

Crowdsourced bathymetry on the Great Barrier Reef

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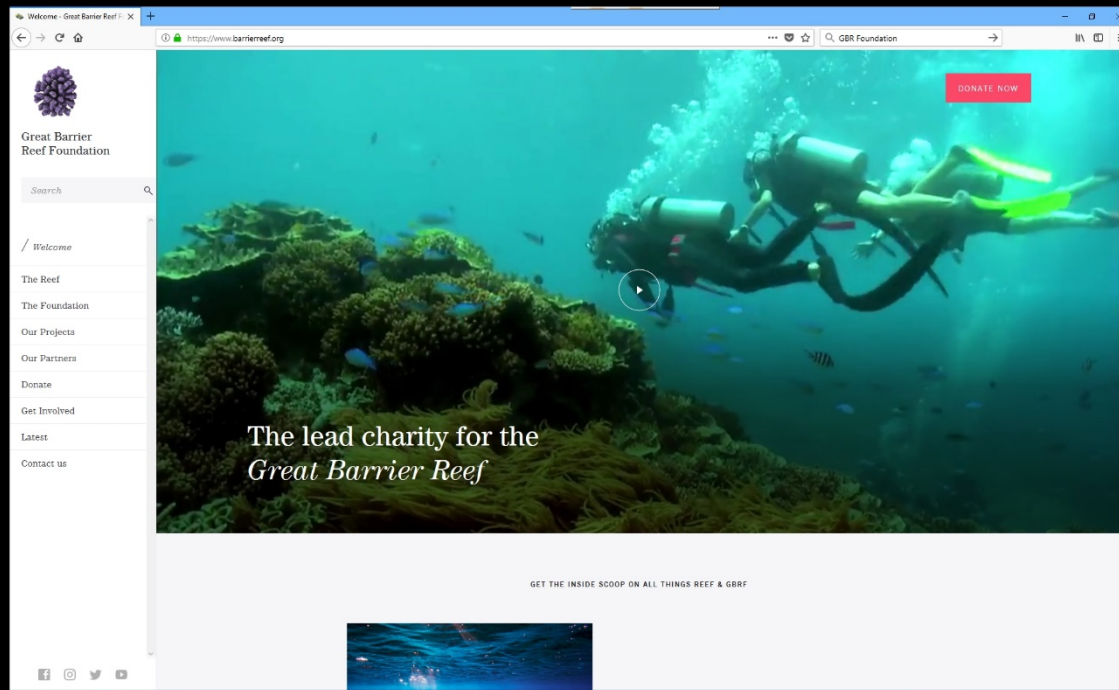


Aims

- Crowdsourced bathymetry (CSB) is collection of depth measurements from vessels, using standard navigation instruments engaged in routine operations.
- International Hydrographic Organisation (IHO) accepts CSB data into the Data Centre for Digital Bathymetry (DCDB) through a network of 'Trusted Nodes'.
- The 'Crowdsourced bathymetry on the GBR' project is a Trusted Node.
- Talk will focus on how CSB data are collected, processed and made public.

