

MCM Meteorological Maintenance History

2024-07-09

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Sensors:

List of sensors currently used on McMurdo LTER meteorological stations

Sensor Type	Manufacturer	Model Number
Air Temperature	Campbell	107
Relative Humidity (retired 2022)	Vaisala	HMP45
Relative Humidity (new 2022/23)	Vaisala	HMP155A-L
Wind (anemometer)	RM Young	05103
Shortwave radiation (pyranometer)	Licor	LI-200R
Shortwave radiation (pyranometer)	Eppley	SPP or PSP
Photosynthetically Active Radiation (PAR)	Licor	LI-190R
Longwave radiation (pyrgeometer)	Eppley	PIR
Soil Temperature	Campbell	107
Ultrasonic Ranger	Campbell	SR-50
Barometer	Vaisala	CS106
Soil moisture	Campbell	CS655
Datalogger (retired 2022)	Campbell	CR10X
Datalogger (new 2022/23)	Campbell	CR1000X

GPS Locations

Station.Type	Landing	ID	Name	Lat	Long
Met Station	Land	BOYM	Lake Bonney Met	-77.71473	162.4647
Met Station	Land	BRHM	Lake Brownworth Met	-77.43350	162.7036
Met Station	Glacier	CAAM	Canada Glacier Met	-77.61315	162.9647
Met Station	Glacier	COHM	Commonwealth Glacier Met	-77.56453	163.2826
Met Station	Land	EXEM	Explorers Cove Met	-77.58870	163.4175
Met Station	Land	FLMM	Mt Fleming Met	-77.53260	160.2711
Met Station	Land	FRLM	Lake Fryxell Met	-77.61130	163.1701
Met Station	Land	FRSM	Friis Hills Met	-77.74740	161.5162
Met Station	Land	HO2M	Lake Hoare Met	-77.62399	162.8995
Met Station	Glacier	HODM	Howard Glacier Met	-77.67108	163.0784
Met Station	Land	MISM	Lake Miers Met	-78.10113	163.7877
Met Station	Glacier	TARM	Taylor Glacier Met	-77.74020	162.1284
Met Station	Land	VAAM	Lake Vanda Met	-77.52567	161.6913
Met Station	Land	VIAM	Lake Vida Met	-77.37735	161.7991
Lake Station	Lake Ice	LFBB	Lake Fryxell Blue Box	-77.61028	163.1469
Lake Station	Lake Ice	LHBB	Lake Hoare Blue Box	-77.62770	162.9105
Lake Station	Lake Ice	ELBBB	East Lake Bonney Blue Box	-77.71352	162.4491
Lake Station	Lake Ice	WLBBB	West Lake Bonney Blue Box	-77.72000	162.2993
Lake Station	Lake Ice	LMBB	Lake Miers Blue Box	-78.09690	163.8516
Lake Level Survey Site	Land		Don Juan Pond	-77.56336	161.1800
GPS Station	Glacier		Taylor Glacier South GPS	-77.72556	162.2650
GPS Station	Glacier		Taylor Glacier North GPS	-77.72374	162.2579

(continued)

Station.Type	Landing	ID	Name	Lat	Long
Time Lapse Camera	Land		Nussbaum Riegel, Fryxell View Camera	-77.72374	162.2579
Time Lapse Camera	Land		Blood Falls Camera	-77.71965	162.2745
Time Lapse Camera	Land		Lake Hoare Camera	-77.62880	162.8608

Post-Processing data workflow:

Raw-data [15 min]

1. Raw data files are downloaded in the field from the CR1000x dataloggers at stored both on the field laptop and on Google Drive. These files are also available via telemetry.
2. For each station, there is an R script that maps to the google drive directory. The script pulls the datafiles, and binds them together, making sure there are no duplicates or mismatches in timestamps.
3. QA/QC automated checks are performed. These include:
 - Range checks on air temp, air pressure, RH, radiation, wind speed, soil temp/permittivity/EC/VMC
 - RHwater conversion to RHice following Lowe and Ficke (1974)
 - Apply radiation adjustment for LiCor with mV adapters.
 - Apply PAR correction for Quantum PAR sensors.
 - Apply correction to Epply pyranometers if needed.
 - All multipliers are read from Google Drive metadata
 - Remove outlier ice surface temperature measurements if sudden shift more than 10°C. These are associated with station visits.
 - Remove outlier sonic anemometer measurements if shift more than 10 cm. These are associated with station visits.
4. Plot timeseries of all parameters for visual inspection.
5. Where necessary add site-specific custom outlier removal code to the station processing script.
6. Save final raw .csv [15-minute interval]

```
# Function to convert RHwater to RHice
RHice.convert <- function(rh, airtemp) {
  rh * (6.107799961 + airtemp * (0.4436518521 + airtemp * (0.01428945805 + airtemp *
(0.0002650648471 + airtemp * (0.000003031240396 + airtemp *
(0.00000002034080948 + 6.136820929E-11 * airtemp)))))) /
(6.109177956 + airtemp * (0.503469897 + airtemp * (0.01886013408 + airtemp *
(0.0004176223716 + airtemp * (0.00000582472028 + airtemp *
(0.00000004838803174 + 0.0000000001838826904 * airtemp))))))
}
```

Averaging

1. Wind direction must be vector scaled. Example daily averaging below. Must give a data threshold (`data.tresh`). This threshold is the proportion of data that must exist for a given hour or day for the averaging to be executed. Otherwise returns NA. Default data threshold is 0.75 for 1 hour (i.e. 3 out of 4 measurements), and 0.90 for daily.

```

raw.data |>
  mutate(Date = as.Date(date_time), Hour = hour(date_time)) |>
  mutate(Uu = wspd * sin(2 * pi * wdir/360)) |>
  mutate(Vv = wspd * cos(2 * pi * wdir/360)) |>
  group_by(metlocid, Date, Hour) |>
  mutate(timestep = c(NA, diff(date_time))) |>
  mutate(timestep = median(timestep, na.rm = T)) |>
  filter(n() >= data.thresh * 60/timestep) |>
  # summarise_all(mean) |>
  summarise(across(everything(), ~if (sum(is.na(.x))/length(.x) <=
                                     1 - data.thresh) {mean(.x, na.rm = TRUE)} else {
                                     NA
                                   }))) |>
  mutate(wdir = as.vector(atan2(Uu,Vv) * 360/2/pi)) |>
  mutate(wdir = if_else(wdir < 0, wdir+360, wdir)) |>
  mutate(wspd = (Uu^2 + Vv^2)^0.5) |>
  mutate(date_time = ymd_h(paste(Date,Hour))) |>
  ungroup() |>
  select(-Uu, -Vv, -Date, -Hour, -ppt, -wspdmax, -wspdmin, -timestep) |>
  select(date_time, everything())

```

2. Precipitation is summed (not averaged). Wind speed max and min are taken as the hourly/daily max and min.
3. These datasets are joined with the historic data set and visually analyzed for any irregularities.
4. All scripts saved in GitHub repo.

2023-2024 Season Notes from Meteorological Station Maintenance

Bonney Met Station (BOYM)

Maintenance Performed

- Station visited by C. Dougherty, H. Dugan, and P. Doran on 11/19/2023.
- Station was discovered to have lost power upon arrival due to a battery issue on 9/1/2023.
- Uploaded a new program to reflect the new low voltage cutoff. New threshold is 12.0 V from 12.4 V. This program also included code to run the new Pluvio2 precipitation gauge.
- Downloaded data from card and logger, and wiped card clean.
- Replaced upward LiCor Pyranometer, old SN = PY28349, new SN = PY20562.
- Replaced downward facing LiCor pyranometer, old SN = PY20567, new SN = PY28167.
- Both downward and upward pyranometers only have one year left of calibration and will need to be replaced again in the 2024/25 season.
- Replaced LiCor PAR sensor, old SN = Q30805, new SN = Q17248.
- Replaced RM Young Wind Monitor, new SN = WM27720.
- Replaced 0cm and 5cm 107 probe since old sensors had cracked insulation.
- Replaced both 12V batteries on the station.
- Removed Belfort precipitation gauge. Installed and calibrated OTT Pluvio 2 precipitation gauge.

Additional Visit

- Station visited by H. Dugan on 11/20/2023.
- Added a 12V bus bar inside of enclosure to increase the number of available 12V ports for the datalogger.

Brownworth Met Station (BRHM)

Maintenance Performed

- Visited 11/10/2023. Arrived at 11:00 and departed at 12:15.
- Uploaded a new program to reflect the new low voltage cutoff. New threshold is 12.0 V from 12.4 V.
 - Old program: BRHM_202223_V4.CR1x.
 - New program: BRHM_202324_V1.CR11x.
- Downloaded data from card and logger, and wiped the card clean.
- Recorded the distance of the ultrasonic unit to the ground at 59.05 cm.
- Replaced the entire ultrasonic unit. New SN = C3386.
- Recorded radio model number (865-4459).
- Station powered back on at 11:50.

Canada Glacier Met Station (CAAM)

Maintenance Performed

- Visited 11/14/2023 by H. Dugan, C. Dougherty, and P. Doran.
- Powered station off at 13:35.
- Uploaded a new program to reflect the new low voltage cutoff. New threshold is 12.0 V from 12.4 V. This new program also added code for military time, which was missing in the previous program. The addition of military time allowed the telemetry to come online, since a specific military time is called in that command to turn the radio on.
 - Old program: CAAM_202223_V4.CR1X.
 - New program: CAAM_202324_V1.CR1X.
- Downloaded data from card and logger, and wiped card clean.
- 14 degree clockwise adjustment of wind vane. Previously, it would have overestimated west in the past year.
- Replaced RM Young Wind Monitor. New SN = WM15190.
- Adjusted wind monitor 14 degrees using Garmin InReach GPS method.
- Replaced Upward Pyranometer. Old SN = PY20562. New SN = PY28371.
- Replaced Down Pyranometer. Old SN = PY28167. New SN = PY58364.
- Redrilled down glacier leg, put one flight down.
- Powered station back on at 14:45.

Commonwealth Glacier Met Station (COHM)

Maintenance Performed

- First visit: 11/13/2023 by Charlie Dougherty, Peter Doran, and Hilary Dugan. Arrived at 10:00.
- Downloaded data from card and logger, and wiped the card clean.
- Powered off at 10:17.
- Uploaded new program, to reflect new low voltage cutoff for telemetry, and a fix for broken military time.
 - New program = COHM_202324_V2.CR1x.
- Replaced upward Eppley Pyranometer. Old SN = 35071F3. New SN = 30884F3.
- Replaced downward Eppley Pyranometer. Old SN = 30853F3. New SN = 29777F3.
- Replaced upward pyrgeometer. Old SN = 32348F3. New SN = 30831F3.

- Did not replace the downward facing pyrgeometer due to lack of a functional replacement sensor.
- Replaced RM Young wind monitor (new SN: WM47480). Pinwheel on the previous wind monitor was loose.
- Replaced Campbell ultrasonic transducer.
- Longwave radiation sensors were having problems since last year that were not resolved by replacing the sensor.

Additional Visit

- Hilary Dugan made a return visit on November 30, 2023 to troubleshoot the issues with longwave, but was not able to resolve the issue. Need to return in 2024-25 season after having done more research into what is causing the problem.

