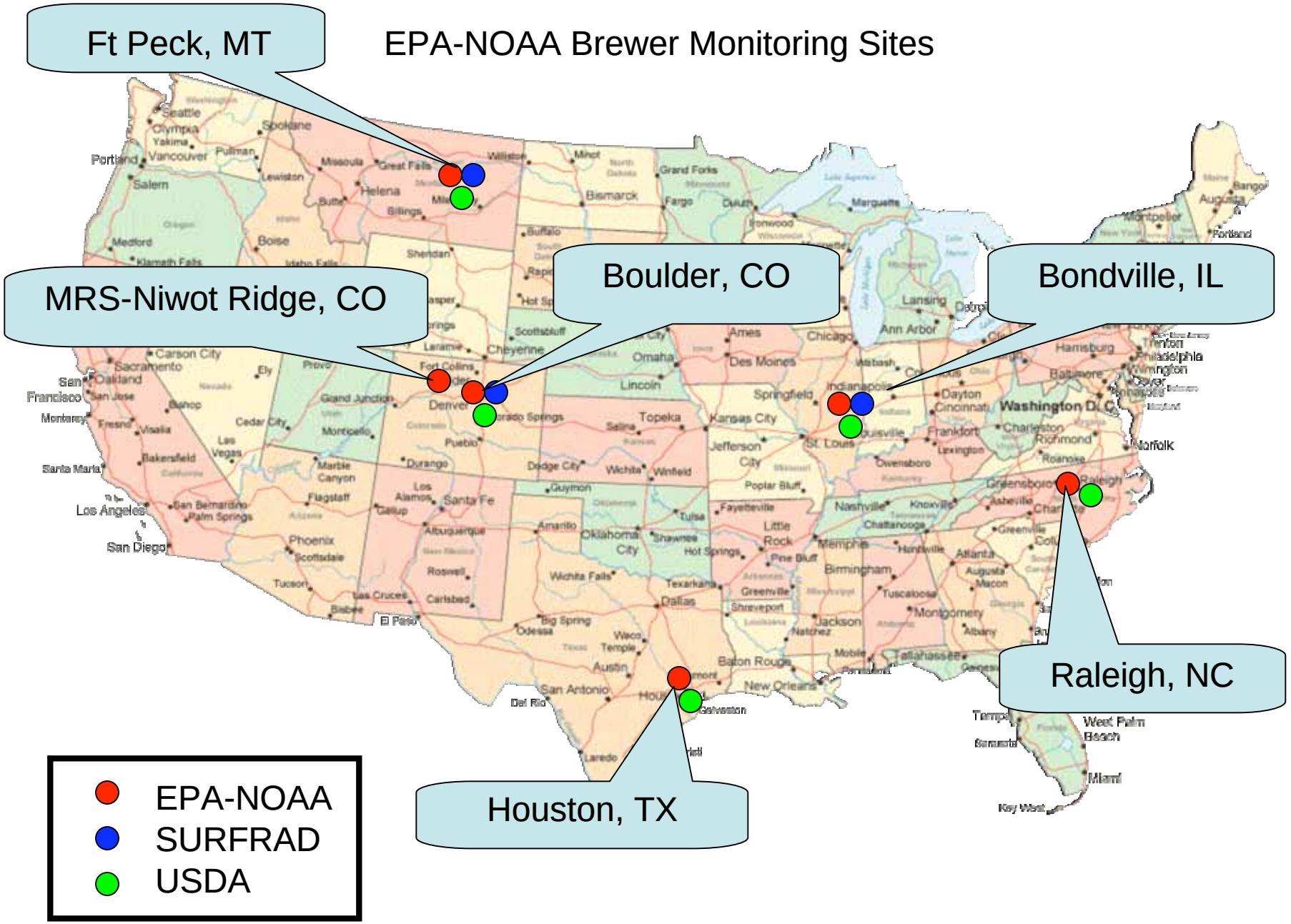
EPA-NOAA Brewer UV-ozone network-2 (UVnet2) Overview and current status

