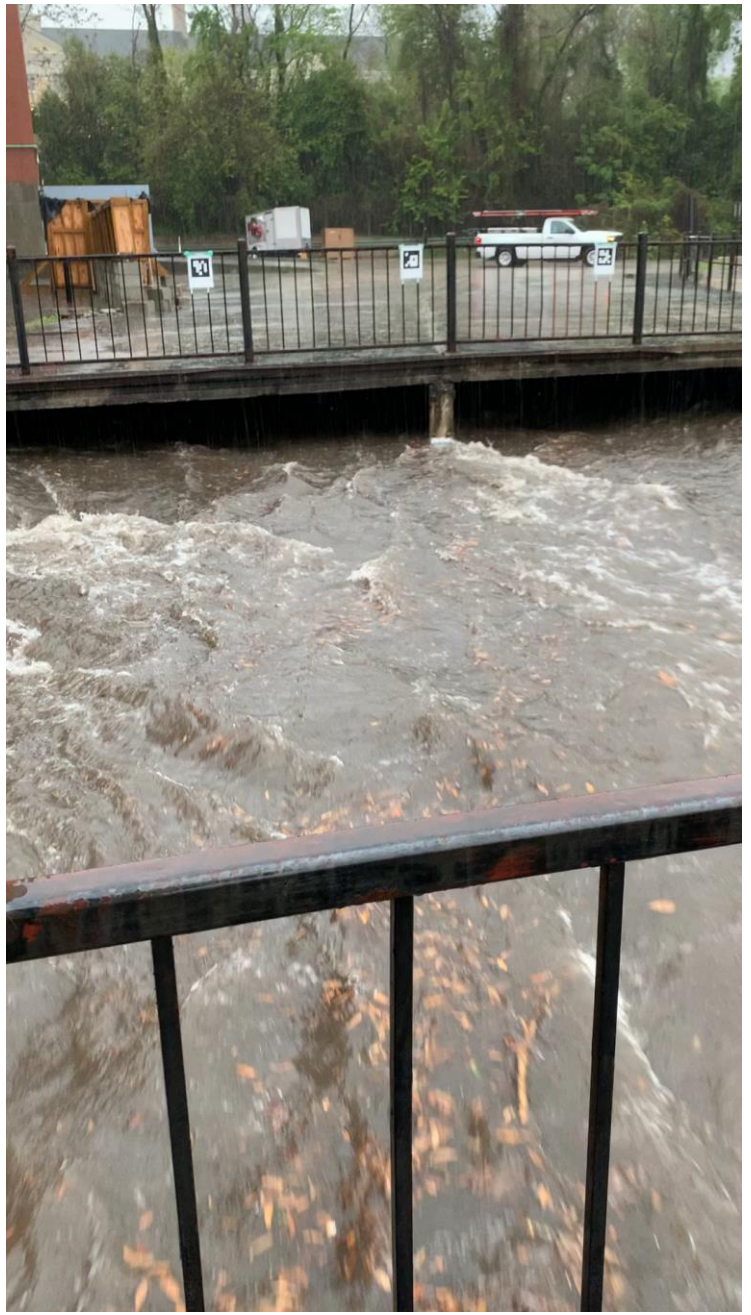

USGS 02169506
stage sensor package
distance (ft)
172
170
168
166
164
03-31 09
03-31 10
03-31 11
03-31 12
03-31 13
03-31 14
03-31 15
03-31 16
03-31 17
03-31 18
03-31 19
datetime

4/5

- Severe thunderstorms and tornado warning
- Deployed behind 300 Main on bridge
  - Channel profile differs from USGS; peaks should line up, but magnitude may not
- Pressure sensor was secured to bridge leg, ultrasonic sensor was draped over side
- Data collection timeframe: 13:50 – 20:42
  - Cause of failure: waterproofing issues shorted datalogging board
  - Solution: add glue to further waterproof area around cable glands
- Some noisy readings on ultrasonic sensor towards end of deployment
  - Possible cause: sensor may not be as “waterproof” as datasheet claims