Explorer's Cove Met Station (EXEM)

Maintenance Performed

- Visited once 11/13 by P. Doran, H. Dugan, and C. Dougherty.
- Arrived at 13:30, departed at 14:30.
- Uploaded new program to reflect new low voltage cutoff of 12.0 V instead of 12.4V.
- Downloaded data from card and logger, and wiped card clean.
 - Old program = EXEM_202223_V3.CR1X.
 - New program = EXEM_202324_V1.CR1x.
- Fully removed Belfort Precipitation gauge, and sent parts into McMurdo to be disposed of. No precipitation gauge was installed to replace the Belfort, but there is a Pluvio precipitation gauge wintering over in the Lake Hoare instrument lab to be installed in 2024-25. The proper calibration kit and scale is currently at LSU, and will need to be shipped down for 24-25 for install.
- Moderate glycol spill during gauge removal. All affected soil and rocks were collected and removed. Spill is fully resolved.
- Appeared that Soil temperature probes were incorrectly wired and buried.
 - 5 cm was correct at 5cm depth.
 - 0cm probe was wired into the 10cm port.
 - 10 cm was wired into 0 cm port, and was at surface due to improper burial. It appeared to have resurfaced since a visit in 2022-23.
- All sensors were reburied and are now correctly wired. Only depth that we lost over this period was the 10cm depth, since no sensor was actually at that depth.
- Wind monitor alignment was correct and did not require adjustment.

Mt. Fleming Met Station (FLMM)

Maintenance Performed

- Visited once one 11/15/2023. Arrived at 11:30; Charlie Dougherty, Peter Doran, Hilary Dugan.
- Adjusted the wind monitor alignment 20 degrees counterclockwise.
- Uploaded new program to reflect new low voltage cutoff of 12.0 V instead of 12.4V.
- Original plan was to remove the 1m air sensor from the program, but we installed a new 1m air as well as a new 3m air sensor, so both stayed in the program. For the past year, the 3m air data was collected on the Vaisala relative humidity sensor, which collects temperature as well as humidity data.
- Relative humidity sensor (installed in 2022-23) was installed at 2.5 m. We moved the sensor up 0.5m, to a final height of 3m.
- Departed at 12:50.

Lake Fryxell Met Station (FRLM)

Maintenance Performed

- Visited once; 10/31/2023. Arrived at 10:15. Maintenance performed by P. Doran and C. Dougherty.
- Powered off at 11:06.
- Wind Monitor was correctly aligned and did not require adjustment.
- Powered back on 12:38.
- Replaced upward facing Licor Pyranometer. Old SN = PY41030. New SN = PY45668.
- Replaced downward facing Licor Pyranometer. Old SN = PY20561. New SN = PY23250.
- Replaced Licor quantum (PAR) sensor. Old SN = Q23210. New SN = Q121192.
- Replaced RM Young Wind Monitor. Old SN = New SN = WM27726.
- Replaced both 12V batteries.
- Uploaded new program to reflect new low voltage cutoff (12.0 V over 12.4 V).

Friis Hills Met Station (FRSM)

Maintenance Performed

- **Visited:** 11/21/2023; arrived at 12:15
- **Maintenance performed by:** Peter Doran, Hilary Dugan, and Charlie Dougherty
- **Tasks:**
 - New helicopter landing site established by Ryan Skorecki farther up the hill; greatly reduced the amount of lugging required to get to the station. R. Skorecki created a half circle of rocks at the new landing zone.
 - Wind monitor correctly aligned, did not require adjustment.
 - Uploaded new program to reflect new low voltage cutoff.
 - Moved RH3m from 2.5m to 3m. Was at 2.5m on arrival.
 - Did not fix the wind monitor.
 - Added 3m air sensor.
 - Radio model # FGR_115RC.

Lake Hoare Met Station (HO2M)

Maintenance Performed

- **Multiple visits made while at Lake Hoare Camp**
- **First visit made:** 11/09/2023 0955
- **Maintenance performed by:** Peter Doran and Charlie Dougherty
- **Tasks:**
 - Bulk of the maintenance on HO2M happened on this day.
 - Powered station down at 10:12.
 - Card downloaded and replaced at 10:10.
 - Quick power up and down at 12:00.
 - Final power up at 3:00 PM.
 - Ultrasonic ranger distance was measured to be 97.5 cm to the ground.
 - Replaced Vaisala Barometer (U1010307).
 - Replaced Upward Licor Pyranometer (PY41099).
 - Replaced Downward Licor Pyranometer (PY27929).
 - Replaced Licor Quantum (Q9916).
 - Replaced RM Young wind monitor (WM80545).

- Reinstalled UV sensor and cable (15109). Rewired into separate CR10X.
- Replaced Ultrasonic Transducer on Campbell Ultrasonic ranger (R386).
- Had to find correct UV program for CR10X before running, so this was not up and running on the 9th.
- Station had been running two OTT Pluvio2 precip gauges. One was missing its scale, and therefore not producing accurate data.
- Both were removed and calibrated. One was replaced and one was taken to BOYM.
- Both need to have firmware upgrades.

Notes

- Very packed box!
- For future years, might make sense to start writing the SN of RM Young WM's on the actual monitor itself, since there is no actual SN written anywhere on it, as far as we could tell.
- Raised the upward pyranometer, Quantum, and UV to get a better sky view, and reduce self-shading.
- As previously configured, would have had worse shading from temp and RH sensors.

Howard Glacier Met Station (HODM)

Maintenance Performed

- **Visited:** 11/14/2023. Arrived 10:15.
- **Maintenance performed by:** Charlie Dougherty, Peter Doran, and Hilary Dugan
- **Tasks:**
 - Powered off 10:53, although station was dead on arrival, due to bad batteries.
 - Power back on at 11:40.
 - Radio model Number: FGR26E.
 - Wind monitor was correctly aligned and did not require adjustment.
 - Ultrasonic ranger distance prior to lowering was 123.5 cm. After lowering, it was 100.5 cm.
 - Lowered entire station by 23cm. Did not redrill any of the legs.
 - Replaced wind monitor (WM85183).
 - Replaced Ultrasonic Transducer (R396).
 - Station battery was dead on arrival, voltage had dipped to 8V prior to dying over the winter. Originally only had one battery on the station, but we wired up two fresh ones. Station now is running on two batteries total.

Notes

- Pilot Ryan L. flew us to Howard Met this year and was able to land upland of the met station and shut down. He was able to find a piece of snowpack, and land despite the angle. In the future, even if the helo has to stay hot, it would be better to have them land upwards of the met station rather than downwards. This allows for easier loading and unloading of the helo since the approach is from below rather than having to move farther down the glacier to approach from below, for a farther downward landing.

Lake Miers Met Station (MISM)

Maintenance Performed

- **Visited:** 11/30/2023. Arrived 1442.

- **Maintenance performed by:** Hilary Dugan, Charlie Dougherty, S Datta-Barua
- **Tasks:**
 - Power off at 15:02.
 - Wind monitor alignment correct and did not require adjustment.
 - Replaced LiCor Quantum (Q29766).
 - Replaced Vaisala Barometer (RO141345).
 - Replaced RM Young Monitor (WM27761).
 - Soil Temp 5cm was not working on arrival.
 - There is no soil temp 5 cm installed on the station. Need to bring an extra 107 probe out to the station in 24/25 to install.
 - Power up at 15:34, station completely fixed at 16:05.
 - Soil Temp 0cm may be flipped with soil temp 10C, but it is hard to tell.
 - Radio model # FGR-115RC.

Notes

- In future for Vaisala Barometer, you don't need to unwire the cable from the panel. Can just swap the barometer part.

Taylor Glacier Met Station (TARM)

Maintenance Performed

- **Visited:** 11/21/2023, arrived at 10:10.
- **Maintenance performed by:** Peter Doran, Hilary Dugan, and Charlie Dougherty
- **Tasks:**
 - Wind monitor alignment correct and did not require adjustment.
 - Ultrasonic ranger distance to ground was 96cm prior to lowering, and 74cm after lowering.
 - Lowered and leveled the station, but did not drill any new legs. Lowered the station 22 cm.
 - Upward Eppley pyranometer shield had too large of a screw hole. Had to use a washer, but come prepared to fix next year.
 - Vaisala Relative humidity probe was out of its shield and hanging upon arrival. No indication of how long it was like that, but was working properly. Reinstalled tightly.
 - Uploaded new program at 10:51.
 - Radio model # FGR_115RC. SN 916-7017.

Lake Vanda Met Station (VAAM)

Maintenance Performed

- **Visited:** 11/15/2023
- **Arrived:** 0955.
- **Maintenance performed by:** Peter Doran, Charlie Dougherty, and Hilary Dugan
- **Tasks:**
 - Hilary went ice skating.
 - Wind monitor alignment was not correct and was adjusted 5 degrees clockwise.
 - Replaced Upward Licor Pyranometer (no SN).
 - Replaced Downward Licor Pyranometer (PY20523).

- Replaced Ultrasonic (C3393). Note about VAAM ultrasonic. We replaced an entirely nonfunctional unit with a partially functional unit. This new ultrasonic makes a high-pitched sound when it makes a reading and will likely fail at some point. Arrive next year with a fully functional unit to make a replacement. Distance to ground before Ultrasonic swap was 61.0cm, and was 59.0 cm after installation of the new one.
- Replaced 3m air with a new temp 107 probe that has a longer cable.
- Forgot the replacement wind monitor, so did not swap wind this year. We will need to come with a fresh wind monitor next year for replacement.
- Radio model # FGR_115RC.

Lake Vida Met Station (VIAM)

Maintenance Performed

- **Visited:** 11/10/2023. Arrived at 12:35.
- **Maintenance performed by:** Charlie Dougherty, Peter Doran, and Bradley Kryziak
- **Tasks:**
 - Power off at 13:00.