UVnet-2 personnel

Dr Peter Kiedron
Senior research scientist

Scott Stierle
Programmer/technician


Ft Peck, MT
EPA-NOAA Brewer Monitoring Sites
MRS-Niwot Ridge, CO
Boulder, CO
Bondville, IL
Raleigh, NC
Houston, TX
EPA-NOAA
SURFRAD
USDA

NOAA SURFRAD site instrumentation:

-Visible multi-filter rotating shadowband radiometer
-Yankee UVB-1 broadband radiometer
-Spectrosun pyranometer
-Pyrgeometer
-LICOR sensor
-Meteorological tower, which includes upwelling PSP and pyrgeometer
-Tracker with normal incidence pyranometer, shaded PSP and pyrgeometer

USDA monitoring site instrumentation:

-Yankee visible multi-filter rotating shadowband radiometer
-Yankee UV multi-filter rotating shadowband radiometer
-Yankee UVB-1 broadband radiometer
-LICOR sensor
-Temperature and relative humidity probe

BREWER SITE LOCATION INFORMATION

BREWER	SERIAL #	LATITUDE	LONGITUDE	ELEVATION
Raleigh, NC	96-140	N 35.728	W 078.680	124 masl
MRS, CO	97-146	N 40.032	W 105.533	2923 masl
Ft Peck, MT	97-147	N 48.308	W 105.102	634 masl
Houston, TX	97-154	N 29.718	W 095.341	84 masl
Bondville, IL	96-144	N 40.053	W 088.372	213 masl
Table Mtn, CO	94-108	N 40.125	W 105.237	1689 masl
Table Mtn, CO	96-139	N 40.125	W 105.237	1689 masl
Table Mtn, CO	96-141	N 40.125	W 105.237	1689 masl

NETWORK OBJECTIVE

To produce high quality solar UV spectral irradiance and total column ozone measurements for our research and collaborating researchers

GENERAL RESEARCH DIRECTIONS

How clouds and other meteorological conditions affect surface UV levels (and radiative forcings)?

How tropospheric pollution (ozone and fine particles) affect surface UV levels (and radiative forcings)?

How do surface UV and ozone observations compare to space-based measurements of UV and ozone at these sites

How do variations in stratospheric ozone concentrations affect surface UV levels

Brewer Mark IV Spectrophotometer 93-101 Table Mtn, Colorado

Brewer Mark IV command structure and sample schedule

O3-mode

DS – direct sun ozone measurement
ZS - zenith sky measurement
UM – Umkehr measurement
UX – extended UV spectral scan
PS – direct sun measurement

N2-mode

DS – direct sun NO_2 measurement
ZS – zenith sky NO_2 measurement

SAMPLE SCHEDULE

```
-115
jdb2w1ci
-105
pfo3rshgsldtsln2sl
-93
pfn2zszszszszs
-90
pfo3hgum
-85.803
pfWZuxzsum
-80.803
pfWZuxzsum
-75.803
pfWZb1uxhgzsdsum
-70.803
pfo3WZb1uxhgdspsn2dso3psds
-65.803
pfo3WZb1uxhgdspsn2dso3psds
-60.803
pfo3WZb1uxhgdspsn2dso3psds
-55.803
pfo3WZb1uxhgdspsn2dso3psds
-50.803
pfo3WZb1uxhgdspsn2dso3psds
```

Brewer 97-147 Ft Peck, Montana

Collocated Instruments:

NOAA SURFRAD site
USDA monitoring site
NOAA Surface flux measurement
Climate reference network site (CRN)
IMPROVE site

Brewer 96-146 Mountain Research Station
Niwot Ridge, CO

Collocated Instruments:

UV-MFRSR
vis-MFRSR
UVB-1 radiometer
UVA radiometer
Eppley PSP pyranometer
Pressure, T & RH probe

Brewer 97-154
University of Houston
Houston, Texas

Collocated Instruments:
USDA monitoring site
Total Sky Camera
Meteorological tower
Cimel sun photometer

