Accessing and understanding your data extracts with `matos`, `rvdat`, and `otndo`

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- Interact with the ACT_MATOS database
- Pull data from receivers or ACT_MATOS database
- Wrap your head around ACT/OTN data pushes
- Programmatic and reproducible
- https://ocean-tracking-network.r-universe.dev

matos

https://matos.obrien.page

- An API to the MATOS website/database tool
- List projects and files, download files, upload files to MATOS
- No data analysis/manipulation
- May provide sanity checks in the future (Kim’s sanity)

Connect to the MATOS database

Treat this just like you're visiting https://matos.asascience.com/account/login

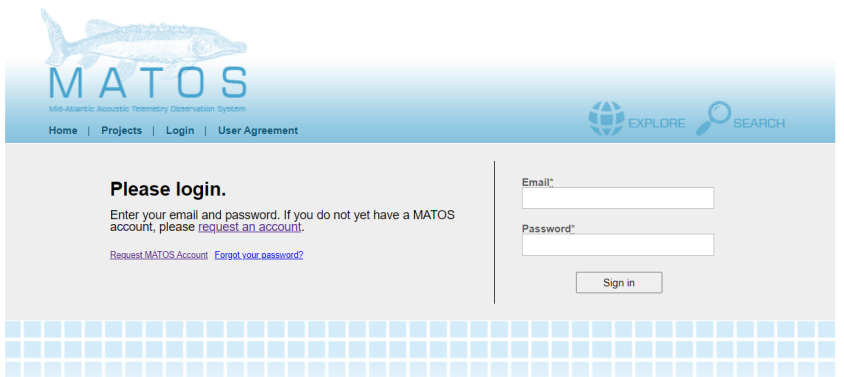
```
library(matos)
```

```
By continuing, you are agreeing to the ACT Network MATOS User Agreement and
Data Policy, Version 1.2:

<https://matos.asascience.com/static/MATOS.User.Agreement.V1.1.pdf>
```

```
matos_login()
```

```
! Please log in.
✓ Login successful!
```



List all projects

- Like visiting https://matos.asascience.com/project, but more.
- Connects to the OTN database to quickly download project metadata

```
1 all_projects <- list_projects()
```

```
ℹ These projects are missing metadata as they have not yet synced with OTN:
"BTWaves Caribbean Acoustic Tagging", "CT DEEP Array (2022-2026)", "ERDC-VCU
James River Array", "ERDC_Brunswick", "SBU Eco-Pod", "SBU Landscape Lab
Array",
"SBU NY Ocean Indicators", "UNH - Rainbow smelt", "VCU/ERDCTelemetry Tags",
and
"WCS New York Sand Tiger Shark Study"
```

```
# A tibble: 146 × 19
   name    number url   FID   collectioncode longname shortname ocean
seriescode
   <chr>    <dbl> <chr> <chr> <chr>          <chr>    <chr>     <chr> <chr>
 1 ACK Ar…    168 http… otn_… ACT.NEAQACK    "Invest… ACK Array NE A… ACT
 2 APG At…    176 http… otn_… ACT.ATSHS      "Aberde… APG Atla… NE A… ACT
 3 ASI - …    211 http… otn_… ACT.ASIWHITE21 "Atlant… ASI - Wh… NE A… ACT
 4 ASI Ac…    100 http… otn_… ACT.ASIARRAY   "Using … ASI Acou… NE A… ACT
 5 ASI Sp…    227 http… otn_… ACT.ASISPINNER "ASI sp… ASI Spin… NE A… ACT
 6 ASI Wh…    232 http… otn_… ACT.ASIWHITE   "ASI Wh… ASI Whit… NE A… ACT
 7 BOEM-D…     85 http… otn_… ACT.DEWEA      "Occurr… BOEM-DE … MID …… ACT
 8 BOEM-V…    217 http… otn_… ACT.VAHMSSHARK "Sandbr… BOEM-VA:… NE A… ACT
 9 BOEM L…    239 http… otn_… ACT.MABASKMOLA "Invest… BOEM Liv… NE A… ACT
10 Brandy…    162 http… otn_… ACT.BRAWSHAD   "Examin… Brandywi… NE A… ACT
# ℹ 136 more rows
# ℹ 10 more variables: status <chr>, citation <chr>, abstract <chr>
```

List only your projects

```
1 list_my_projects()
```

	name	number
35	Maryland Department of Natural Resources	90
47	Navy Kennebec ME Telemetry Array	192
48	NCBO-MD DNR Chesapeake Backbone North	181
49	NCBO-VMRC Chesapeake Backbone South	164
123	UMCES-NYSDEC Hudson Striped Bass Spawning	127
124	UMCES Black Sea Bass & Offshore Construction	97
125	UMCES BOEM Marine Mammal Monitoring	242
126	UMCES BOEM Offshore Wind Energy	87
127	UMCES Chesapeake Backbone, Mid-Bay	161
128	UMCES Lower Hudson Striped Bass Contingents	155
129	UMCES Potomac River Striped Bass Migration	60
130	UMCES Resident Hudson Striped Bass Migration	160
131	UMCES Striped Bass Thermal Squeeze	152
132	UMCES TailWinds	240