Notes

Maintenance History

BOYM - Bonney

Date	sensor	notes
2007-01-24	3m Temp	Station Moved
2007-01-24	3m RH	Station Moved
2007-01-24	Soil Temp 0cm	Station Moved
2007-01-24	Soil Temp 5cm	Station Moved
2007-01-24	Soil Temp 10cm	Station Moved
2007-01-24	LicorUp pyra	Station Moved
2007-01-24	LicorDown pyra	Station Moved
2007-01-24	Quantum PAR	Station Moved
2007-01-24	Wind 3m	Station Moved
2007-01-24	Ultrasonic	Station Moved
2007-01-24	Prec	Station Moved
2007-01-24	CR10X	Station Moved
2007-01-24	100amp/hr Battery	Station Moved
2007-01-24	20W SolarPanel	Station Moved
2007-11-25	Epply Up Pyrgeometer	30831F3
2007-11-25	Epply Down Pyrgeometer	32059F3
2010-12-16	Quantum PAR	Q23204
2011-01-21	3m RH	Replaced Head
2011-01-21	1m Temp	New: 107
2011-01-21	Wind 3m	Replaced RM Young
2011-01-21	100 amp Battery	New: Second 100 amp/hr
2011-12-21	3m RH	Replaced Head
2011-12-21	Prec	Replaced fluid with 2 L glcol and mineral oil

(continued)

Date	sensor	notes
2011-12-21	20W SolarPanel	Disconnected regulatory
2011-12-21	Notes	Installed new charge controller, installed radio
2012-11-24	Quantum PAR	replaced
2012-11-24	Wind 3m	Replaced RM Young
2013-11-21	LicorUp pyra	Recorded SN: PY51356
2013-11-21	LicorDown pyra	Recorded SN: PY56364
2014-11-16	3m Temp	Replaced
2014-11-16	3m RH	Replaced
2014-11-16	LicorDown pyra	Replaced (SN PY18633)
2014-11-16	Quantum PAR	Replaced (SN Q28265)
2014-11-16	Wind 3m	Replaced RM Young (SN WM57319)
2014-11-16	CR10X	Replaced
2015-11-17	LicorDown pyra	Replaced (SN PY18656)
2016-11-17	3m RH	Replaced (SN Y3250058)
2016-11-17	LicorUp pyra	Replaced (SN PY27937)
2016-11-17	Quantum PAR	Replaced (SN 29764)
2016-11-17	CR10X	Replaced (SN X23868)
2016-11-17	Notes	Replaced SM4M storage module (P8: BOYM_201112_V1.dld)
2017-11-21	LicorDown pyra	Replaced (SN PY28170)
2017-11-21	Epply Down Pyrgeometer	Replaced w/ new cable (Currently not working)
2017-11-21	Wind 3m	Replaced RM Young (SN WM85155)
2017-11-21	Prec	Replaced fluid with 4 L glycol and mineral oil
2017-11-21	Notes	Installed new 12V Battery for Camera 12/14/17 Replaced SM4M storage module (P8: BOYM_201112_V1.dld)
2018-11-17	3m RH	Replaced (SN W4230010)
2018-11-17	LicorUp pyra	Replaced (SN PY25306)
2018-11-17	Quantum PAR	Replaced (SN C11725) *DO NOT HAVE CALIBRATION SHEET*
2018-11-17	Epply Up Pyrgeometer	Replaced (SN 37501F3)- CHECK IS THIS A PYRA?
2018-11-17	Epply Down Pyrgeometer	REMOVED - not working
2018-11-17	Ultrasonic	Replaced internal transducer
2018-11-17	CR10X	Replaced (SN X36197)
2018-11-17	Notes	Installed new Campbell camera, removed Stardot camera because not working.
2019-11-12	LicorDown pyra	Replaced (SN PY20222)
2019-11-12	Notes	Upward pyranometer cables are damaged, need to replace asap
2020-12-02	Notes	Station visited by Cray staff (Robyn Thomas) to download data - season cancelled for MCM LTER
2021-12-13	Soil Temp 0cm	Measured to be 2.5 cm depth before. Re-established at 1.7 cm depth (just below surface rocks)
2021-12-13	Soil Temp 5cm	Measured to be 7.1 cm depth before. Re-established at 5.0 cm depth
2021-12-13	Soil Temp 10cm	Measured to be 11.5 cm depth before. Re-established at 10.0 cm depth
2021-12-13	LicorUp pyra	Replaced (SN PY28349 (or D52440) labeled as both)
2021-12-13	LicorDown pyra	Replaced (SN PY20567)
2021-12-13	Quantum PAR	Replaced (SN Q30805). NOTE: old SN says Q29764...so C11725 may not have been right?
2021-12-13	Epply Up Pyrgeometer	Removed

(continued)

Date	sensor	notes
2021-12-13	Wind 3m	Replaced RM Young (SN WM15192). Rotated 2 degrees clockwise using Brunton compass (Michael Stone)
2021-12-13	Ultrasonic	Replaced internal transducer
2021-12-13	Notes	Wind monitor was snapped off upon arrival - broke during wind event on 8/2/2021. Ultrasonic was not working upon arrival. Soil temperature depths were checked and re-established.
2022-12-07	3m RH	Installed new Vaisala HMP155 with new shield (new SN U2511024)
2022-12-07	Soil Temp 10cm	Replaced with new CS 107 probe because one of the conductors snapped off during maintenance
2022-12-07	Epply Up Pyrgeometer	No Eppleys on station
2022-12-07	Epply Down Pyrgeometer	No Eppleys on station
2022-12-07	Wind 3m	Rotated 13 degrees clockwise on 12/14/2022 using new method of Garmin GPS bearing
2022-12-07	Prec	Belfort precip gage is now on its own CR10X with old code (BOYM_201718_V1.dld)
2022-12-07	Barometer	Installed a new barometer. Vaisala PTB110 (SN U1020309)
2022-12-07	Soil moisture probes (CS655)	Installed 2 new soil moisture probes at 5 and 10 cm.
2022-12-07	CR10X	Removed CR10X
2022-12-07	CR1000X	Installed new CR1000X datalogger
2022-12-07	Notes	Station visited on 12/7/2022, 12/14/2022, and 12/26/2022. Belfort precipitation gage would not work with CR1000X. Reloaded program onto CR10X and it is running off of that (only sensor wired into CR10X).
2023-11-19	Soil Temp 0cm	Replaced due to insulation cracks
2023-11-19	Soil Temp 5cm	Replaced due to insulation cracks
2023-11-19	LicorUp pyra	Replaced (SN PY20562)
2023-11-19	LicorDown pyra	Replaced (SN PY28167)
2023-11-19	Quantum PAR	Replaced (SN Q17248)
2023-11-19	Epply Down Pyrgeometer	No Eppleys.
2023-11-19	Wind 3m	Replaced RM Young (SN WM27720).
2023-11-19	Prec	Removed Belfort Precip Gauge. Installed new Pluvio2 precip
2023-11-19	100amp/hr Battery	Replaced
2023-11-19	100 amp Battery	Replaced
2023-11-19	Notes	Both up and down pyranometers only have one year left of calibration due to mix up with available sensors. These pyranometers had been deployed for one year at Canada Met. Will need to replace in 2024/25. Datalogger was dead on arrival, and lost out on about 2 months of data.

BRHM - Brownworth

Date	sensor	notes
2010-11-19	3m RH	Replaced Head
2010-11-19	Wind 3m	Replaced
2012-01-06	3m RH	Replaced Head

(continued)

Date	sensor	notes
2012-01-06	LicorUp pyra	Moved to new stand (SN PY40423)
2012-01-06	LicoDown pyra	Moved down to stand next to sonic (SN PY27929)
2012-01-06	Quantum PAR	rotated arm about 20 degrees CCK (SN Q32567)
2012-01-06	Wind 3m	rotated about 180 degrees
2012-01-06	Ultrasonic	removed, not working
2012-01-06	100ampHBattery 1	replaced CSI regulator with Flexcharge charge controller
2012-01-06	10WSolarPanel	Rotated panel about 15 degrees cck
2012-01-06	Notes	Added radio, 12dbi antenna and SC932B/serial cable
2012-01-26	Ultrasonic	reinstalled
2012-11-27	Wind 3m	Replaced
2013-11-18	3m RH	Replaced head
2013-11-18	LicorUp pyra	Replaced (SN PY28347)
2013-11-18	LicoDown pyra	Replaced (SN PY28349)
2013-11-18	Ultrasonic	Sonic removed
2013-11-18	Notes	Replaced SM4M
2014-11-10	Quantum PAR	Replaced (SN Q30806)
2014-11-10	Ultrasonic	Installed new sonic
2014-11-10	CR10X	Replaced
2015-11-12	LicorUp pyra	Replaced (SN PY25306)
2015-11-12	LicoDown pyra	Replaced (SN PY28370)
2015-11-12	Wind 3m	Replaced (SN WM31284)
2015-11-12	Ultrasonic	Replaced internal transducer
2016-12-10	3m RH	Replaced (SN U2340002) HMP45AC
2016-12-10	Quantum PAR	Replaced (SN Q17248)
2016-12-10	Ultrasonic	Replaced internal transducer
2016-12-10	CR10X	Replaced (SN 19225)
2016-12-10	Notes	Replaced SM4M
2017-11-30	LicorUp pyra	Replaced (SN PY20567)
2017-11-30	LicoDown pyra	Replaced (SN PY28347)
2017-11-30	Ultrasonic	Replaced internal transducer
2017-11-30	Notes	Replaced SM4M
2018-12-22	3m RH	Replaced (SN Y3340029) HMP45D
2018-12-22	Quantum PAR	Replaced (Q09916)
2018-12-22	Notes	Replaced SM4M
2019-12-29	LicorUp pyra	Replaced (SN PY51355??) - in Dec 2022 notes say the old SN is PY51356
2019-12-29	LicoDown pyra	Replaced (SN PY28371)
2019-12-29	Ultrasonic	Replaced internal transducer
2019-12-29	CR10X	Replaced (SN 23287)
2019-12-29	Notes	Replaced SM4M. Installed new battery
2020-11-30	Notes	Met station visited by Crary Lab staff (Robyn Thomas)
2022-01-19	3m RH	Replaced HMP45ASP (SN Y3340029)
2022-01-19	Wind 3m	Replaced (SN WM 15190)
2022-01-19	Notes	Replaced SM4M.
2022-12-13	3m RH	Removed old RH and replaced with new Vaisala HMP155, SN = U2511014
2022-12-13	SoilTemp 0cm	Confirmed depth, looks good
2022-12-13	SoilTemp 5cm	Confirmed depth, looks good
2022-12-13	SoilTemp 10cm	Confirmed depth, looks good
2022-12-13	Soil moisture probes	Installed two new Campbell CS655 Soil Moisture probes. 5 cm probe, SN = 53911, 10 cm probe SN = 53925

(continued)

Date	sensor	notes
2022-12-13	LicorUp pyra	Replaced (SN PY33985)
2022-12-13	LicoDown pyra	Replaced (SN PY28370)
2022-12-13	Quantum PAR	Replaced (SN Q29764) - very faint, sandblasted
2022-12-13	Wind 3m	Replaced (SN WM 17647)
2022-12-13	CR10X	Removed CR10X (SN 18805)
2022-12-13	CR1000X	Installed new CR1000X (SN 40091)
2022-12-13	Notes	Upgraded station to CR1000X datalogger. All values looked good except for ultrasonic which is still not working. Wind monitor rotated by 36 degrees clockwise using new method of Garmin InReach GPS
2023-11-10	Ultrasonic	Replaced (SN C3386)
2023-11-10	Notes	Mainly visited to fix ultrasonic. Will revisit in 24/25

CAAM - Canada

Date	sensor	notes
2010-12-31	AirT3m	Moved
2010-12-31	AirT3m Aspirated	Moved
2010-12-31	RH3m	Moved
2010-12-31	IRT	Moved
2010-12-31	Wind 3m	Moved
2010-12-31	LicorUp pyra	Moved (SN PY20565)
2010-12-31	LicoDown pyra	Moved & Replaced (SN PY18395)
2010-12-31	CR10X	Moved
2010-12-31	100ampHBattery 1	Moved
2010-12-31	100ampHBattery 2	Moved
2010-12-31	20WSolarPanel	Moved
2010-12-31	10WSolarPanel	Moved
2010-12-31	Tripod	Moved
2011-11-01	Notes	Replaced SM4M, lowered station by 7.9 cm (11/1/2011), lowered station by 13 cm (1/4/2012)
2012-01-04	AirT3m Aspirated	removed aspirated shield, and moved air temp probe to new shield at 1m about the ice.
2012-01-04	AirT1m	See note to the left about aspirated air temp
2012-01-04	Notes	The notes about air temp 3 m aspirated and 1 m air temp were added on 2/13/2023 by K Myers after error was recognized
2012-12-28	Notes	Replaced SM4M, lowered station by 19.6, 21.6, 22.0 cm
2013-11-11	RH3m	Replaced
2013-11-11	LicorUp pyra	Replaced (SN PY2327)
2014-11-11	Wind 3m	Replaced (SN WM15361)
2014-11-11	CR10X	Replaced
2015-11-07	Wind 3m	Replaced (SN WM10365)
2015-11-07	LicorUp pyra	Replaced (SN PY20222)
2015-11-07	LicoDown pyra	Replaced (SN PY20565)
2015-11-07	CR10X	Replaced (SN X44311)
2015-11-07	100ampHBattery 1	Battery replaced
2015-11-07	100ampHBattery 2	Battery replaced
2015-11-07	Notes	Lowered station by 9 cm
2016-10-28	RH3m	Replaced (SN V1140044)