Funding and support

- Great Barrier Reef Foundation



GBR Foundation at: <https://www.barrierreef.org/>

- Citizens of the Great Barrier Reef



Citizens of the GBR at: <https://citizensgbr.org/>

Technology

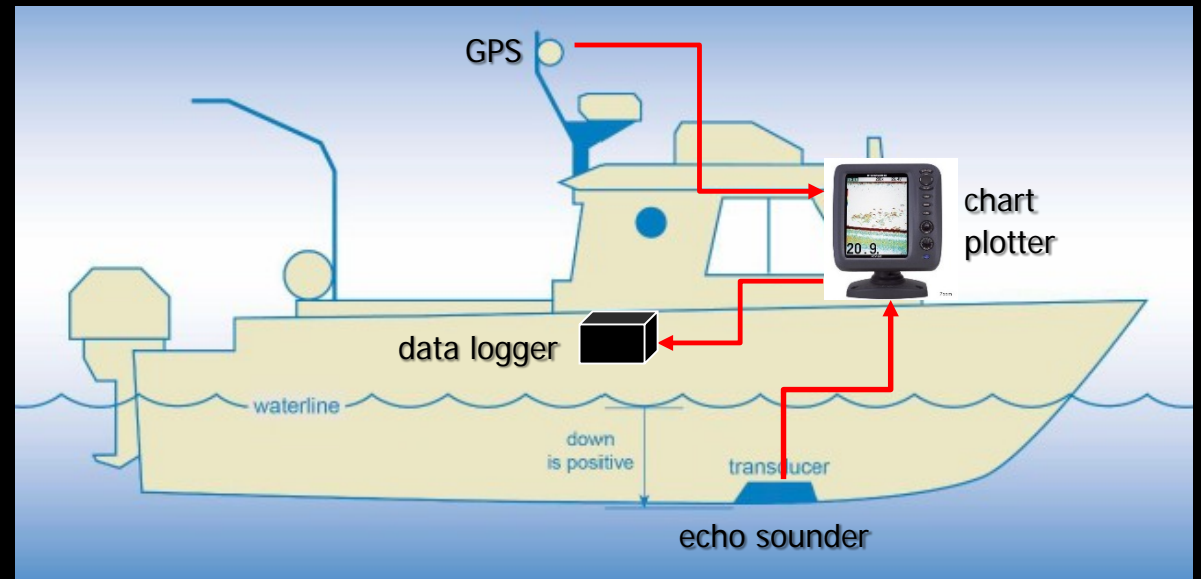
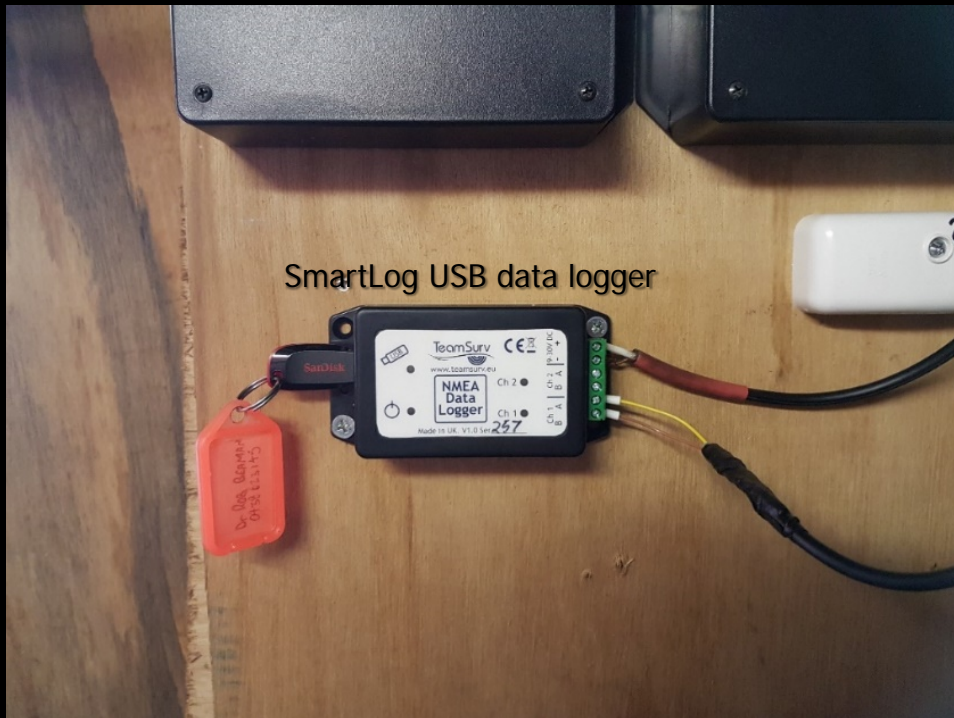
- TeamSurv SmartLog USB logger
- 12/24VDC plus NMEA channel 1
- reliable but sensitive to over-voltage

- stores raw NMEA 0183 to USB

```
$GPGGA,022018,1617.7499,S,14541.6567,E,1,11,0.84,-62.51,M,59.91,M,,*76
$GPBWC,022020,1617.3701,S,14541.0190,E,301.8,T,295.0,M,0.721,N,End,A*37
$SDDBT,3.74,f,1.14,M,0.62,F*36
```