List your project's files

```
1 list_project_files(project = 161)
```

	project	file_type	upload_date
1	161	Deployed Receivers - Deployment Metadata	2023-10-12
2	161	Tag Detections - .vfl file	2023-10-12
3	161	Deployed Receivers - Deployment Metadata	2023-09-28
4	161	Tag Detections - .vfl file	2023-09-13
5	161	Tag Detections - .vfl file	2023-09-13
6	161	Tag Detections - .vfl file	2023-09-13
7	161	Tag Detections - .vfl file	2023-09-13
8	161	Tag Detections - .vfl file	2023-09-13
9	161	Tag Detections - .vfl file	2023-09-13
10	161	Tag Detections - .vfl file	2023-09-13
11	161	Tag Detections - .vfl file	2023-09-13
12	161	Deployed Receivers - Deployment Metadata	2022-05-05
13	161	Tag Detections - .vfl file	2022-05-05
14	161	Tag Detections - .vfl file	2022-05-05
15	161	Tag Detections - .vfl file	2022-05-05

Download (get) a project file

```
1 get_project_file(2, 161)
```

```
── Downloading files ──────────────────────────────────────────────────────────

✓ File(s) saved to:
   C:\Users\darpa2\Analysis\ACT-2024\ACT_20240123\VR2AR_546323_20231012_1.vrl

── Unzipping files ────────────────────────────────────────────────────────────

[1] "C:\\Users\\darpa2\\Analysis\\ACT-
2024\\ACT_20240123\\VR2AR_546323_20231012_1.vrl"
```

List your data extract files

```
1 list_extract_files(project = 161)
```

	project	file_type	detection_type	detection_year	upload_date
1	161	Data Extraction File	qualified	2021	2023-11-21
2	161	Data Extraction File	qualified	2022	2023-11-21
3	161	Data Extraction File	qualified	2023	2023-11-21
4	161	Data Extraction File	sentinel_tag	2021	2023-03-16
5	161	Data Extraction File	sentinel_tag	2022	2023-03-16
6	161	Data Extraction File	unqualified	2021	2023-11-21
7	161	Data Extraction File	unqualified	2022	2023-11-21
8	161	Data Extraction File	unqualified	2023	2023-11-21

	file_name
1	cbbbmb_qualified_detections_2021.zip
2	cbbbmb_qualified_detections_2022.zip
3	cbbbmb_qualified_detections_2023.zip
4	cbbbmb_sentinel_tag_detections_2021.zip
5	cbbbmb_sentinel_tag_detections_2022.zip
6	cbbbmb_unqualified_detections_2021.zip

Download (get) your data extract files

```
1 get_extract_file(1, 161)
```

```
── Downloading files
──────────────────────────────────────────────────────────────────────

✓ File(s) saved to:

   C:\Users\darpa2\Analysis\ACT-
2024\ACT_20240123\cbbbmb_qualified_detections_2021.zip

── Unzipping files
──────────────────────────────────────────────────────────────────────

✓ File(s) unzipped to:

   C:/Users/darpa2/Analysis/ACT-
2024/ACT_20240123/cbbbmb_qualified_detections_2021.csv
   C:/Users/darpa2/Analysis/ACT-2024/ACT_20240123/data_description.txt

[1] "C:/Users/darpa2/Analysis/ACT-
2024/ACT_20240123/cbbbmb_qualified_detections_2021.csv"
[2] "C:/Users/darpa2/Analysis/ACT-2024/ACT_20240123/data_description.txt"
```

How is this helpful?

Project management! Bulk downloads:

```
list_extract_files(161)$url |>
  lapply(
    function(url) get_extract_file(url = url)
  )
```

How is this helpful?

Bulk uploads:

```
upload_file(
  161,
  list.files('everything in this folder')
)
```

How is this helpful?

Networking:

"I wonder who else is working on striped bass?"

```
all_projects <- list_projects()

all_projects[grepl('striped bass', all_projects$abstract), ]$name
```

```
 [1] "MADMF Striped Bass Migration Ecology Study"
 [2] "Mallows Bay National Marine Sanctuary"
 [3] "MBL STRIPED BASS"
 [4] "MBL/WTGHA Striped Bass Study"
 [5] "Monmouth University Coastal Fisheries Study"
 [6] "NCBO Back Creek"
 [7] "NCCOS Poplar Island"
 [8] "NCDMF Anadromous Fisheries Tagging Study"
 [9] "NCDMF Multi-Species Tagging Program"
[10] "NCDMF Tar-Pam Neuse Arrays"
[11] "SERC Juvenile Striped Bass Study"
[12] "UMCES-NYSDEC Hudson Striped Bass Spawning"
[13] "UMCES BOEM Offshore Wind Energy"
[14] "UMCES Lower Hudson Striped Bass Contingents"
[15] "UMCES Potomac River Striped Bass Migration"
```