(continued)

Date	sensor	notes
2016-10-28	Notes	Lowered station by 30 cm
2017-11-27	Wind 3m	Replaced (SN WM31283)
2017-11-27	LicorUp pyra	Replaced (SN PY28349)
2017-11-27	LicoDown pyra	Replaced (SN PY23271)
2017-11-27	CR10X	Replaced (SN X09315)
2017-11-27	Notes	Swapped SM4M on @ 12:52 and Lowered station by 9 cm
2018-11-27	RH3m	Replaced (SN U2730016)
2018-11-27	Notes	Swapped SM4M, lowered station by average of 15.2 cm
2019-12-28	Wind 3m	Replaced (SN: WM15188)
2019-12-28	LicorUp pyra	Replaced (SN: PY56364)
2019-12-28	LicoDown pyra	Replaced (SN: PY27929)
2019-12-28	CR10X	Replaced (SN: X23165)
2019-12-28	Notes	Swapped SM4M, lowered station by average of 14.66 cm
2020-12-14	Notes	Station visited by Crary lab staff (Shelly Campbell) - no LTER season due to COVID 19
2021-12-24	RH3m	Replaced (SN Y3250058) HMP45AC
2021-12-24	Wind 3m	Replaced (SN: WM15828)
2021-12-24	Tripod	Redrilled one leg
2021-12-24	Notes	Swapped SM4M. Redrilled SE leg which was coming out of the ice. Unfortunately got kovacs drill stuck 3 flights deep! Now using kovacs as the leg
2022-12-12	RH3m	Replaced with new Vaisala HM155, SN U2511018)
2022-12-12	LicorUp pyra	Replaced (SN: PY20562)
2022-12-12	LicoDown pyra	Replaced (SN: PY28167)
2022-12-12	CR10X	Removed CR10X (SN 26110)
2022-12-12	...12	Installed new CR1000X datalogger, SN = 40090
2022-12-12	100ampHBattery 1	Replaced 12V battery - there was weird blue liquid in bottom of battery box. Cleaned up, wasn't leaking thankfully!
2022-12-12	100ampHBattery 2	Replaced 12V battery - there was weird blue liquid in bottom of battery box. Cleaned up, wasn't leaking thankfully!
2022-12-12	Notes	Tripod legs will need to be redrilled, wobbly! Rotated wind monitor by 5 degrees clockwise using Garim InReach GPS method. • Noticed that historical station tasks sheets listed variable 7 as 3 m aspirated air temperature, however this is incorrect and it has been a 1 m air temperature measurement since 1/4/2012. Task sheet was never updated. Now variable 7 is listed as air temp 1 m, and database will be adjusted to reflect the variable name correction.
2023-11-14	Wind 3m	Replaced (SN: WM15190). Also adjusted 14 degrees clockwise.
2023-11-14	LicorUp pyra	Replaced (SN: PY28371)
2023-11-14	LicoDown pyra	Replaced (SN: PY56364)
2023-11-14	Tripod	Redrilled one leg
2023-11-14	Notes	Redrilled one tripod leg and put one flight down (down glacier leg).

COHM - Commonwealth

Date	sensor	notes
2004-11-10	100ampHBattery 1	Added 1 Additional

(continued)

Date	sensor	notes
2005-11-04	CR10X	Adjust CR10X ahead 2 minute and 01 seconds on November 04, 2005 @ 1424
2006-01-19	Eppley Upward Pyrgeometer	replaced
2006-01-19	Eppley downward Pyrgeometer	replaced
2006-01-19	CR10X	Adjust CR10X ahead 1 minute and 28 seconds on January 19, 2006 (19) @ 0944, replaced CR10x
2006-11-08	3m RH	replaced
2006-11-08	Eppley Upward Pyranometer	replaced
2006-11-08	Eppley downward Pyranometer	replaced
2006-11-08	Wind 3m	replaced
2006-11-08	CR10X	replaced
2007-11-19	3m RH	replaced
2007-11-19	Eppley Upward Pyranometer	replaced
2007-11-19	Wind 3m	replaced
2007-11-19	Notes	replaced cable from battery to CR10X
2008-11-05	CR10X	Time adjust back 3 min and 30 sec on November 5, 2008 at 1517.
2008-11-18	Eppley Upward Pyrgeometer	replaced
2008-11-18	Eppley downward Pyrgeometer	replaced
2008-11-18	IRT	Installed
2008-11-18	CR10X	replaced
2009-11-17	3m RH	replaced
2009-11-17	Eppley Upward Pyranometer	replaced
2009-11-17	Eppley downward Pyranometer	replaced
2009-11-17	IRT	resistors added
2009-11-17	CR10X	Time adjusted back 2 min on November 17, 2009 at 1016.
2010-11-05	CR10X	CR10X adjusted back 00:03:22 & Replaced
2010-11-05	CR10X	Adjusted back 00:03:22 on Nov 5, 2010 1434, placed CR10x
2011-01-19	CR10X	CR10X adjusted ahead 1 minute and 20 secs
2012-01-03	3m RH	replaced
2012-01-03	1m Temp	installed
2012-01-03	Ice Temp...6	removed
2012-01-03	Ice Temp...7	removed
2012-01-03	Eppley Upward Pyranometer	replaced (SN 30884F3)
2012-01-03	Eppley downward Pyranometer	replaced and moved (SN 29763F3)
2012-01-03	Eppley Upward Pyrgeometer	(SN 32348F3)
2012-01-03	Eppley downward Pyrgeometer	moved (SN 29786F3)
2012-01-03	Wind 3m	replaced
2012-01-03	IRT	moved

(continued)

Date	sensor	notes
2012-01-03	CR10X	Adjusted clock ahead 1 min and 8 secs
2012-01-03	100ampHBBattery 1	just 1 battery
2012-01-03	Notes	Installed flexcharge charge controller, and disconnect 20W regulator, moved station, added new crossbas, moved downward sensors to sonic arm
2012-11-09	Notes	Swapped SM4M
2013-11-08	3m RH	Replaced
2013-11-08	Ultrasonic	Replaced (11/14/2013)
2013-11-08	CR10X	Replaced
2013-11-08	Notes	Swapped SM4M
2014-11-11	CR10X	Replaced (SN X36154)
2015-11-12	3m RH	Replaced (SN V1140041)
2015-11-12	1m Temp	Replaced
2015-11-12	Eppley Upward Pyranometer	Replaced (SN 29776F3)
2015-11-12	Wind 3m	Replaced (SN WM37721)
2016-10-28	Eppley downward Pyrgeometer	Accidentally replaced with pyranometer (SN 30884F3) should be pyrgeometer!
2016-10-28	CR10X	Replaced (SN X13999)
2016-10-28	Notes	Swapped SM4M, lowered station by 27 cm
2017-11-27	Eppley downward Pyranometer	Replaced (SN 30853F3)
2017-11-27	Ultrasonic	Replaced (SN C11834)
2017-11-27	Notes	Swapped SM4M, lowered station by 7.5 cm
2018-11-27	3m RH	Replaced HMP45C (SN V1110042)
2018-11-27	Eppley Upward Pyranometer	Replaced (SN 35071F3)
2018-11-27	Wind 3m	Replaced (SN WM10384)
2018-11-27	CR10X	Replaced (SN X44860)
2018-11-27	Notes	Swapped SM4M, lowered station by average 9.17 cm, Removed one flight from southern tripod leg due to ablation
2019-12-28	Notes	Swapped SM4M, lowered station by average 10 cm
2020-12-14	Notes	Swapped SM4M. Station visited by Crary lab staff (Shelly Campbell) - no maintenance, field season cancelled due to COVID-19
2021-12-24	3m RH	Replaced (SN V1140044) HMP45C
2021-12-24	Wind 3m	Replaced (SN WM27713)
2021-12-24	Notes	Swapped SM4M. Station lowered ~ 16 cm. Tried to replace downward facing pyrgeometer but it read 99999, so had to replace with existing sensor (PIR, 29786F3)
2022-12-10	3m RH	Replaced with new Vaisala HMP155 and shield (new SN = 2511015)
2022-12-10	CR10X	Removed CR10X from station
2022-12-10	CR1000X	Installed new CR1000X datalogger on station
2023-11-13	Eppley Upward Pyranometer	Replaced (SN 30884F3)
2023-11-13	Eppley downward Pyranometer	Replaced (SN 29777F3)
2023-11-13	Eppley Upward Pyrgeometer	Replaced (SN 30831F3)
2023-11-13	Wind 3m	Replaced (SN WM47480)

(continued)

Date	sensor	notes
2023-11-13	Notes	Pinwheel was loose on the wind monitor. Military time was not working, which was why the radio connection was not working either. Didn't replace the downward pyrgeometer, due to lack of replacement sensor.