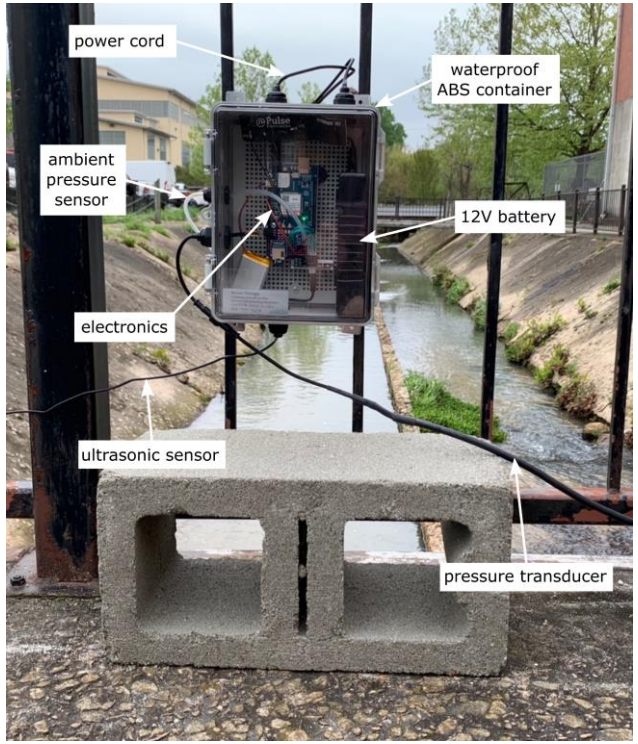
Results

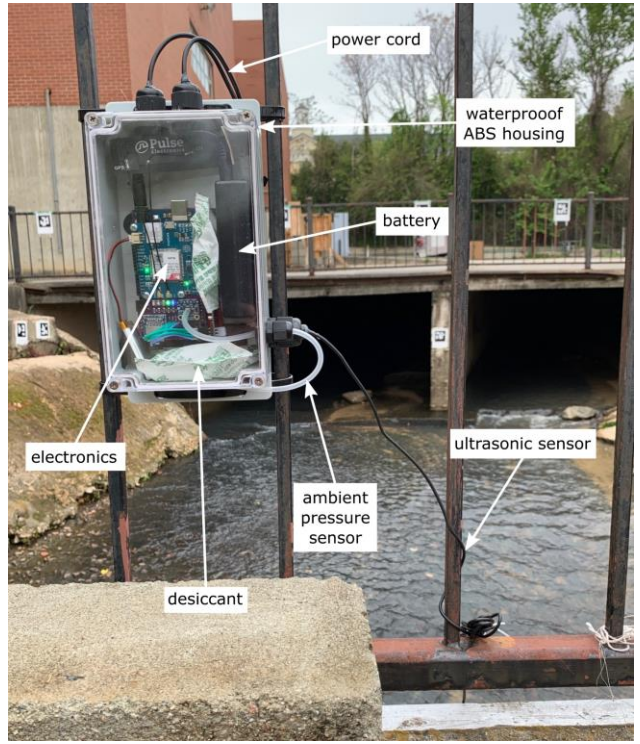

175
170
165
160
155
distance (ft)
USGS 02169506
ultrasonic sensor
pressure sensor
04-05 14
04-05 15
04-05 16
04-05 17
04-05 18
04-05 19
04-05 20
04-05 21
datetime