More information

https://matos.obrien.page

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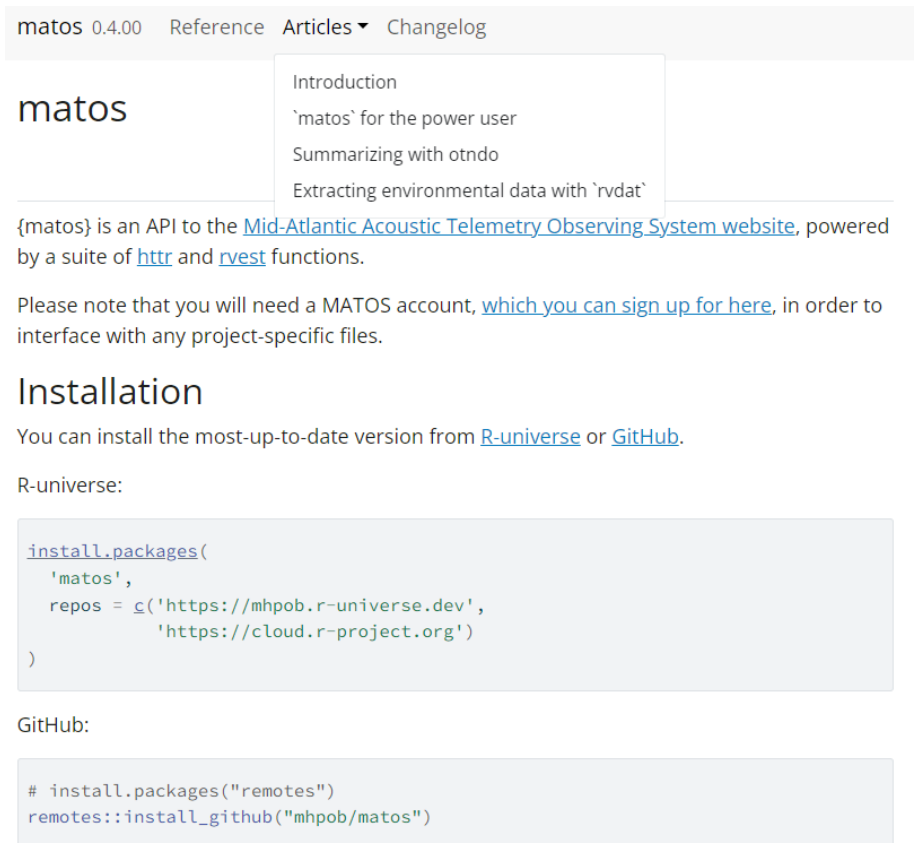


matos 0.4.00 Reference Articles Changelog

Introduction
`matos` for the power user
Summarizing with otndo
Extracting environmental data with `rvdat`

matos

{matos} is an API to the Mid-Atlantic Acoustic Telemetry Observing System website, powered by a suite of httr and rvest functions.

Please note that you will need a MATOS account, which you can sign up for here, in order to interface with any project-specific files.

Installation

You can install the most-up-to-date version from R-universe or GitHub.

R-universe:

```
install.packages(
  'matos',
  repos = c('https://mhpob.r-universe.dev',
            'https://cloud.r-project.org')
)
```

GitHub:

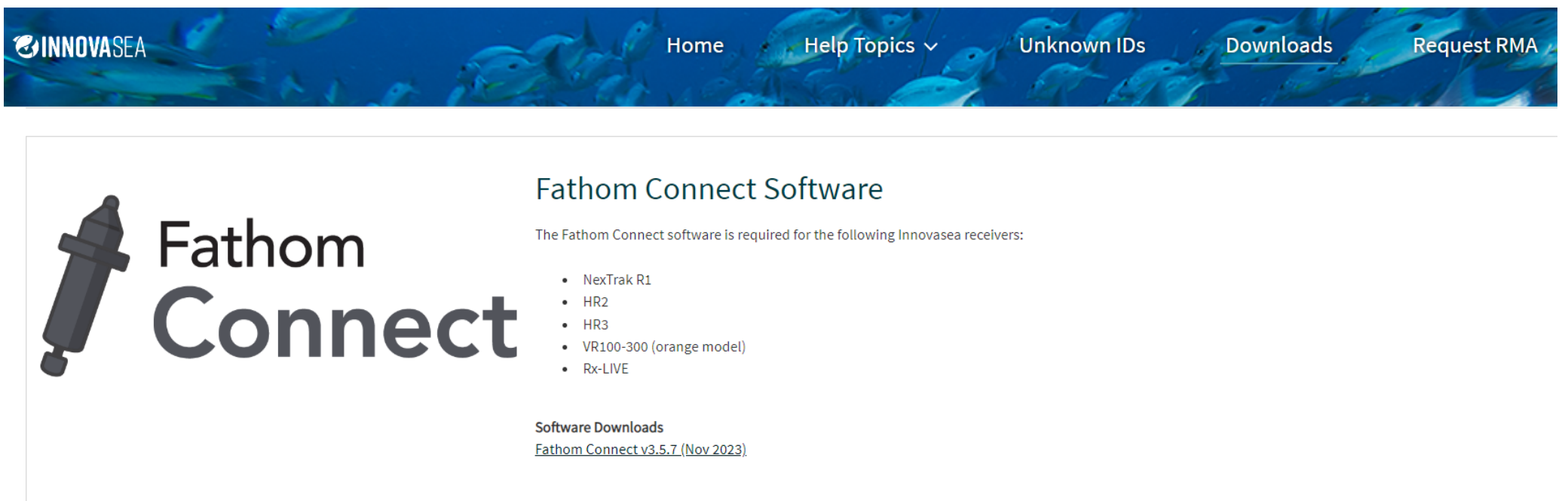
```
# install.packages("remotes")
remotes::install_github("mhpob/matos")
```

rvdat

Change your VUEpoint of receiver data

https://rvdat.obrien.page/

- An interface to `vdat.exe`, distributed with Fathom Connect



Big note

- `rvdat` just talks to `vdat.exe`, nothing more (like data manipulation)
- If you're a `glatos` user, this functionality will be baked into the newest version (0.8.0).
  - https://github.com/ocean-tracking-network/glatos/tree/dev