EXEM - Explorer's Cove

Date	sensor	notes
2010-12-13	Wind 3m	Replaced
2010-12-13	CR10X	Replaced & loaded new program, exe1011v1
2010-12-13	Notes	replaced pyranometer level mounts
2011-01-05	CR10X	Time reset +20secs & new program, exe1011v2 loaded.
2011-01-05	10WSolarPanel	Moved solar panels higher
2011-01-05	Notes	Removed old storage module mount, and added new black serial cable.
2011-11-17	3m RH	Replaced
2011-11-17	SoilTemp 0cm	Repositioned
2011-11-17	SwRadIn	Replaced (SN PY23275)
2011-11-17	SwRadOut	Moved to lower arm and sensor replaced (SN PY45668)
2011-11-17	PAR	Replaced (SN Q33906)
2011-11-17	CR10X	Time reset +6 min and 1 sec & Loaded new program, EXE1112V1.dld
2011-11-17	Prec	Swapped glycol (4L) to bucket on 12/28/2011
2011-11-17	Sensit	Moved to new datalogger
2011-11-17	100ampHBBattery 1	Sensit (2 35 amp.hr) and Met (one 100 amp.hr) batteries consolidated in one box
2011-11-17	Notes	Radio, antenna and relay switch installed, swapped SM4M
2012-11-22	Notes	Removed sensit from station
2014-11-10	3m RH	Replaced
2014-11-10	CR10X	Replaced
2015-11-12	SwRadOut	Replaced (SN PY28167)
2015-11-12	Wind 3m	Replaced (SN WM17401)
2016-12-10	PAR	Replaced (SN Q30804)
2016-12-10	CR10X	Replaced (SN X23866)
2016-12-10	Notes	Replaced SM4M
2017-11-22	3m RH	Replaced (SN W4230011)
2017-11-22	SwRadIn	Replaced (SN PY23277)
2017-11-22	SwRadOut	Replaced (SN PY41090)
2017-11-22	Wind 3m	Replaced (SN WM15361)
2017-11-22	Prec	Refilled with 4L glycol and layer of mineral oil on 12/26/2017
2017-11-22	Notes	Replaced SM4M
2018-12-20	PAR	Replaced (SN Q33906)
2018-12-20	Prec	Added 50 - 100 mL of mineral oil to precip gauge
2018-12-20	Soil Moisture Probe Decagon ECH20 5TM	Installed
2018-12-20	Notes	Replaced SM4M. Added new Campbell Camera + external power supply w 1 battery and 10W solar panel. Added soil moisture probe (Maddie Myers project). Added 1800 mL of water to calibrate precip gauge

(continued)

Date	sensor	notes
2019-12-29	3m RH	Replaced (V1140043) HMP45C
2019-12-29	SwRadIn	Replaced (SN PY41099)
2019-12-29	SwRadOut	Replaced (SN PY28348)
2019-12-29	Wind 3m	Replaced (SN 17645)
2019-12-29	CR10X	Replaced (SN X28584)
2019-12-29	100ampHBattery 1	Replaced battery from 2012, other battery listed installaion of 2018)
2020-12-02	Notes	Station visited by Crary lab staff (Robyn Thomas) - SM4M swapped but no maintenance performed because season was cancelled due to COVID-19
2021-12-23	3m RH	Replaced (SN X1210007) HMP45ASP
2021-12-23	SoilTemp 0cm	Original depth = 0 cm, reset to 0 cm
2021-12-23	SoilTemp 5cm	Original depth = 8.2 cm, reset to 5.0 cm
2021-12-23	SoilTemp 10cm	Original depth = 13.9 cm, reset to 10.0 cm
2021-12-23	SwRadOut	Replaced (SN PY45668) - note field notes switched existing & new SNs
2021-12-23	PAR	Replaced (SN Q30804)
2021-12-23	Wind 3m	Replaced (SN WM85183)
2021-12-23	Prec	Dumped out old (green) glycol, cleaned out ~0.5 inches of seident. Filled to bottom rim (~2 inches with food grade glycol from Crary
2021-12-23	Notes	Replaced SM4M. Camera wasn't working upon arrival - charge controller was wired incorrectly so battery died. Replaced camera battery and wired it correctly
2022-12-09	3m RH	Replaced with new Vaisala HMP155 sensor, SN = U2511017
2022-12-09	SwRadIn	Replaced (SN PY28169)
2022-12-09	SwRadOut	Replaced (SN PY28170)
2022-12-09	PAR	Replaced (SN Q33906)
2022-12-09	Wind 3m	Replaced (SN WM15361)
2022-12-09	CR10X	Removed CR10X from station
2022-12-09	CR1000X	Installed new CR1000X (SN 40101)
2022-12-09	Prec	Not working! Need new cable, and should install on CR10X if it wont work with CR1000X
2022-12-09	Soil Moisture Probe Decagon ECH20 5TM	Removed old Decagon sensor
2022-12-09	CS655 Campbell Soil moisture probes	Installed 2 soil moisture probes at 5 and 10 cm near soil temperature sensors
2022-12-09	Notes	Belfort precipitation gage didnt successfully connect to new CR1000X. Cable is also permanently damaged and will need to be replaced (damage occurred when cable was being moved from one enclosure to another)
2023-11-13	Prec	Removed Belfort Precipitation gauge. Will need to install a Pluvio2 in 24/25.
2023-11-13	Notes	Removed Belfort precipitation gauge. Soil Temperature wiring was incorrect, with 0 cm wired in as 10cm, and 10cm at surface due to improper burial. 5cm was correct. All sensors now reflect the wiring diagram.

FLMM - Flemming

Date	sensor	notes
2011-01-08	CR10X	loaded flm1011v1
2011-01-08	Notes	Converted station to LTER format
2011-12-14	RH250cm (m)	Swapped head
2011-12-14	Wind360cm (m)	Replaced
2011-12-14	Pressure	Replaced
2011-12-14	CR10X	Replaced
2011-12-14	Notes	Added radio
2012-01-26	Pressure	Replaced
2012-02-04	Notes	radio unplugged
2014-12-05	RH250cm (m)	Swapped (SN Y2850072)
2014-12-05	Wind360cm (m)	Replaced (SN WM80546)
2014-12-05	Notes	SM4M swapped on 11/20/2014
2015-12-02	CR10X	Replaced
2016-12-09	Wind360cm (m)	Replaced (SN WM 31296)
2017-11-30	RH250cm (m)	Replaced (SN Y2820009)
2017-11-30	Notes	SM4M Swapped on 11/30/2017 13:00
2018-12-18	Wind360cm (m)	Replaced (SN WM12802)
2018-12-18	Notes	Wind broken upon arrival. Replaced wind.
2019-12-27	RH250cm (m)	Replaced (SN Z1340106)
2021-12-27	RH250cm (m)	Replaced (SN X1210006)
2021-12-27	Wind360cm (m)	Replaced (SN WM17804)
2021-12-27	Notes	SM4M swapped - program FLMM_201213_v2.dll
2022-12-30	RH250cm (m)	Replaced with new Vaisala HMP155 sensor (that was on Vida from 2021/22), SN = T2920234
2022-12-30	Wind360cm (m)	Replaced (SN WM31284)
2022-12-30	NetRad205cm (m)	REMOVED
2022-12-30	Pressure	REMOVED
2022-12-30	CR10X	REMOVED
2022-12-30	CR1000X	Installed new CR1000X (SN 40102)
2022-12-30	100 amp/hr Battery...11	Replaced battery
2022-12-30	100 amp/hr Battery...12	Replaced battery
2022-12-30	Notes	Removed barometer because it was very old and out of calibration. Did not have a spare. CR1000X program installed FLMM_202223_V2.CR1X
2023-11-15	AirT250cm (m)	moved up to 300cm
2023-11-15	AirT100cm	New install
2023-11-15	RH250cm (m)	Moved up to 300cm.
2023-11-15	Wind360cm (m)	20 degree adjustment clockwise.

FRLM - Frxyell

Date	sensor	notes
2010-12-23	Wind 3m	Replaced
2010-12-23	CR10X	Replaced
2010-12-23	Notes	Replaced leveling mounts for PAR and SwRads
2011-11-16	3m Temp	Replaced
2011-11-16	3m RH	Replaced
2011-11-16	SoilTemp 0cm	Replaced
2011-11-16	SoilTemp 5cm	Replaced

(continued)

Date	sensor	notes
2011-11-16	SoilTemp 10cm	Replaced
2011-11-16	SwRadIn	Replaced (SN PY41099)
2011-11-16	SwRadOut	Replaced (SN PY23276)
2011-11-16	PAR	Replaced (SN Q99253)
2011-11-16	Sensit	Removed
2011-11-16	100ampHBattery 1	installed 2 battery
2011-11-16	SolarPanels	Installed additional 10W panel with charge controller for radio
2011-11-16	Radio	Installed FGR-115RC radio, wavelink PRO890-12-40F02N4 12 dbi antenna, Crydom solid-state relay DC60S3 and SC32B. Antenna pointed at Kukri Hills remote site
2011-11-16	Notes	Moved station up the hill from old site
2012-11-23	Notes	Swapped SM4M
2013-11-24	CR10X	Replaced
2013-11-24	Notes	Swapped SM4M
2014-11-10	3m RH	Replaced
2014-11-10	PAR	Replaced (SN Q30794)
2014-11-10	Wind 3m	Replaced (SN WM31281)
2015-12-04	SwRadIn	Replaced (SN PY45665)
2015-12-04	SwRadOut	Replaced (SN PY40423)
2016-11-04	CR10X	Replaced (SN X23287)
2016-11-04	Notes	Station was found on its side in early November. Was knocked over in Spring from what was probably a katabatic event. Station lost power and did not record data from May 2016 - Nov 2016
2017-12-11	PAR	Replaced (SN Q28259)
2017-12-11	Ultrasonic	Replaced internal Ultrasonic
2017-12-11	Notes	Swapped SM4M 12/11/2017 -turned on 15:32
2018-12-06	SwRadIn	Replaced (SN PY18400)
2018-12-06	SwRadOut	Replaced (SN PY20562)
2018-12-06	PAR	Replaced but didn't write down the SN. *UPDATE* SN recorded in 2021 as Q23199
2018-12-06	Wind 3m	Replaced (SN WM20111)
2018-12-06	CR10X	Replaced (SN X40645)
2018-12-06	Notes	Swapped SM4M. Also returned on 7-DEC-2018 (installed pyra, quantum, datalogger, and installed new campbell camera)
2019-12-19	SwRadIn	Replaced (SN PY28170)
2020-11-30	Notes	Station visited by Crary lab staff (Robyn Thomas) - SM4M swapped, no other maintenance performed
2021-11-30	3m RH	Replaced (W4230008) (HMP45ASP)
2021-11-30	SwRadIn	Replaced (SN PY41090)
2021-11-30	SwRadOut	Replaced (SN PY20561)
2021-11-30	PAR	Replaced (SN Q23210) on 12/28/2021
2021-11-30	Wind 3m	Replaced (SN WM04846). Rotated wind by 15degrees clockwise on 3-DEC-2021
2021-11-30	Ultrasonic	Replaced (wasn't working before)
2021-11-30	Notes	Swapped SM4M. Also retruned on 3-DEC-2021 & 28-DEC-2021
2022-12-10	3m RH	Replaced with Vaisala HMP155 (SN U2511016)
2022-12-10	CR10X	Removed CR10X datalogger (SN 14271)
2022-12-10	CR1000X	Installed new CR1000X datalogger (SN 40087)
2022-12-10	Barometer (Pressure)	Installed new Vaisala PTB110 Barometer (SN U1410827) [fixed code Dec 20th, 2022]

(continued)

Date	sensor	notes
2022-12-10	Soil moisture probes	Installed 2 Campbell CS655 soil moisture probes at 5 and 10 cm depth
2022-12-10	100ampHBattery 1	Replaced 2 12V 100 AmpHr batteries
2022-12-10	Notes	Rotated wind monitor by 44 degrees counter clockwise on 12/15/2022 (P Doran)
2023-10-31	SwRadIn	Replaced (SN PY45668)
2023-10-31	SwRadOut	Replaced (SN PY23250)
2023-10-31	PAR	Replaced (SN Q121192)
2023-10-31	Wind 3m	Replaced (SN WM27726)