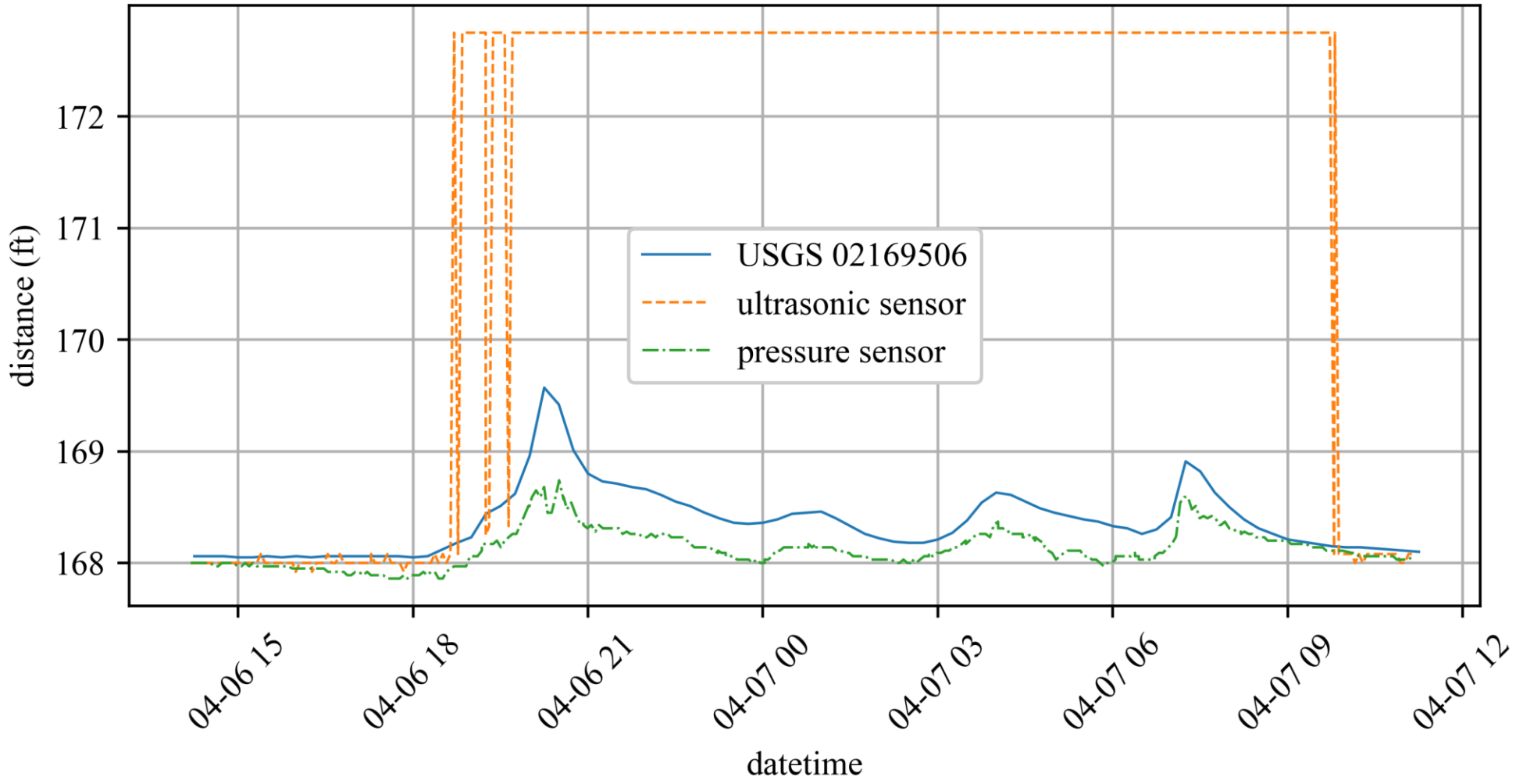
4/6-4/7

- Tested fixed sampling package and adaptive sampling package
- Fixed sampling:
  - Readings every 4 minutes
  - Lasted 4/6 14:10 – 4/7 11:10 (manually stopped)
  - New ultrasonic sensor kept in makeshift housing to keep it dry
    - Possible cause of error sensor readings from 4/6 18:30 until 4/7 9:30
- Adaptive sampling:
  - Readings vary between 4 and 20 minutes depending on average second derivatives of readings
  - Lasted 14:10 – 21:18 due to smaller battery
  - Noisy readings can accelerate sampling rate
    - Current equation is too responsive