Connect to your instance of VDAT

```
1 library(rvdat)
2
3 vdat_here('c:/program files/innovasea/fathom/vdat.exe')
```

ℹ vdat.exe is located at c:/program files/innovasea/fathom/vdat.exe

Inspect your file

```
1  info <- vdat_inspect('VR2AR_546323_20231012_1.vrl')
```

```
================================================================================
                                      VRL
================================================================================
File:      VR2AR_546323_20231012_1.vrl
Original:  VR2AR_546323_20231012_1.vrl
Container: VR2AR VRL file (com.vemco.file.vrl.0207.ff02.ff02/5.2.2)
Created:   2023-10-12T14:28:01
Data UUID: 1713ed82-3f34-1a47-9f30-8afebee9b1c4
Rx Model:  VR2AR-69
Rx Serial: 546323

================================================================================
                                    Device
================================================================================
Decoding Map:      MAP-114
Blanking Interval: 360 ms
```

Inspect your file… to a data.frame

```
          1  info
```

```
          variable                                                value
1             File                                VR2AR_546323_20231012_1.vrl
2         Original                                VR2AR_546323_20231012_1.vrl
3        Container VR2AR VRL file (com.vemco.file.vrl.0207.ff02.ff02/5.2.2)
4          Created                                          2023-10-12T14:28:01
5        Data UUID                    1713ed82-3f34-1a47-9f30-8afebee9b1c4
6         Rx Model                                                 VR2AR-69
7        Rx Serial                                                  546323
8     Decoding Map                                                 MAP-114
9 Blanking Interval                                                260 ms
  section
1     VRL
2     VRL
3     VRL
4     VRL
5     VRL
```

Convert your VRL file (or other VDAT files!)

```
1 vdat_to_folder('VR2AR_546323_20231012_1.vrl')
```

✓ File converted:

VR2AR_546323_20231012_1.vrl

ℹ Files saved in:

C:/Users/darpa2/Analysis/ACT-2024/ACT_20240123/VR2AR_546323_20231012_1.csv-fathom-split

```
1 list.files('VR2AR_546323_20231012_1.csv-fathom-split')
```

```
 [1] "ATTITUDE.csv"          "BATTERY.csv"           "CFG_CHANNEL.csv"
 [4] "CFG_STUDY.csv"         "CFG_TRANSMITTER.csv"   "CLOCK_REF.csv"
 [7] "DATA_SOURCE_FILE.csv" "DEPTH.csv"             "DET.csv"
[10] "DIAG.csv"              "EVENT.csv"             "EVENT_INIT.csv"
[13] "EVENT_OFFLOAD.csv"     "HEALTH_VR2AR.csv"      "TEMP.csv"
```

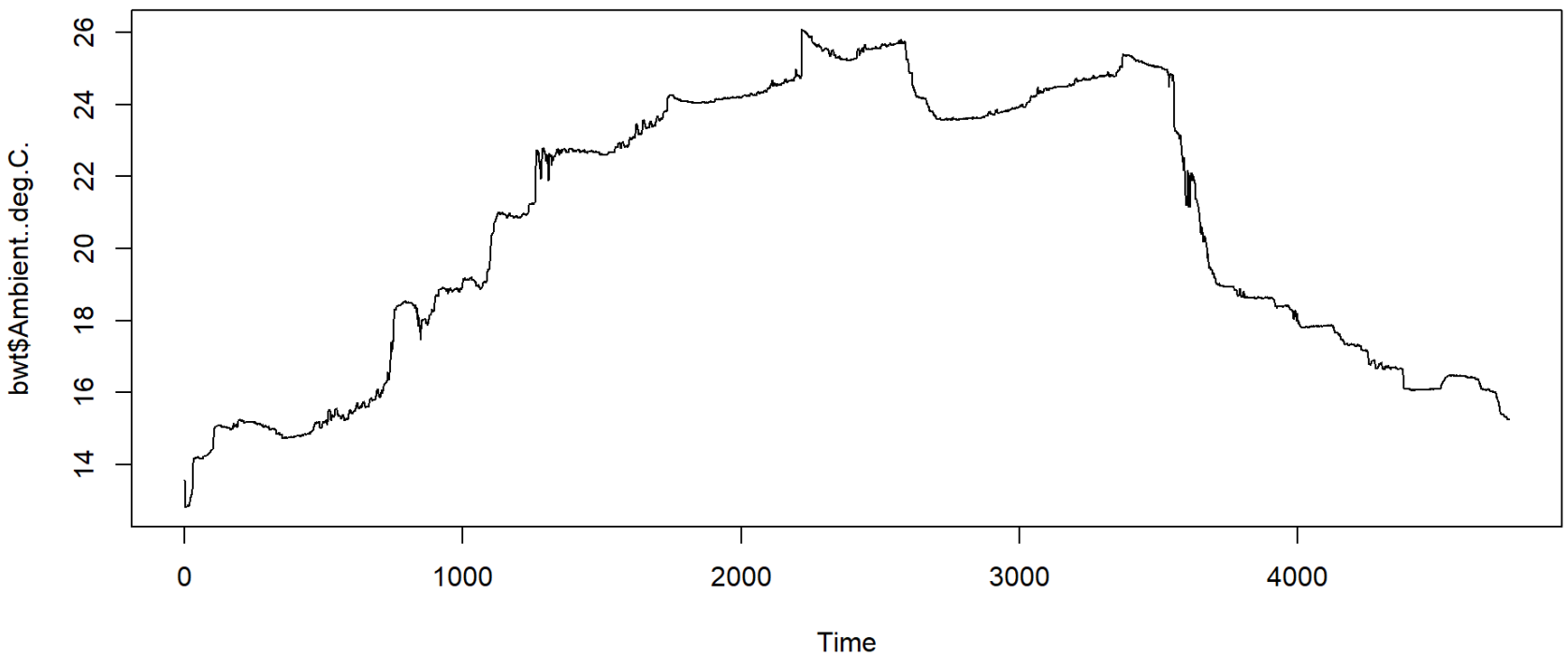
Pull out detections

```r
dets <- read.csv('VR2AR_546323_20231012_1.csv-fathom-split/DET.csv'
                 skip = 1)

xtabs(~ Full.ID, data = dets)
```

```
Full.ID
A69-1601-26187 A69-1601-60787 A69-1601-60934 A69-1602-21404 A69-1602-25905
             2          28410            841             47             13
A69-1602-25908 A69-1602-34360 A69-1602-49365 A69-1602-51178 A69-1602-55932
             9              4            451              2              6
A69-1602-55959   A69-1604-690 A69-9001-15398 A69-9001-15402  A69-9001-1898
            13             23             31              2              2
A69-9001-21721 A69-9001-24477 A69-9001-26408 A69-9001-64709  A69-9001-6906
             2             13             19             13             15
```