FRSM - Friis Hills

Date	sensor	notes
2010-12-21	CR10X Program	Friis1011v1
2010-12-21	Notes	Converted station to LTER format
2011-12-14	RH250cm (m)	Replaced head
2011-12-14	CR10X	Replaced
2011-12-14	Notes	Radio installed, new CR10X not working properly. Replaced wind, but thought it was not working, but turns out it was the new CR10X
2012-01-27	Wind360cm (m)	Rotated 10o CCW
2012-01-27	CR10X	Replaced
2012-01-27	Notes	Swapped SM4M
2012-11-20	Wind360cm (m)	Replaced - but only worked intermittently
2012-11-20	Notes	Swapped SM4M
2013-11-21	RH250cm (m)	Replaced head
2014-12-05	Notes	Swapped SM4M
2015-12-02	Notes	Couldn't change CR10X bc of awkward set up; will need to be rewired
2016-12-09	Wind360cm (m)	Attempted to replace but didn't work; will need to look at this in more detail
2016-12-09	Notes	Swapped SM4M
2017-11-30	RH250cm (m)	Replaced (SN U2340043)
2017-11-30	Wind360cm (m)	Replaced (SN WM27761)
2017-11-30	CR10X	Replaced (SN X14326)
2017-11-30	Notes	Swapped SM4M on @ 11/30/17 11:30
2018-12-18	CR10X Program	FRSM_201314_V1.dld
2018-12-18	Notes	Swapped SM4M
2019-12-27	RH250cm (m)	Replaced (U2340002)
2019-12-27	Wind360cm (m)	Replaced (WM12803)
2019-12-27	Barometer	Repalced. Old: PTB101B, SN: Y2440013. New PTB110, SN: R0141345
2019-12-27	CR10X	Replaced (X44861)
2019-12-27	CR10X Program	New Program installed: FRSM_201920_V1.dld
2019-12-27	100ampHBattery 1	Swapped (1) 12V battery and battery box
2019-12-27	Notes	Swapped SM4M
2020-12-02	Notes	Station visited by Crary lab staff (Robyn Thomas) SM4M swapped but no maintenance preformed because season was cancelled due to COVID-19

(continued)

Date	sensor	notes
2021-12-27	RH250cm (m)	Replaced (SN W4230016)
2021-12-27	Wind360cm (m)	Replaced (WM38186)
2021-12-27	WindRotation	Rotated wind monitor by 30 degrees clockwise to point true north
2021-12-27	Barometer	Replaced (New SN: T1140838)
2021-12-27	CR10X Program	FRSM_201920_v1.dld
2021-12-27	Notes	SM4M swapped. So much snow!! 7 cm!
2022-12-30	AirT250cm (m)	No Air temp sensor observed on station?
2022-12-30	RH250cm (m)	Replaced with new Vaisala HMP155 sensor, SN = U2511022
2022-12-30	Wind360cm (m)	Replaced (WM38188)
2022-12-30	WindRotation	Rotated wind monitor by 20 degrees clockwise using Garmin InReach GPS
2022-12-30	NetRad205cm (m)	Removed
2022-12-30	CR10X	Removed CR10X from station
2022-12-30	CR1000X	Installed new CR1000X (SN 40086)
2022-12-30	CR1000X Program	FRSM_202223_V1.CR1X
2022-12-30	Notes	No 107 temperature on station, will use Vaisala RH for temp data. Need to bring new wind monitor cable because leads are very stripped and short. Used telemetry data for processing because didn't download from SM4M
2023-11-21	AirT250cm (m)	107 Probe installed
2023-11-21	CR1000X Program	FRSM_202324_V1.CR1X
2023-11-21	Notes	Replaced wind monitor cable. Installed 107 probe for air temp.

HODM - Howard

Date	sensor	notes
2010-11-09	CR10X	clock reset back 7 minutes and 25 secs at 11/9/2010 @ 1415
2011-01-13	Eppley Up pyra	New upward pyranometer, 30853F3 (8.1), installed
2011-01-13	Eppley Down pyra	New downward pyranometer, 32058F3 (8.89), installed
2011-01-13	CR10X	hod1011v1 was loaded, clock changed ahead 36 secs on 01/13/2011 @ 1439
2011-11-05	3m RH	Replaced
2011-11-05	Wind 3m	Replaced
2011-11-05	NOTES	Swapped SM4M. Installed legs
2012-11-19	NOTES	Swapped SM4M
2013-11-15	NOTES	Swapped SM4M; removed ice temperature sensors
2014-11-11	3m RH	Replaced
2014-11-11	1m RH	Replaced
2014-11-11	Wind 3m	Replaced (SN WM47856)
2014-11-11	Ultrasonic	Replaced
2014-11-11	CR10X	Replaced
2014-11-11	NOTES	Swapped SM4M, lowered station by 14.5cm
2015-11-07	Eppley Up pyra	Replaced (SN 33733F3)
2015-11-07	Eppley Down pyra	Replaced (SN 29777F3)
2015-11-07	Ultrasonic	Replaced
2015-11-07	100 amp Battery...15	Replaced (1) battery
2016-10-28	3m RH	Replaced (SN Y2850072)
2016-10-28	1m RH	Replaced (SN V1140043)
2016-10-28	Wind 3m	Replaced (SN WM85183)

(continued)

Date	sensor	notes
2016-10-28	CR10X	Replaced (SN X23165)
2016-10-28	NOTES	Swapped SM4M; lowered station by 35 cm
2017-11-27	NOTES	Swapped SM4M
2018-11-27	3m RH	Replaced (SN U2730013)
2018-11-27	1m RH	Replaced (SN U2340010)
2018-11-27	Eppley Down pyra	Replaced (SN 30884F3)
2018-11-27	Wind 3m	Replaced (WM27726)
2018-11-27	CR10X	Replaced (SN X40361)
2018-11-27	NOTES	Eppley Pyranometer
2019-12-28	Eppley Up pyra	Replaced (SN 32057F3)
2019-12-28	NOTES	Station lowered 13 cm
2020-12-14	NOTES	Station visited by Crary lab staff (Shelly Campbell) to download data. SM4M replaced. No other maintenance performed due to season cancellation because of COVID 19
2022-01-20	NOTES	Station visited by Krista Myers, just swapped SM4M. Did not have time to do any maintenance (just got out of helo while it was still hot, glacier conditions bad to land on and we were running out of time before weather was coming in)
2022-12-19	3m RH	Replaced with new Vaisala HMP155 sensor, SN = U2511021
2022-12-19	1m RH	Removed 1 m RH sensor
2022-12-19	Eppley Up pyra	REMOVED Eppley
2022-12-19	Eppley Down pyra	REMOVED Eppley
2022-12-19	Licor Up pyranometer	Installed new Lico pyra, new SN = PY112239
2022-12-19	Licor Down pyranometer	Installed new Lico pyra, new SN = PY112238
2022-12-19	Wind 3m	Replaced (WM85158)
2022-12-19	CR10X	Removed CR10X from station
2022-12-19	CR1000X	Installed new CR1000X
2022-12-19	100 amp Battery...15	Confirmed there is only 1 battery at HODM
2022-12-19	NOTES	1 m and 3 m RH sensor SNs were opposite in 22/23 field sheet when they were recorded as the "old SN".
2023-11-14	Wind 3m	Replaced (SN WM85183)
2023-11-14	100 amp Battery...15	Replaced
2023-11-14	100 amp Battery...16	Added one more battery
2023-11-14	NOTES	Station dead on arrival. Lost power in July. Replaced ultrasonic transducer, since it didn't happen on schedule in 2022/23.

HOEM(HO2M) - Hoare

Date	sensor	notes
2010-11-07	SoilTemp 0cm	Moved from LHPM
2010-11-07	SoilTemp 5cm	Moved from LHPM
2010-11-07	SoilTemp 10cm	Moved from LHPM
2010-11-07	Precip	Removed housing for old gage
2010-11-07	Notes	Added Multiplexer, and moved soil and prec to main station
2010-11-22	Precip	Added Pluvio Prec Gage
2010-11-22	100ampHBattery 2	Added 2nd battery from LHPM
2010-11-22	Notes	Swapped solar mounts for ones with new bolts
2011-11-09	3m RH	Replaced

(continued)

Date	sensor	notes
2011-11-09	LicorUp pyra	Replaced
2011-11-09	LicoDown pyra	Replaced
2011-11-09	Quantum PAR	Replaced
2011-11-09	Wind 3m	Replaced
2011-11-09	CR10X	Replaced
2011-11-09	100ampHBattery 2	Switch to Radio
2011-11-09	Program	hoe1112v1
2011-11-09	Notes	Added radio, antenna, 10W solar panel (for radio), swapped light stands for new ones with new bolts
2012-01-26	Program	hoem_201112_v3
2012-01-26	Notes	swapped module, loaded new program, and set SM16M to ring mode
2015-11-09	LicorUp pyra	Replaced (PY20562)
2015-11-09	LicoDown pyra	Replaced (PY28371)
2015-11-09	Wind 3m	Replaced (WM27713)
2015-11-09	CR10X	Replaced (SN D52414)
2016-10-27	Quantum PAR	Replaced (Q29766)
2017-11-28	3m RH	Replaced (SN W4230016)
2017-11-28	LicorUp pyra	Replaced (SN PY23276)
2017-11-28	LicoDown pyra	Replaced (SN PY20561)
2017-11-28	Wind 3m	Replaced (SN WM80553)
2017-11-28	Pressure	Replaced PTA427 w/ new PTB110/CS106 (SN 607046)
2017-11-28	Precip	Added 4L glycol and layer of mineral oil
2017-11-28	CR10X	Replaced (SN X35782)
2017-11-28	100ampHBattery 1	Replaced
2017-11-28	100ampHBattery 2	Replaced
2017-11-28	Notes	Swapped SM4M- T. Nylen loaded new program to correct new CS106 barometer 1/16/18
2018-12-17	Quantum PAR	Replaced (SN Q32567)
2018-12-17	Ultrasonic	Replaced
2018-12-17	Precip	Added ~ 1 gallon glycol (filled up to line in gauge) and ~150 mL mineral oil
2018-12-17	Program	HOEM_201718_v2.dld
2018-12-17	Notes	Swapped SM4M
2019-12-08	3m RH	Replaced (SN V1140041)
2019-12-08	LicorUp pyra	Replaced (SN PY28169)
2019-12-08	LicoDown pyra	Replaced (SN PY28370)
2019-12-08	Wind 3m	Replaced (SN WM10365)
2019-12-08	Pressure	Replaced (SN R1030609)
2019-12-08	CR10X	Replaced (SN X23868)
2019-12-08	100ampHBattery 3	Installed 3rd battery 2020
2019-12-08	Notes	Swapped SM4M, installed new precip gauge
2020-11-30	Notes	Crary staff visited station and downloaded SM4M data. No other maintenance performed. Season cancelled due to COVID-19
2021-11-24	3m RH	Replaced (SN U2340043)
2021-11-24	LicorUp pyra	Replaced (SN PY18400)
2021-11-24	LicoDown pyra	Replaced (SN PY40424)
2021-11-24	Quantum PAR	Replaced (SN Q20266)
2021-11-24	Wind 3m	Replaced (SN WM31282)
2021-11-24	Pressure	Replaced (SN N0750442)
2021-11-24	100ampHBattery 1	Replaced

(continued)

Date	sensor	notes
2021-11-24	100ampHBattery 2	Replaced
2021-11-24	100ampHBattery 3	Replaced
2021-11-24	Notes	Swapped SM4M.
2022-11-22	3m RH	Replaced with HMP155 (SN U2511019)
2022-11-22	CR10X	REMOVED
2022-11-22	CR1000x	New CR1000x
2023-11-09	LicorUp pyra	Replaced (SN PY41099)
2023-11-09	LicoDown pyra	Replaced (SN PY27929)
2023-11-09	Quantum PAR	Replaced (SN Q9916)
2023-11-09	Wind 3m	Replaced (SN WM80545)
2023-11-09	Pressure	Replaced (SN U101307)
2023-11-09	Precip	Removed one
2023-11-09	100ampHBattery 1	Replaced
2023-11-09	100ampHBattery 2	Replaced
2023-11-09	100ampHBattery 3	Replaced
2023-11-09	Program	H02M_202324_V1.CR1x
2023-11-09	Notes	Upward pyranometer, Quantum, and UV were all raised in order to avoid partial shading from Relative humidity and temperature sensors.