Brewer 96-144 Bondville, Illinois

Collocated instruments:

EPA/CASTnet IMPROVE protocol site
NOAA SURFRAD site
USDA UV site
Climate reference network (CRN)
Aeronet site-Cimel sun-photometer
Total Sky Camera

Brewer 96-140 Raleigh, North Carolina

Collocated instruments:
USDA monitoring site

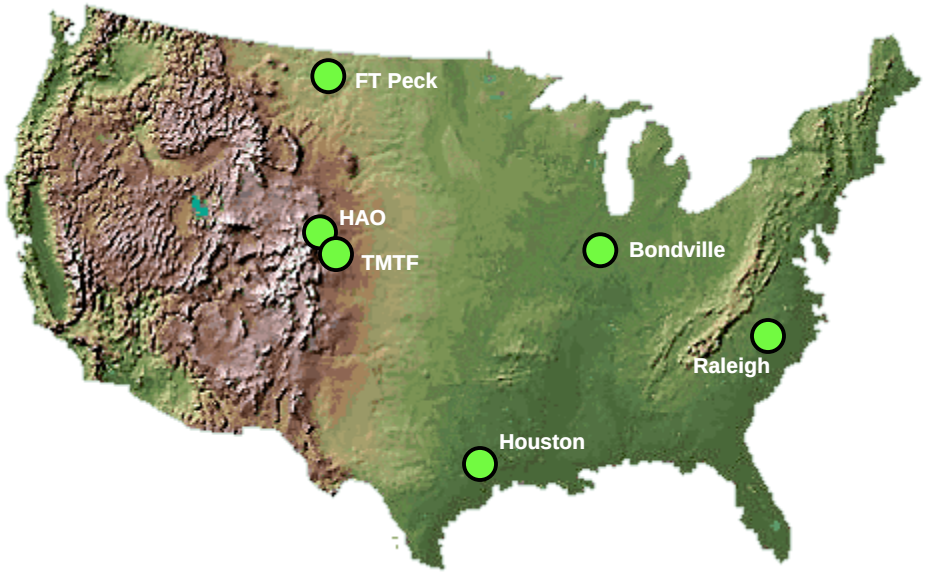
Earth System Research Laboratory
Global Monitoring Division

NOAA/EPA
Brewer Spectrophotometer
UV and Ozone Network

About:

Brewer MK IV Spectrophotometer

The NOAA/EPA Brewer Spectrophotometer Network consists of six stations located in the central and eastern United States. Each Brewer instrument provides daily Ultra-Violet (UV) Radiation and Total-Column Ozone measurements. Some Brewers are co-located at NOAA SURFRAD stations equipped with UV instrumentation and Total Sky Imagers.



Brewer Network Stations

Brewer Deployments:

Houston, TX	July 24, 2006
HAO, CO	Oct 25, 2006
Bondville, IL	Sep 25, 2006
Raleigh, NC	Oct 13, 2006
Ft. Peck, MT	Nov 07, 2006

Summary Data for yyyy-mm-dd

Station	AVG UV	UV Index	AVG TC DS O3
TMTF **HAO** **FT. PECK** **HOUSTON** **BONDVILLE** **RALEIGH**			

Stations:

Houston, TX

TMTF, CO

FT PECK, MT

Bondville, IL

MRS, CO

Raleigh, NC

Table Mountain Test Facility

Location:

Boulder, Colorado
Latitude: 40.125
Longitude: -105.237
Elevation: 5541.3 ft, 1689 m

Brewer Instruments:

Brewer MKIV Spectrophotometer:
BR-101, BR-108, BR-139

Co-located Instruments:

Total Sky Imager
U111 Spectroradiometer

Contacts:

Patrick Disterhoft
303-497-6355
patrick.disterhoft@noaa.gov
Scott Stierle
303-497-6620
scott.stierle@noaa.gov
Peter Kiedron
303-497-4937
Peter.Kiedron@noaa.gov

The Table Mountain Test Facility located 7-miles north of Boulder is the home for the NOAA-EPA Brewer Network Reference Triad.