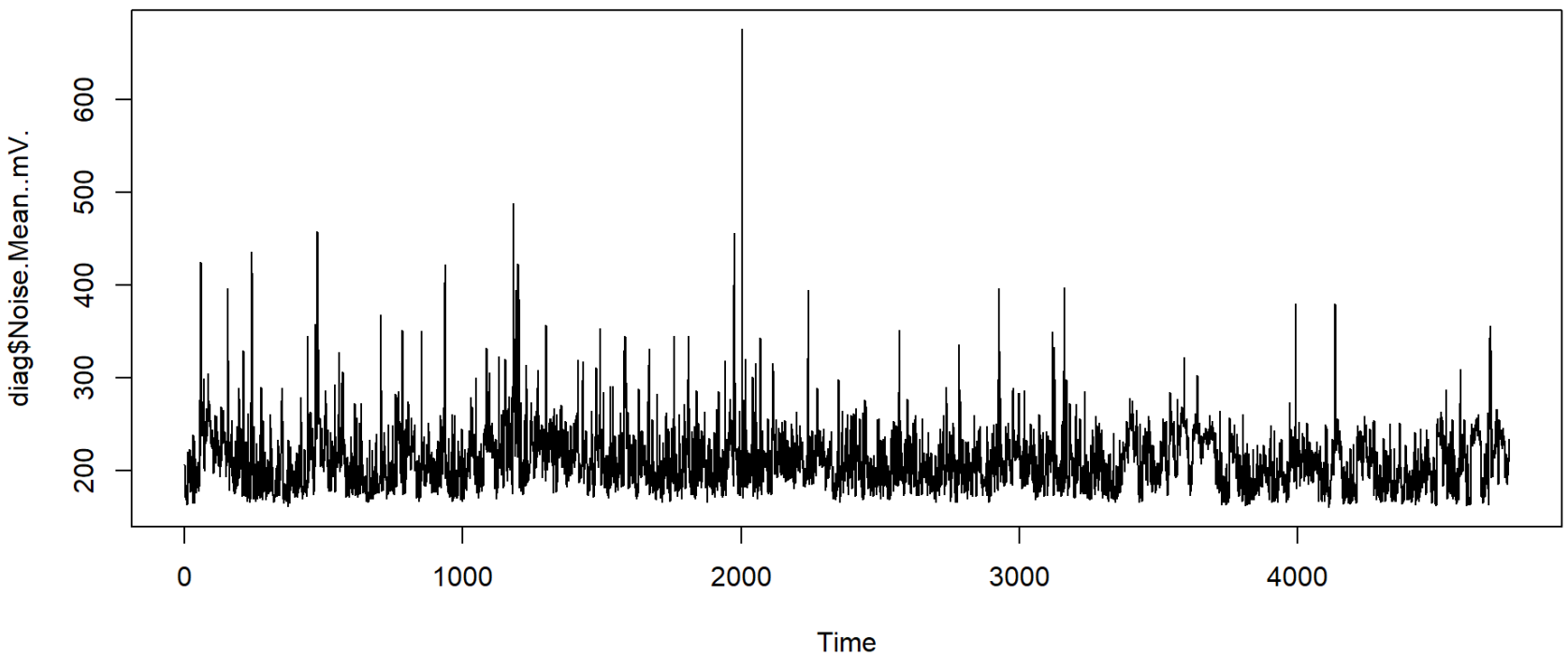
Pull out temperature data

```r
bwt <- read.csv('VR2AR_546323_20231012_1.csv-fathom-split/TEMP.csv'
                skip = 1)

plot.ts(bwt$Ambient..deg.C.)
```