MISM - Miers

Date	sensor	notes
2010-12-08 00:00:00	Wind 3m	adjusted 30 degrees clockwise, wind monitored removed
2010-12-08 00:00:00	CR10X	Replaced
2011-01-27 00:00:00	Quantum	Installed Q9916
2011-01-27 00:00:00	Wind 3m	Installed new wind monitor
2011-01-27 00:00:00	CR10X	New Prog: GAD1011v2
2011-01-27 00:00:00	Pressure	Add new pressure sensor
2011-01-27 00:00:00	Notes	Moved SwRadOut to Quantum arm, which was flipped from its normal position to move the sensor closer to the ground. 5. SwRadIn is also on new radiation mount on upper cross-arm.
2012-01-11 11:00:00	Notes	Turned off and disassembled station; moved from Garwood Valley to Miers Valley
2012-01-28 00:00:00	3m RH	Replaced
2012-01-28 00:00:00	Wind 3m	Replaced
2012-01-28 00:00:00	Notes	New location in Miers Valley
2012-11-28 00:00:00	100ampHBattery 1	Added additional battery and regulator
2012-11-28 00:00:00	Notes	Swapped SM4M
2013-11-21 00:00:00	Licor Up pyra	Replaced (SN PY23250)
2013-11-21 00:00:00	Licor Down pyra	Replaced (SN PY28169)
2013-11-21 00:00:00	Quantum	Replaced (SN Q30803)
2014-11-17 00:00:00	Notes	Data downloaded but no maintenance
2015-12-12 00:00:00	Quantum	Replaced (SN Q23204)
2015-12-12 00:00:00	Wind 3m	Replaced (SN WM47474)
2015-12-12 00:00:00	CR10X	Replaced (SN X44863)
2016-12-13 00:00:00	3m RH	Replaced (SN U2020021)
2016-12-13 00:00:00	Licor Up pyra	Replaced (SN PY40424)
2016-12-13 00:00:00	Licor Down pyra	Replaced (SN PY45668)

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Date	sensor	notes
2016-12-13 00:00:00	Notes	Swapped SM4M; field sheet has old pyranometers switched.
2017-12-29 00:00:00	Quantum	Replaced (SN Q23210)
2017-12-29 00:00:00	Wind 3m	Replaced (SN WM80545)
2017-12-29 00:00:00	CR10X	Replaced (X23872)
2017-12-29 00:00:00	Notes	Swapped SM4M 12/29/2017 9:28 (check barometer reading accuracy next season)
2018-12-05 00:00:00	3m RH	U2730014
2018-12-05 00:00:00	Licor Up pyra	Replaced (SN PY18656)
2018-12-05 00:00:00	Licor Down pyra	Replaced (SN PY28167)
2018-12-05 00:00:00	Notes	Swapped SM4M. Station blew over in December 2019, and was fixed January 11, 2019. Will have data gap.
2019-12-02 00:00:00	Quantum	Replaced (SN Q17248)
2019-12-02 00:00:00	Wind 3m	Replaced (SN WM17809)
2019-12-02 00:00:00	CR10X	Replaced (X23866)
2019-12-02 00:00:00	Notes	Swapped SM4M.
2020-12-14 00:00:00	Notes	Station visited by Cray lab staff. No maintenance performed other than swapping SM4M due to season cancellation (COVID-19)
2022-01-21 00:00:00	SoilTemp 0cm	Measured and re-set: original depth = 1cm, final depth 0cm
2022-01-21 00:00:00	SoilTemp 10cm	Measured and re-set: original depth = 12cm, final depth = 10cm
2022-01-21 00:00:00	Licor Up pyra	Replaced (SN PY23276)
2022-01-21 00:00:00	Licor Down pyra	Replaced (SNPY27937)
2022-01-21 00:00:00	Quantum	Replaced (SN Q114258)
2022-01-21 00:00:00	Wind 3m	Replaced (SN WM80554)
2022-01-21 00:00:00	Pressure	Replaced (SN T1140837)
2022-01-21 00:00:00	Notes	Swapped SM4M. Wind monitor adjusted 33 degrees clockwise.
2022-12-28 00:00:00	3m RH	Installed new Vaisala HMP155 with new shield (new SN U2511025)
2022-12-28 00:00:00	Soil moisture probes (CS655)	Installed 2 new soil moisture probes at 5 and 10 cm.
2022-12-28 00:00:00	CR10X	REMOVED
2022-12-28 00:00:00	CR1000X	Installed new CR1000X datalogger part of equipment upgrade. New SN = 40105
2022-12-28 00:00:00	Ultrasonic	No ultrasonic on station
2022-12-28 00:00:00	Notes	Didn't have time to align wind monitor - need to do this next year. Need to remove 5 cm soil temp from program next season
2023-11-30 00:00:00	Quantum	Replaced (SN Q29766)
2023-11-30 00:00:00	Wind 3m	Replaced (SN WM27761)
2023-11-30 00:00:00	Pressure	Replaced (SN R0141345)
2023-11-30 00:00:00	Notes	Didn't have enough licor pyranometers to replace up and down on all stations, so decided to leave these ones for an extra year. Soil Temp 5cm is in the code, but not actually installed on the station.

TARM - Taylor

Date	sensor	notes
2010-11-09	Wind 3m	Rotated wind 50o counter-clockwise & replaced
2010-11-09	CR10X	Reset datalogger clock + 59 min 49 secs & loaded new program tar1011v1

(continued)

Date	sensor	notes
2010-11-09	100ampHBattery 1	Replaced
2010-11-09	Notes	Drilled nu-rail on cross arm and tighten center post.
2011-01-21	CR10X	Reset datalogger clock -15 secs & 5. Installed new serial cable
2011-01-21	Notes	Pulled multiplexer
2011-12-02	3m Temp	Moved towards x-arm
2011-12-02	3m RH	Moved towards x-arm
2011-12-02	1m Temp	Moved to 100 cm over the ice
2011-12-02	Eppley Up pyra	Arm rotated to point approx north, SwRadIn positioned on north side of arm
2011-12-02	Eppley Down pyra	Moved to lower cross-arm, placed beside sonic ranger
2011-12-02	Wind 3m	Arm rotated to point approx north, Wind positioned on south side of arm
2011-12-02	Ultrasonic	lower cross-arm extended out a little more, and the sonic placed besides SwRadOut
2011-12-02	CR10X	Replaced, and CR10X moved to vertical position in box
2011-12-02	100ampHBattery 1	One battery in the box
2011-12-02	20WSolarPanel	Disconnected internal regulator, and plug panel into CH12 regulator in white box
2011-12-02	Notes	10W solar panel removed
2012-01-21	20WSolarPanel	new charge controller, flexcharge
2012-01-21	Notes	Added radio, cahnged SM4M to ring mode
2012-11-20	100ampHBattery 1	Added 1 battery
2012-11-20	Notes	Swapped SM4M; lowered station by 16.5 cm
2013-11-13	1m RH	Replaced
2013-11-13	Wind 3m	Replaced
2013-11-13	CR10X	Replaced
2013-11-13	Notes	Swapped SM4M; lowered station by 16.6 cm on 11/21/2013
2014-12-05	Ultrasonic	Fixed ultrasonic
2014-12-05	Notes	Swapped SM4M; lowered station by 12 cm
2015-12-02	3m RH	Replaced (SN V1110042)
2015-12-02	1m RH	Replaced (SN W4230007)
2015-12-02	Eppley Up pyra	Replaced (SN 31437F3)
2015-12-02	Eppley Down pyra	Replaced (SN 31435F3)
2015-12-02	Wind 3m	Replaced (SN WM15192)
2015-12-02	Notes	Lowered station by 18.5 cm
2016-12-09	Ultrasonic	Replaced internal transducer
2016-12-09	CR10X	Replaced (SN X28585)
2016-12-09	Notes	Swapped SM4M; lowered station by 30 cm
2017-11-30	3m RH	Replaced (SN Y2710027)
2017-11-30	1m RH	Replaced (SN W4230013)
2017-11-30	Wind 3m	Replaced (SN WM47856)
2017-11-30	Notes	Swapped SM4M; lowered station by 9.5 cm (average)
2018-12-18	Eppley Up pyra	Replaced (SN 29763F3)
2018-12-18	Eppley Down pyra	Replaced (SN 29762F3)
2018-12-18	CR10X	Replaced (SN X44859)
2018-12-18	Notes	Swapped SM4M; lowered station by average of 16.9 cm
2019-12-27	3m RH	Replaced (SN Y2850072)
2019-12-27	1m RH	Replaced (SN U2520041)
2019-12-27	Wind 3m	Replaced (SN WM15249)
2019-12-27	Ultrasonic	Replaced internal transducer
2019-12-27	Notes	Swapped SM4M; lowered station by average of 30.5 cm

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Date	sensor	notes
2020-12-14	Notes	Station visited by Shelly Campbell (Crary lab staff). Season cancelled due to COVID 19. • Adjusted time by 7 minutes – the datalogger clock was reading FAST so she changed it using the CR10KD and GPS time • Unplugged / replugged in all of the telemetry cables. Telemetry discovered to be back online 12/18/2020 !!
2021-12-27	3m RH	Replaced (SN Y2820003)
2021-12-27	Eppley Up pyra	Replaced (SN 33733F3)
2021-12-27	Eppley Down pyra	Replaced (SN 31435F3)
2021-12-27	Wind 3m	Replaced (SN WM47474)
2021-12-27	100ampHBBattery 1	Changed 2 batteries + new charge controller (UNAVCO)
2021-12-27	Notes	Lowered station by 52.1 cm (average). Removed flight from each of the three tripod legs!
2022-12-29	3m RH	Replaced with new Vaisala HMP155 (new SN U2511023)
2022-12-29	1m RH	Removed 1 m RH (all stations only have 1 RH sensor now)
2022-12-29	CR10X	Removed CR10X
2022-12-29	CR1000X	Installed new CR1000X datalogger. SN 40088
2022-12-29	Notes	Did not lower tripod - did not have enough time. Will need to lower next year.
2023-11-21	Notes	Wind alignment was correct. Eppley pyranometer up shield was jerry-rigged with a washer. Need to replace in 24/25. Vaisala probe was out on arrival. Reinstalled tightly. Radio model # = FGR_115RC and SN 916-7017