NOAA-EPA Brewer Network Database

Current User: stierle

Meta Tables | Data Tables | Queries | Reports | Help

Mon, 13 Nov 2006 16:47:50 - 317 UTC

Brewer Information (brewer)

Meta Tables:
Brewers
Brewer PCs
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Form View

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Ext. Table Prop
Ext. Field Prop
Example Querys

Debug is OFF

NEW | Clear Sort | Clear Filter | No Wrap: Y | Trunc: 32 | Apply

Brewer UID	Active	Brewer Serial #	Tracker Serial #	Schedule	Heater Option	Comms Option	Comms Method	Property #	Notes	Create Date
BR101	Yes	93-101	93-101	EPA96e	No	ICC-11	RS-485	CD0001441602	Sep 18, 2006 16:48 GMT - uploade...	2006-06-26 00:06:02
BR105	Yes	94-105	94-105	EPA96f	No	ICC-11	RS-485	CD0001441604	Oct 26, 2006 17:00 GMT - Connect...	2006-06-26 21:29:00
BR108	Yes	97-108	97-106	EPA96e	No	RS-232	RS-232	CD0001441605	Nov 7, 2006 - Went to TMTF and f...	2006-06-29 00:43:14
BR131	Yes	96-131	96-131	EPA96e	No	RS-232	RS-232	CD0001441610	Oct 30, 2006 - The PC connected ...	2006-08-14 14:35:39
BR132	Yes	??-132	??-132	EPA96d	No	ICC-11	RS-485	CD0001441611	Oct 24, 2006 - Patrick shipped B...	2006-08-23 11:56:31
BR134	Yes	96-134	96-134	EPA96e	No	ICC-11	RS-485	CD0001441613	Sep 18, 2006 17:32 GMT - uploade...	2006-08-15 10:40:20
BR135	Yes	??-135	??-135	EPA96e	No	ICC-11	RS-485	CD0001441614	Oct 2, 2006 - Brought back on li...	2006-08-14 14:29:37
BR139	Yes	96-139	96-139	EPA96e	No	ICC-11	RS-232	CD0001441617	Oct 26, 2006 17:00 GMT - Connect...	2006-06-26 21:30:04
BR140	Yes	96-140	96-140	EPA96e	Yes	ICC-11	RS-485	CD0001441618	Oct 01, 2006 - Cosine measuremen...	2006-08-14 14:24:53
BR141	Yes	97-141	97-141	EPA96e	No	ICC-11	RS-485	CD0001441619	Nov 6, 2006 - Logged into Brewer...	2006-06-26 21:30:39
BR144	Yes	97-144	97-144	EPA96e	Yes	ICC-11	RS-232	CD0001441620	Oct 03,2006 00:30 GMT - Loaded p...	2006-06-26 21:31:46
BR146	Yes	97-146	97-146	EPA96e	Yes	ICC-11	RS-485	CD0001441621	Nove 2, 2006 18:20 - Changed sch...	2006-06-26 21:32:44
BR147	Yes	97-147	97-147	EPA96e	Yes	ICC-11	RS-485	CD0001441622	Nov 6, 2006 - Installed BR147 at...	2006-06-26 21:33:37
BR154	Yes	97-154	97-154	EPA96f	No	IC-485s	RS-485	CD0001441623	Oct 03,2006 00:30 GMT - Loaded 3...	2006-06-26 21:35:05
BR087	No	??-087	??-087		No	IC-485s	RS-485	CD0001441601	Located at Raleigh, NC.	2006-08-16 11:33:45
BR103	No	??-103	??-103		No			CD0001441603	In storage at TMTF.	2006-08-16 12:11:30
BR109	No	??-109	??-109		No			CD0001441606	In storage at TMTF.	2006-08-16 12:14:00
BR112	No	??-112	??-112		No			CD0001441607	In storage at TMTF	2006-08-16 12:15:36
BR114	No	??-114	??-114		No			CD0001441608	In storage at TMTF	2006-08-16 12:16:35
BR130	No	??-130	??-130		No			CD0001441609	In storage at TMTF.	2006-08-16 12:18:11
BR133	No	??-133	??-133		No			CD0001441612	In storage at TMTF.	2006-08-16 12:19:48
BR137	No	??-137	??-137		No	ICC-11	RS-232	CD0001441615	In Lab at DSRC. CW Azimuth swich...	2006-08-14 14:34:01
BR138	No	??-138	??-138		No			CD0001441616	Oct 24, 2006 - Patrick shipped B...	2006-08-16 12:25:44