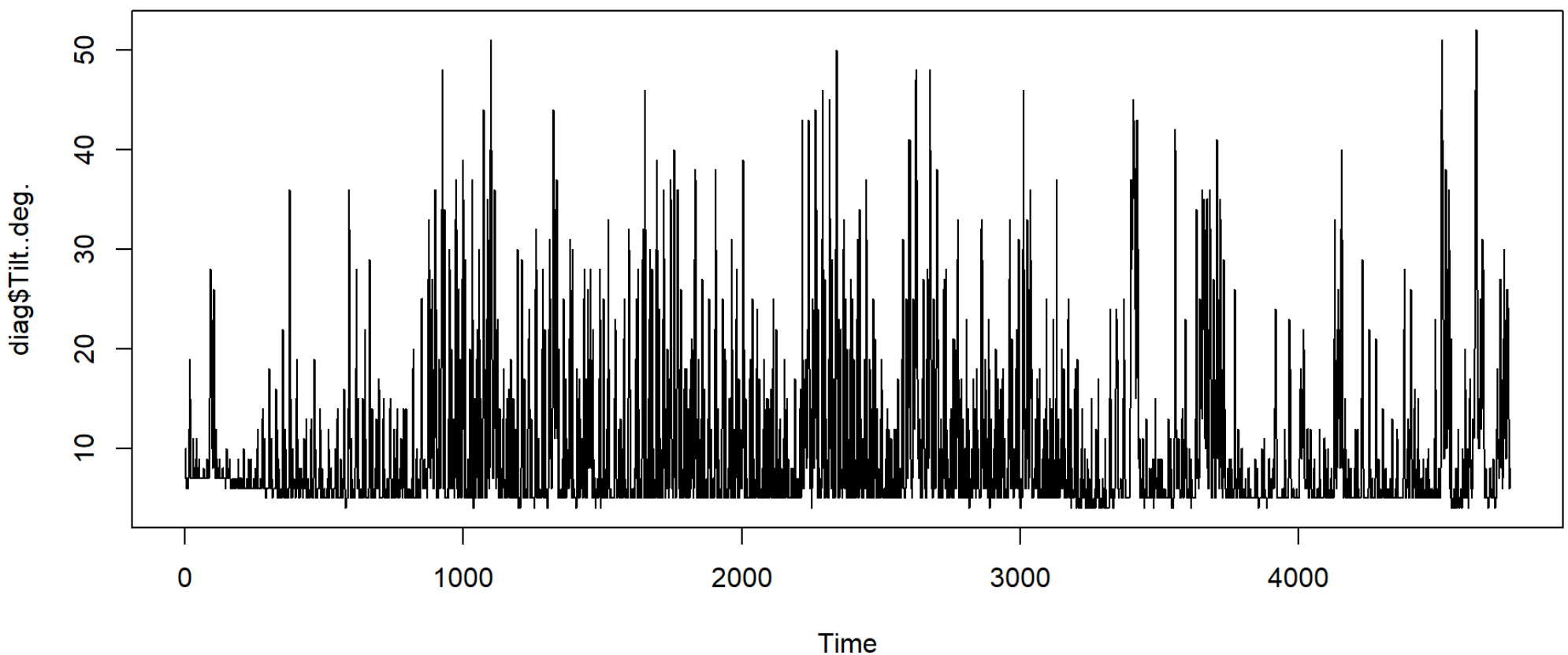
Noise

```
1  diag <- read.csv('VR2AR_546323_20231012_1.csv-fathom-split/DIAG.csv
2                   skip = 1)
3
4  plot.ts(diag$Noise.Mean..mV.)
```



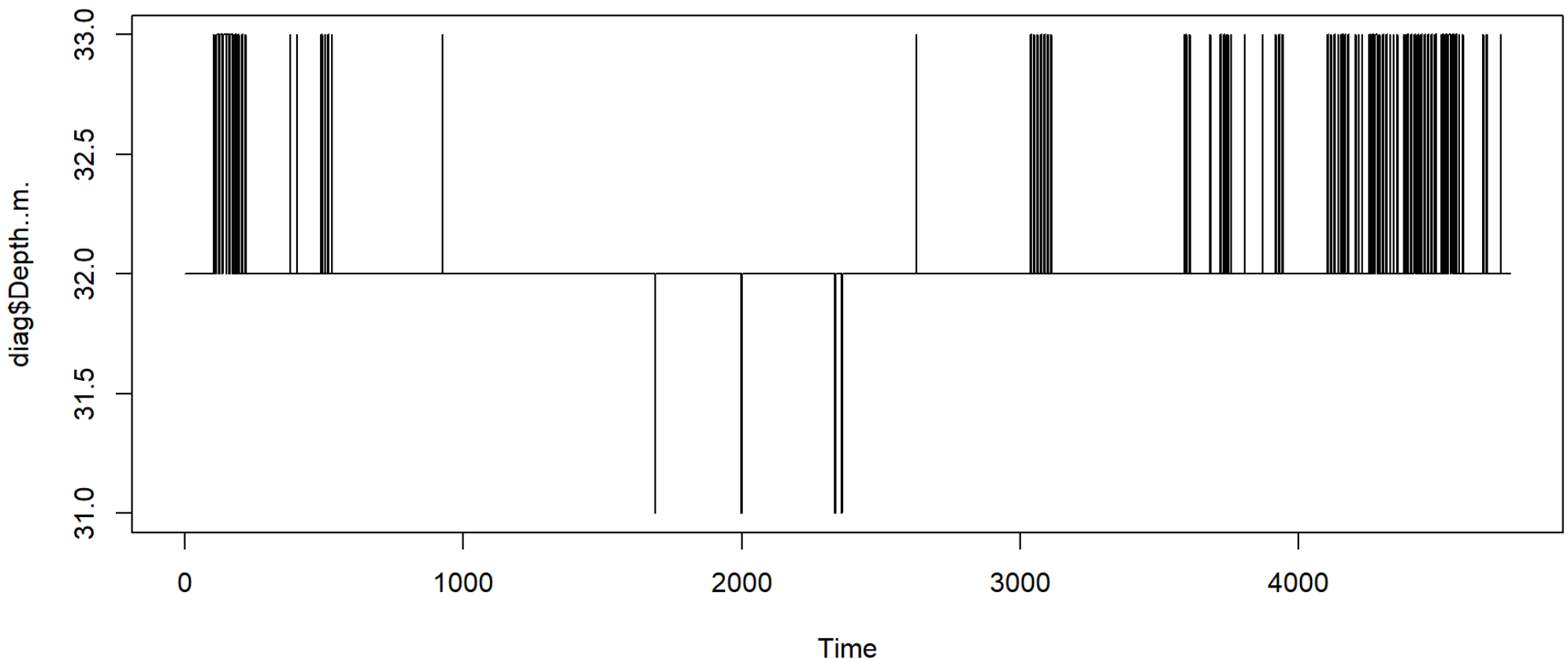
Tilt

```
1 plot.ts(diag$Tilt..deg.)
```