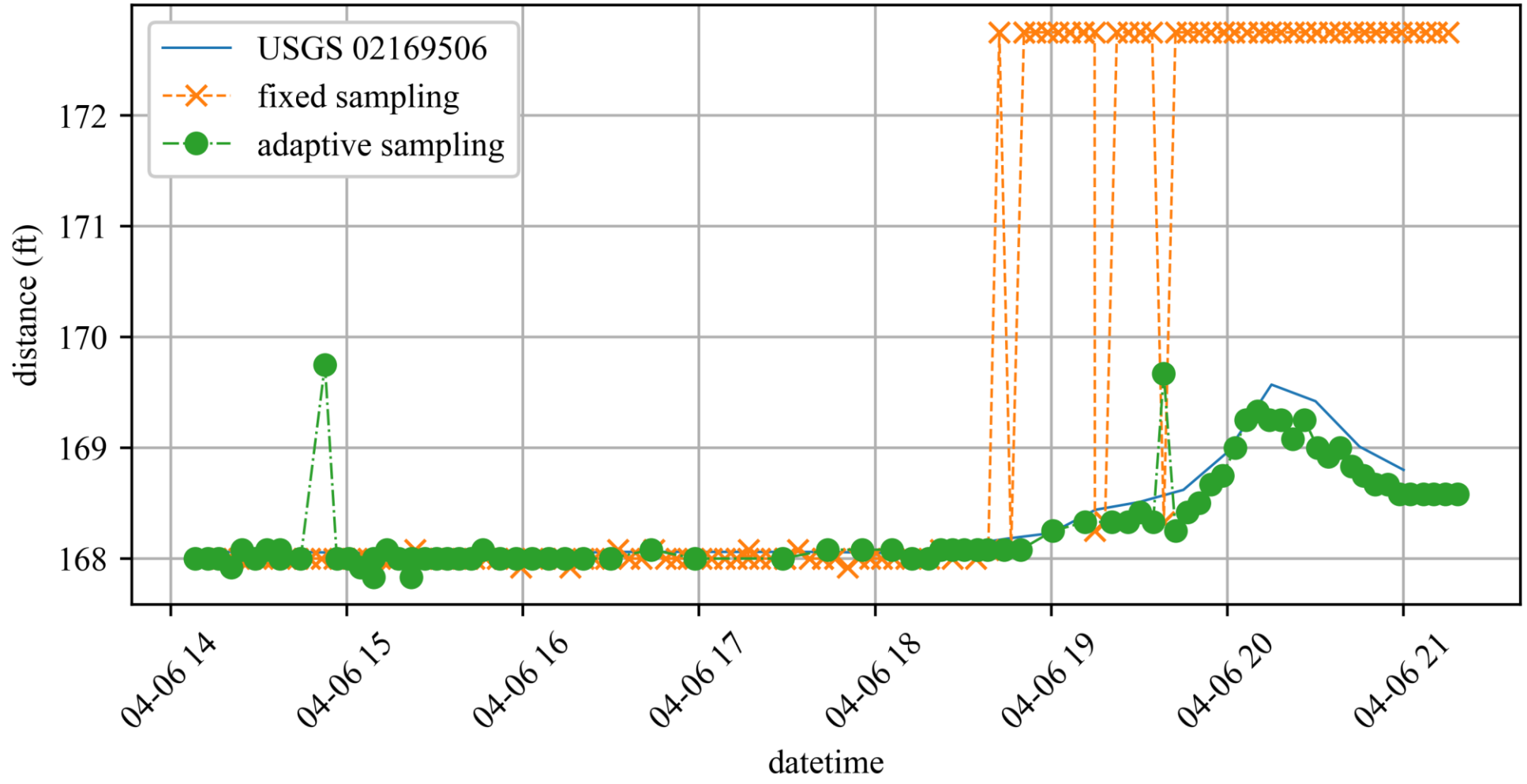




Results


172
171
170
169
168
distance (ft)
USGS 02169506
ultrasonic sensor
pressure sensor
04-06 15
04-06 18
04-06 21
04-07 00
04-07 03
04-07 06
04-07 09
04-07 12
datetime

Results


USGS 02169506
fixed sampling
adaptive sampling
distance (ft)
172
171
170
169
168
04-06 14
04-06 15
04-06 16
04-06 17
04-06 18
04-06 19
04-06 20
04-06 21
datetime

Improvements

- Switch to a two-transducer ultrasonic sensor
  - Two transducers reduces angle spread, which increases accuracy by reducing area that sensor is capturing
- Average multiple sensor readings to reduce outliers
- Design waterproofing housing for sensor
- Make a less responsive time equation (and test more with adaptive sampling package)
- Secure pressure transducer and ultrasonic sensor to structure better
- Implement a trigger that notifies if readings haven’t been taken after a certain timeframe