Record Count: 23 of 23

Meta Tables:
Brewers
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Table View

Help
Logout

Ext. Table Prop
Ext. Field Prop
Example Querys

Debug is OFF

NOAA-EPA Brewer Network Database

Current User: stierle

Meta Tables | Data Tables | Queries | Reports | Help

Mon, 13 Nov 2006 16:44:26 - 317 UTC

Brewer Information (brewer)

Brewer UID: BR101 * Example: BR199
Active: Yes
Brewer Serial #: 93-101 * Example: yy-###
Tracker Serial #: 93-101 Example yy-###
Schedule: EPA96e
Heater Option: No Yes, if Brewer Inst. has internal heater installed
Comms Option: ICC-11 << ICC-11 Type of Internal 232-485 Converter
Comms Method: RS-485 Comms Protocol
Property #: CD0001441602
Notes:

```
Sep 18, 2006 16:48 GMT - uploaded new HG.rtn and restarted Schedule.

Sep 11,2006 - Brewer toPC Comms error timeout, Brewer responding to reset.

Operating at TMTF.
Slated for TMTF Reference Triad.
```

Create Date: 2006-06-26 00:06:02
Created By: postgres
Last Mod Date: 2006-11-02 16:21:16
Last Mod By: stierle

UPDATE | DELETE | NEW | required(*) | BR101 | FIND

Quality control procedures for Brewer spectral UV data

Temperature corrections

Temporal corrections between external calibrations

Wavelength stability – Hg lamp stability, Fraunhofer algorithm

Cosine response correction

Removal of data spikes

Calculation of erythema

Network instrument performance and stability tracking

Command	Measurement	Function
AP	Voltages	Monitor power supplies and PMT supply voltage
AP	Humidity	Monitor internal instrument humidity
SL	Internal QTH lamp	Track ozone and SO2 calibration (also filters)
CI	Spectral scan of QTH lamp	Track UV calibration stability
DT	PMT dead-time test	Monitor signal detection electronics and PMT
RS	Shutter run/stop ratio test	Confirm proper shutter operation
UX	Extended UV scan	PMT dark signal
HG	302.1 nm mercury line scan	Update wavelength registration
SH	Shutter timing test	Insure proper timing constant
AP	Temperatures	Monitor 3 internal thermistors

Site status: operations and calibrations

BREWER	OPERATIONAL	UV CALIBRATION	OZONE CALIBRATION
Ft Peck, MT Brewer 97-147	YES	Novermber 6, 2006	August 2006
Boulder, CO Brewer 94-108	YES	No	August 2006
Boulder, CO Brewer 96-139	YES	No	August 2006
Boulder, CO Brewer 96-141	YES	No	August 2006
MRS, Niwot Ridge Brewer 96-146	YES	No	August 2006
Houston, TX Brewer 97-154	YES	July 21, 2006	No
Bondville, IL Brewer 96-144	YES	September 24, 2006	August 2006
Raleigh, NC Brewer 96-140	YES	October 13, 2006	August 2006