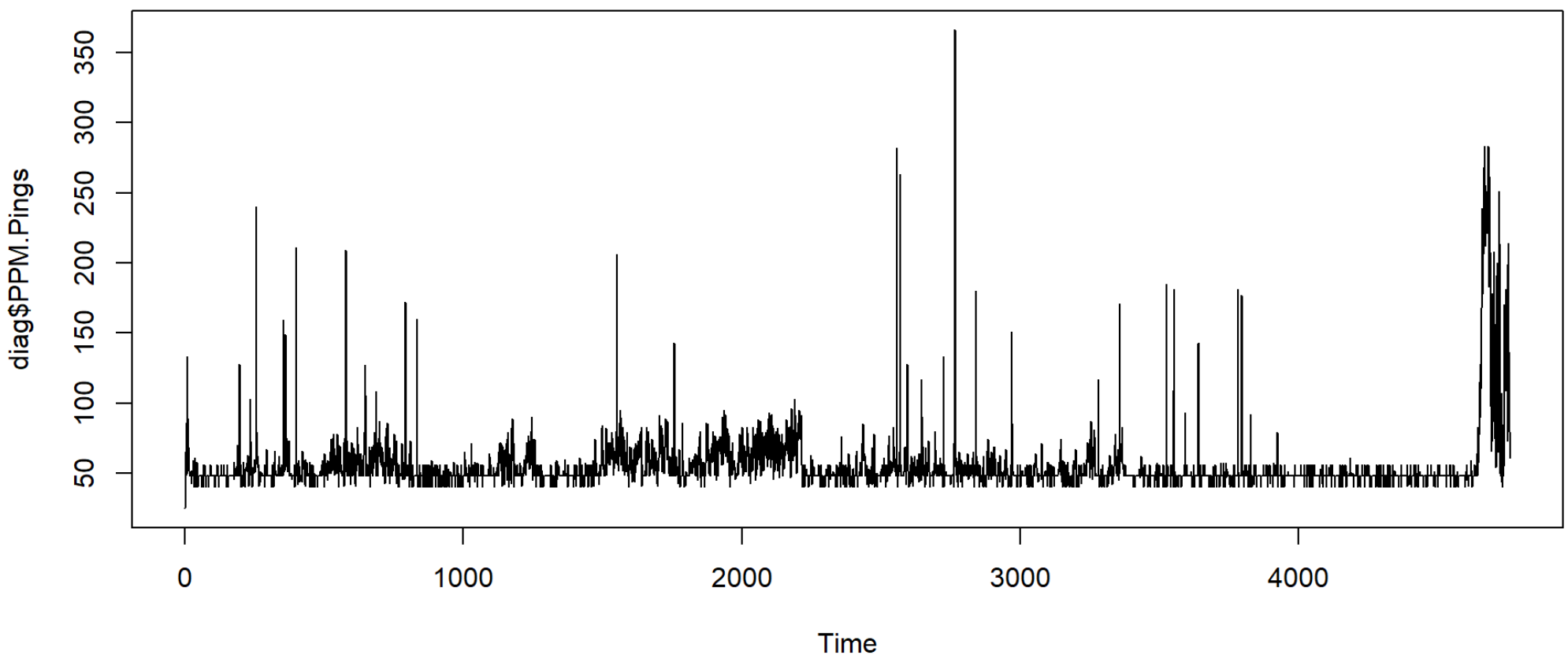
Depth

```
1 plot.ts(diag$Depth..m.)
```