VAAM - Vanda

Date	sensor	notes
2010-11-19	Licor Up pyra	Installed PY40424
2010-11-19	Licor Down pyra	Installed PY33485
2010-11-19	Wind 3m	Replaced
2010-11-19	Ultrasonic	Removed
2010-11-19	CR10X	CR10X adjusted back 13 min and 35 secs & program vaa1011v1 loaded
2010-11-29	Ultrasonic	Installed Sonic with replaced chip
2011-12-17	3m RH	Replaced
2011-12-17	Licor Down pyra	Moved to stand next to sonic
2011-12-17	Quantum	Replaced
2011-12-17	Ultrasonic	Moved to new cross arm, attached to the lower arm
2011-12-17	CR10X	loaded new program, VAAM_201112_v1, clock behind 14 minutes and 11 seconds
2011-12-17	Radio	Installed radio, connected to SW12V
2012-11-27	Quantum	Replaced (SN Q29773)
2012-11-27	Wind 3m	Replaced
2012-11-27	CR10X	Replaced
2012-11-27	NOTES	Swapped SM4M
2013-11-24	NOTES	Station visited but no maintenance necessary
2014-12-12	3m RH	Replaced (SN Y3340029)
2014-12-12	Ultrasonic	Replaced
2014-12-12	NOTES	Swapped SM4M

(continued)

Date	sensor	notes
2015-12-01	Licor Up pyra	Replaced (SN PY27929)
2015-12-01	Licor Down pyra	Replaced (SN PY28348)
2015-12-01	Quantum	Replaced (SN Q20275)
2015-12-01	Eppley Pyrgeometer down	Replaced
2015-12-01	Wind 3m	Replaced (SN WM47080)
2015-12-01	CR10X	Replaced
2016-12-08	3m RH	Replaced
2016-12-08	NOTES	Moved entire station due to encroaching lake level; now on southern side of Onyx River (-77.52567, 161.69129)
2017-12-18	Quantum	Replaced (SN Q20266)
2017-12-18	Wind 3m	Replaced (Sn WM85158)
2017-12-18	Ultrasonic	Replaced (SN C11856)
2017-12-18	CR10X	Replaced (SN 28678)
2017-12-18	NOTES	Swapped SM4M 12/18/2017 on @ 11:21
2018-12-22	3m RH	Replaced HMP45D (SN: Y3340031)
2018-12-22	Licor Up pyra	Replaced (no SN visible, RMA 27666 Line#22)
2018-12-22	Licor Down pyra	Replaced (SN PY33985)
2019-12-26	Quantum	Replaced (SN Q29766)
2019-12-26	Wind 3m	Replaced (SN WM47080)
2019-12-26	Ultrasonic	Replaced (SN C406)
2019-12-26	CR10X	Replaced (SN X07336)
2019-12-26	NOTES	Need to replace entire quantum arm and bracket next year. Note: ultrasonic value not matching up with measured value
2020-11-30	NOTES	Station visited by Crary lab staff. No maintenance performed other than collectnig SM4M due to season cancellation (COVID-19)
2022-01-19	3m RH	Replaced (SN: U2020021)
2022-01-19	Licor Up pyra	Replaced (SN PY23277)
2022-01-19	Licor Down pyra	Replaced (SN PY28374)
2022-01-19	Wind 3m	Replaced (SN WM37721)
2022-12-13	3m RH	Replaced with new Vaisala HMP155 (SN U2511020)
2022-12-13	Quantum	Replaced (SN Q99253)
2022-12-13	Ultrasonic	Not working! Need to replace next year. Didn't have enough spare parts
2022-12-13	Soil moisture probes (CS655)	Installed 2 new soil moisture probes at 5 cm and 10 cm depth
2022-12-13	CR10X	Removed CR10X datatlogger from station
2022-12-13	CR1000X	Installed new CR1000X datalogger
2022-12-13	NOTES	Rotated wind monitor by 5 -8 degrees clockwise using Garmin Inreach GPS method
2023-11-15	Licor Up pyra	Replaced (SN RMA 27666)
2023-11-15	Licor Down pyra	Replaced (SN PY20523)
2023-11-15	Ultrasonic	Replaced (SN C3393)
2023-11-15	NOTES	Forgot to bring appropriate wind monitor, so swap did not happen as scheduled.

VIAM - Vida

Date	sensor	notes
2010-11-17	Licor Up pyra	Installed PY51356
2010-11-17	Licor Down pyra	Installed PY56364
2010-11-17	CR10X	Time adjusted back 6 minutes and 21 seconds & new program via1011v1
2012-01-07	Licor Down pyra	Replaced (SN PY20565)
2012-01-07	Notes	Moved station
2012-11-27	Notes	Added antenna and radio
2013-11-20	3m RH	Replaced
2013-11-20	Licor Down pyra	Replaced (SN PY18400)
2013-11-20	CR10X	Replaced
2013-11-20	Notes	Swapped SM4M
2014-12-12	Quantum	Replaced (SN Q20526)
2014-12-12	Ultrasonic	Replaced
2014-12-12	Notes	Swapped SM4M
2015-12-02	Licor Up pyra	Replaced (SN PY20523)
2015-12-02	Licor Down pyra	Replaced (SN PY56364)
2015-12-02	Wind 3m	Replaced (SN WM17809)
2015-12-02	CR10X	Replaced
2016-12-10	3m RH	Replaced (SN U2730015)
2016-12-10	Quantum	Replaced (SN Q30805)
2016-12-10	Notes	Swapped SM4M
2017-12-18	Wind 3m	Replaced (SN WM47480)
2017-12-18	Ultrasonic	Replaced (SN C11856)
2017-12-18	100ampHBattery 1	Replaced
2017-12-18	Notes	Swapped SM4M on @ 12:36
2018-12-19	3m RH	Replaced (SN Y2850111)
2018-12-19	Licor Up pyra	Replaced (SN PY23250)
2018-12-19	Licor Down pyra	Replaced (SN PY25307)
2018-12-19	Quantum	Replaced (SN Q29765)
2018-12-19	100ampHBattery 1	12/1/2017
2018-12-19	100ampHBattery 2	11/1/2012
2018-12-19	Notes	Swapped SM4M. Vaisala was HMP45AC
2019-12-26	Wind 3m	Replaced (SN WM 17401)
2019-12-26	Notes	Swapped SM4M. Old SM4M would not download. The data processed is from telemetry (12/19/18 - 12/26/2019)
2022-01-19	3m RH	Replaced with NEW model HMP155A-L (SN T2920234)
2022-01-19	Wind 3m	Replaced (SN WM27720)
2022-01-19	100ampHBattery 1	Changed battery 2022
2022-01-19	100ampHBattery 2	Changed battery 2022
2022-01-19	Notes	Relative humidity sensor upgraded - rated below -40.
2022-12-14	3m RH	Replaced with new HMP155 (removed one from last year) (SN U2511026)
2022-12-14	SoilTemp 0cm	Reset soil temp to be at 0 cm
2022-12-14	SoilTemp 5cm	Reset soil temp sensor (was 4 cm, buried to 5 cm)
2022-12-14	SoilTemp 10cm	Reset soil temp sensor (was 7 cm, buried to 10 cm)
2022-12-14	Licor Up pyra	Replaced (SN PY20222)
2022-12-14	Licor Down pyra	Replaced (SN PY18656)
2022-12-14	Quantum	Replaced (SN Q32567)
2022-12-14	Wind 3m	Replaced (SN WM31283)
2022-12-14	Soilmoisture probes	Installed 2 new soil moisture probes (CS655) at 5 cm (SN 53923) and 10 cm depth (SN 53912)
2022-12-14	CR10X	Removed CR10X (old SN 18804)

(continued)

Date	sensor	notes
2022-12-14	CR1000X	Installed new CR1000X (SN 40100)
2022-12-14	100ampHBBattery 1	Replaced battery because of low winter voltage
2022-12-14	100ampHBBattery 2	Replaced battery because of low winter voltage
2022-12-14	Notes	Rotated wind monitor 20 degrees clockwise using new Garmin InReach GPS method
2023-11-10	3m Temp	Replaced due with sensor with a longer cable.
2023-11-10	SoilTemp 0cm	Replaced.
2023-11-10	Ultrasonic	Replaced transducer.
2023-11-10	100ampHBBattery 1	Replaced battery because of low winter voltage
2023-11-10	100ampHBBattery 2	Replaced battery because of low winter voltage
2023-11-10	Notes	Appeared that upward and downward pyranometers were swapped in the code. Rewired to fix this. Ultrasonic ranger distance was measured at 58.5 cm. New program: VIAM_202324_V1.CR1x.

Legacy Station Information

ID	Name	Date of Station Establishment
HOEM	Lake Hoare	Dec 1, 1993 by Peter Doran, Retired on Nov 7, 2014 by Maciej Obryk
HO2M	Lake Hoare	Dec 27, 2012 by Thomas Nylen
FRLM	Lake Fryxell	Jan 6, 1994 by Peter Doran
BOYM	Lake Bonney	November 24, 1993 by Peter Doran
COHM	Commonwealth Glacier	November 22, 1993 by Peter Doran
HODM	Howard Glacier	November 20, 1993 by Peter Doran
TARM	Taylor Glacier	November 21, 1994 by Peter Doran
VAAM	Lake Vanda	November 24, 1994 by Peter Doran, moved due to lake level rise 12/8/2016 (new GPS = -77.52567, 161.69129)
BRHM	Lake Brownworth	November 13, 1996 by Peter Doran and DJ Osborne
EXEM	Explorer's Cove	Nov 21, 1997 by Peter Doran, DJ Osborne and K. Sauter
CAAM	Canada Glacier (no Eddy Sensors)	Nov 20, 1995 by Karen Lewis; reinstalled Jan 13, 1998
VIAM	Lake Vida	November 24, 1995 by Peter Doran
????	RETIRED Hoare Submerged	???
????	RETIRED Fryxell Submerged	???
????	RETIRED Bonney East Submerged	???
????	RETIRED Canada Gl. (w/ Eddy Sensors)	???
????	RETIRED Bonney West Submerged	???
F6MM	F6 Snow Fence, Met, and Sensit	Changed to F6 Met and F6 Sensit by Hassan Basagic, retired Dec 2016
BENM	RETIRED Beacon Valley	Jan 27, 2000 by Susan Kaspari, Thomas Nylen and Adrian Green. Retired in Dec 2012.
LHPM	RETIRED Lake Hoare Precipitatio	January 26, 2002 by Thomas Nylen (also Upper Howard)

ID	Name	Date of Station Establishment
UHDM	RETIRED Upper Howard Met	Temporary station Retired in 2004.
BLDM	RETIRED Blood Falls	Temporary station 11/14/2004
BRMM	Bonney Snow Fence	Changed to Bonney Riegel Met and Sensit by Hassan Basagic. Removed 2016.
FRSM	Friis Hills	Installed by Cuffey et al., Date Unknown; absorbed by LTER.
FLMM	Mt. Fleming	Installed 10/16/2006 by Univ of Wisc AWS
GADM	RETIRED Garwood Valley	Installed by Peter Doran; Removed from service in 2011-12
MISM	Miers Valley	Installed by Nylen 2011-12
GAFM	Garwood Valley Ice Cliff	December 2010 by Thomas Nylen
HTDR	Lake Hoare TDR Station	08-09 Season by Hassan Basagic
EXSM	RETIRED Explorers Cove Sensit	Installed by Hassan Basagic; Retired Nov 2012
F6SM	F6 Snowfence Sensit	Installed by Hassan Basagic; Retired Dec 2016
	Lake Fryxell Sensit	Installed by Hassan Basagic, Data combined with Fryxell station data
	RETIRED Lake Hoare Sensit	Installed by Hassan Basagic, Retired 12/2010