DEVELOPING AND FUTURE WORK

- Ozone reference triad at Table Mtn, CO
  Brewers 108, 139 and 141

- Total colunm NO_2 retrievals
  431-453 nm range

- DSRC Brewer
  Complete the regional triad

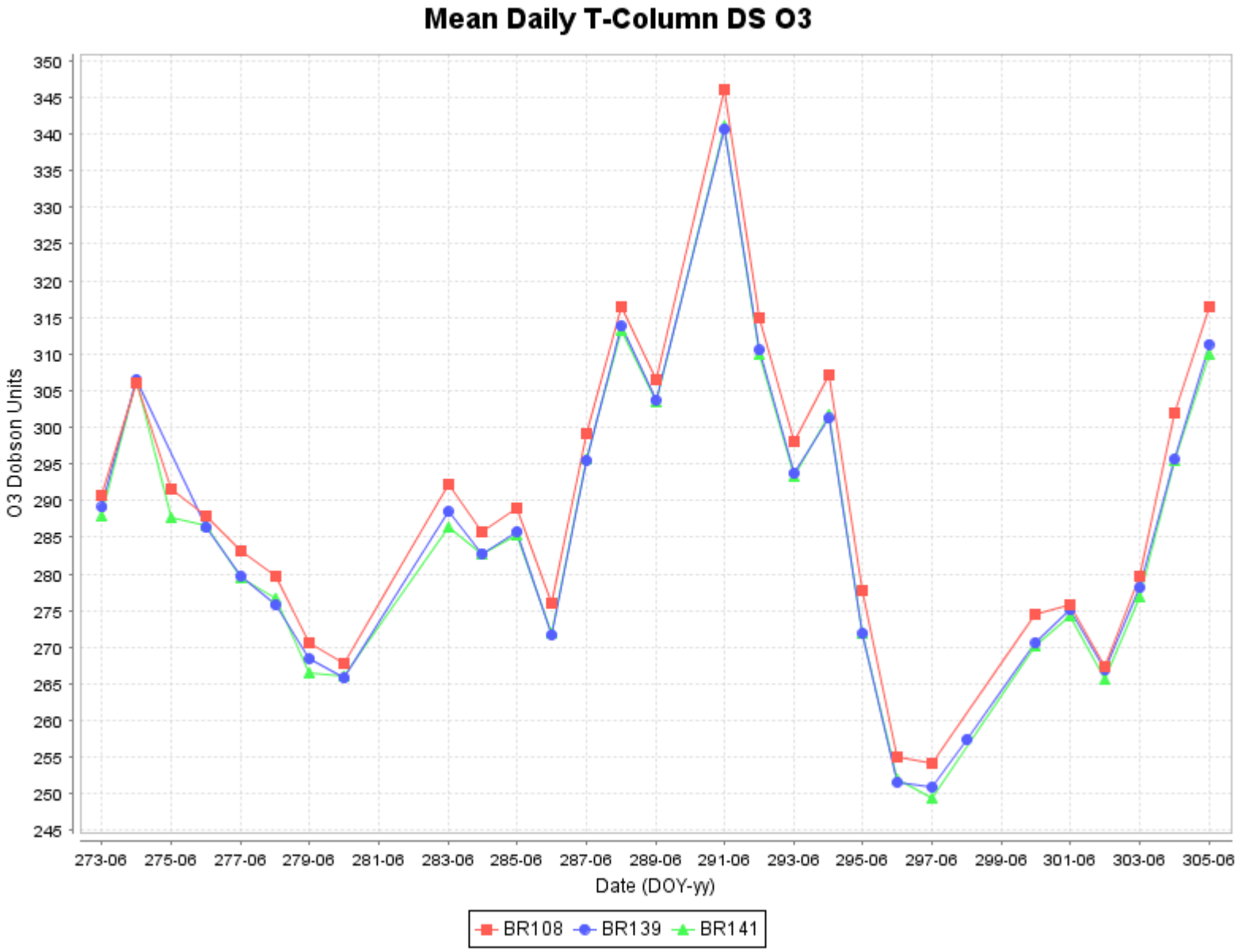
- Mauna Loa Brewer Mark IV for ozone calibrations
  Derive ozone calibration from Langley method