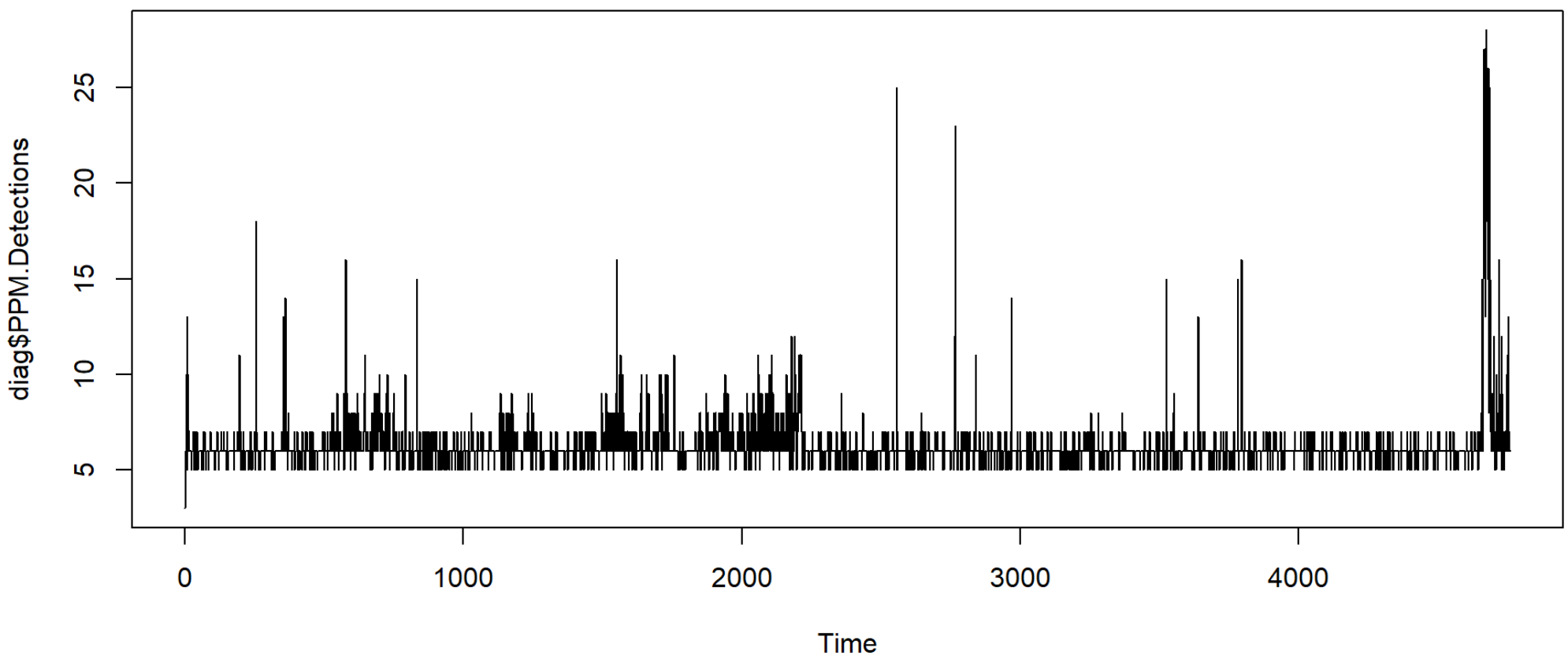
Pings

```
1 plot.ts(diag$PPM.Pings)
```



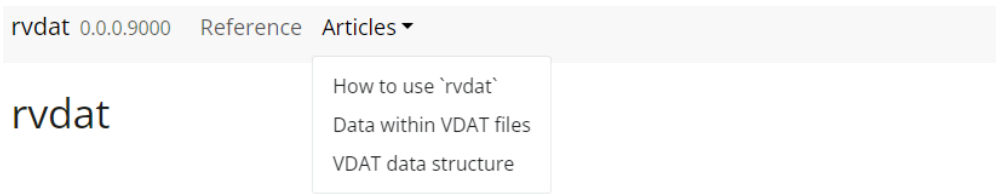
Detections

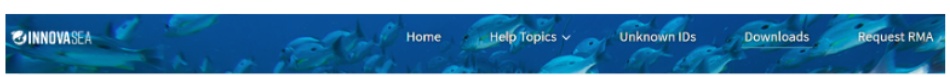
```
1 plot.ts(diag$PPM.Detections)
```



More information

https://rvdat.obrien.page





otndo

- Understand ACT/OTN data pushes
- Quick-and-dirty summary of the data push
- Back to the “network”

What’s needed

```
1 list_my_projects()
```

	name	number
35	Maryland Department of Natural Resources	90
47	Navy Kennebec ME Telemetry Array	192
48	NCBO-MD DNR Chesapeake Backbone North	181
49	NCBO-VMRC Chesapeake Backbone South	164
123	UMCES-NYSDEC Hudson Striped Bass Spawning	127
124	UMCES Black Sea Bass & Offshore Construction	97
125	UMCES BOEM Marine Mammal Monitoring	242
126	UMCES BOEM Offshore Wind Energy	87
127	UMCES Chesapeake Backbone, Mid-Bay	161
128	UMCES Lower Hudson Striped Bass Contingents	155
129	UMCES Potomac River Striped Bass Migration	60
130	UMCES Resident Hudson Striped Bass Migration	160
131	UMCES Striped Bass Thermal Squeeze	152
132	UMCES TailWinds	240

Receiver summary

```
1 library(otndo)
2
3 matos_receiver_summary(161)
```

Transmitter summary

```
1 matos_tag_summary(87)
```