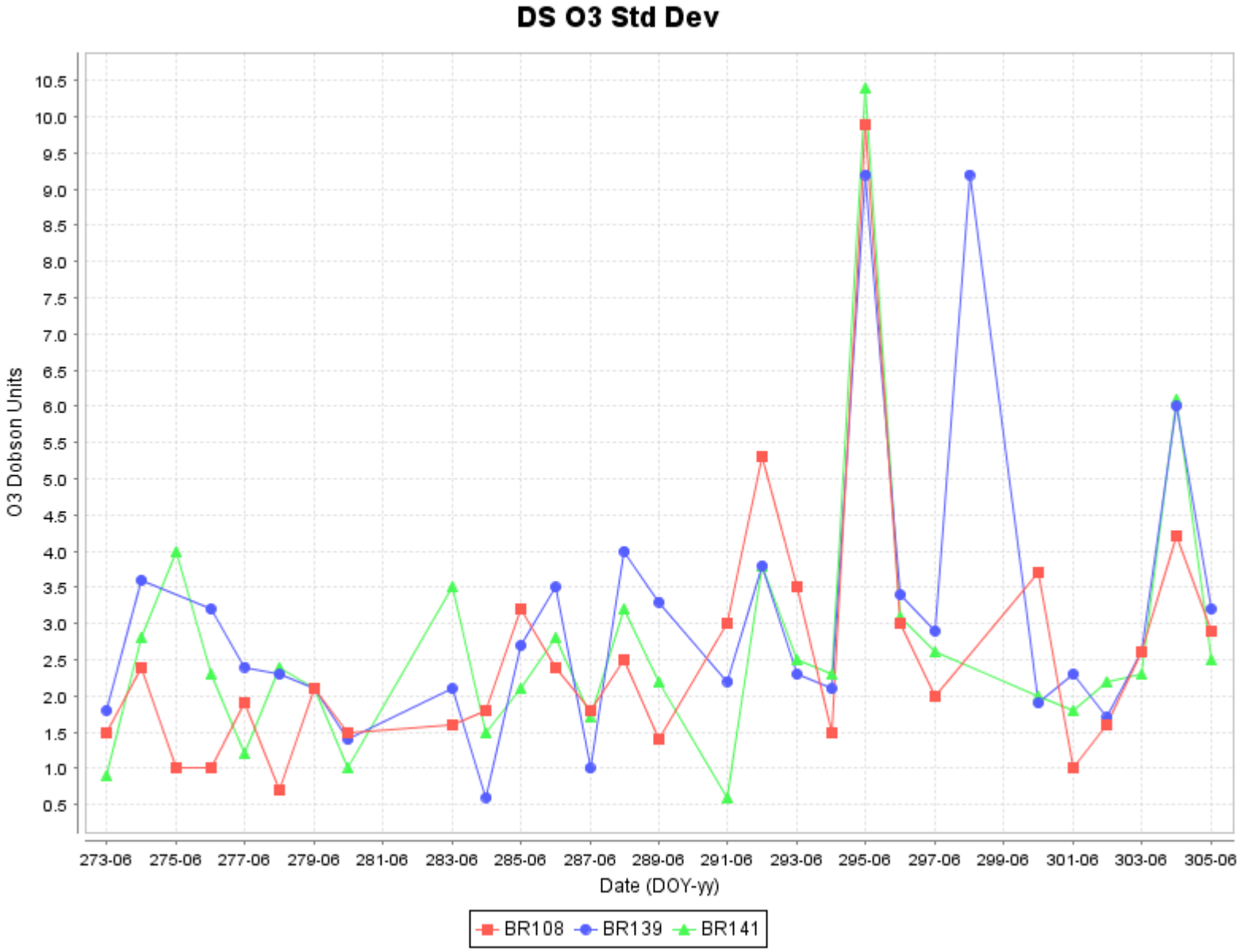
- Traveling ozone reference Brewer
  Field verification of network instruments

- Temperature sensitivity of ozone measurements

- Component replacement to reduce temperature dependence of UV measurements

Brewer Ozone Calibration Reference Triad Table Mtn, Colorado




DS O3 Std Dev
O3 Dobson Units
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Date (DOY-yy)
BR108
BR139
BR141