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Vessels



Chart plotters

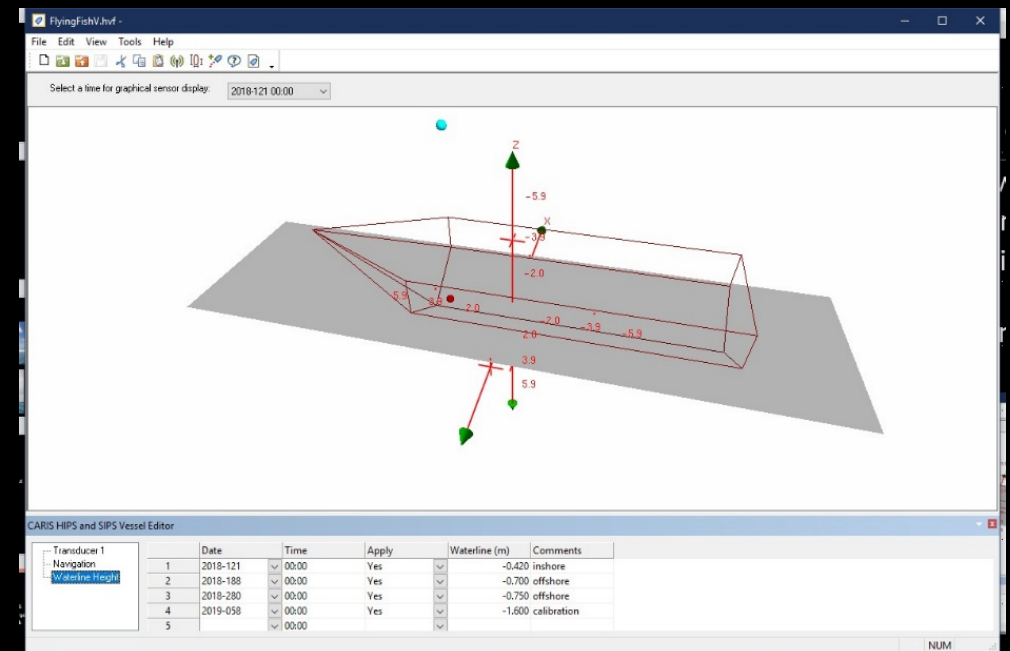


Installation

- marine technician to install
- mount in dry sheltered place
- avoid two NMEA channel feeds
- switch or fuse helps to kill power



- use 30 m tape to measure offsets
- reference point (RP) is the sounder
- GPS aerial is measured to sounder
- measure depth with leadline for waterline height to RP



Python processing

- data logger stores .TSV files
- raw data are NMEA 0183 strings
- can have wrong dates, missing value
- i/p GGA, RMC, ZDA, DBT strings
- o/p lat,long,date,time,course,speed,depth
- report of errors, valid data points, % pass

The image shows a Python script processing NMEA 0183 data. The script reads a .TSV file containing NMEA strings and outputs a processed .TSV file with columns: latitude, longitude, date, time, speed, course, depth. A 'Completed' dialog box shows 'All files completed processing'.

Input File (00000007.TSV):

```
NMEA Data logger version 3.00
$ECGGA,044137.83,1656.294,S,14546.891,E,1,08,1.0,12.80,M,0.0,M,0.00,*4B
$ECGLL,1656.294,S,14546.891,E,044137.83,A,A*62
$ECRMC,044137.83,A,1656.294,S,14546.891,E,3.4,010.0,051219,0.0,A,0.0,A,0.0,A,0.0
$ECVTG,010.0,T,003.0,M,3.4,N,6.3,K,A*32
$ECZDA,044137.83,05,12,2019,,*75
$VWMTW,87.78,C*22
$VWVLW,0.0,N,0.00,N*7C
$ECGGA,044139.93,1656.292,S,14546.891,E,1,08,1.0,12.80,M,0.0,M,0.00,*4B
$ECGLL,1656.292,S,14546.891,E,044139.93,A,A*6B
$ECRMC,044139.93,A,1656.292,S,14546.891,E,3.4,010.0,051219,0.0,A,0.0,A,0.0,A,0.0
$ECVTG,010.0,T,003.0,M,3.4,N,6.3,K,A*32
$ECZDA,044140.04,05,12,2019,,*7A
$VWMTW,87.78,C*22
$VWVLW,0.0,N,0.00,N*7C
$ECGGA,044142.00,1656.290,S,14546.892,E,1,08,1.0,12.80,M,0.0,M,0.00,*4B
$ECGLL,1656.290,S,14546.892,E,044142.00,A,A*6C
$ECRMC,044142.00,A,1656.290,S,14546.892,E,3.4,010.0,051219,0.0,A,0.0,A,0.0,A,0.0
$ECVTG,010.0,T,003.0,M,3.4,N,6.3,K,A*32
$ECZDA,044142.25,05,12,2019,,*7B
$SDBT,47.4,f,14.4,M,7.9,F*0E
$SDDPT,14.4,0.0*66
$VWMTW,87.89,C*2C
$VWVLW,0.0,N,0.00,N*7C
$GPGGA,044144.01,1656.288,S,14546.892,E,1,08,1.0,12.80,M,0.0,M,0.00,*4B
$GPGLL,1656.288,S,14546.892,E,044144.01,A,A*73
$GPRMC,044144.01,A,1656.288,S,14546.892,E,3.5,010.0,051219,007.0,E,A*21
```

Output File (00000001.TSV):

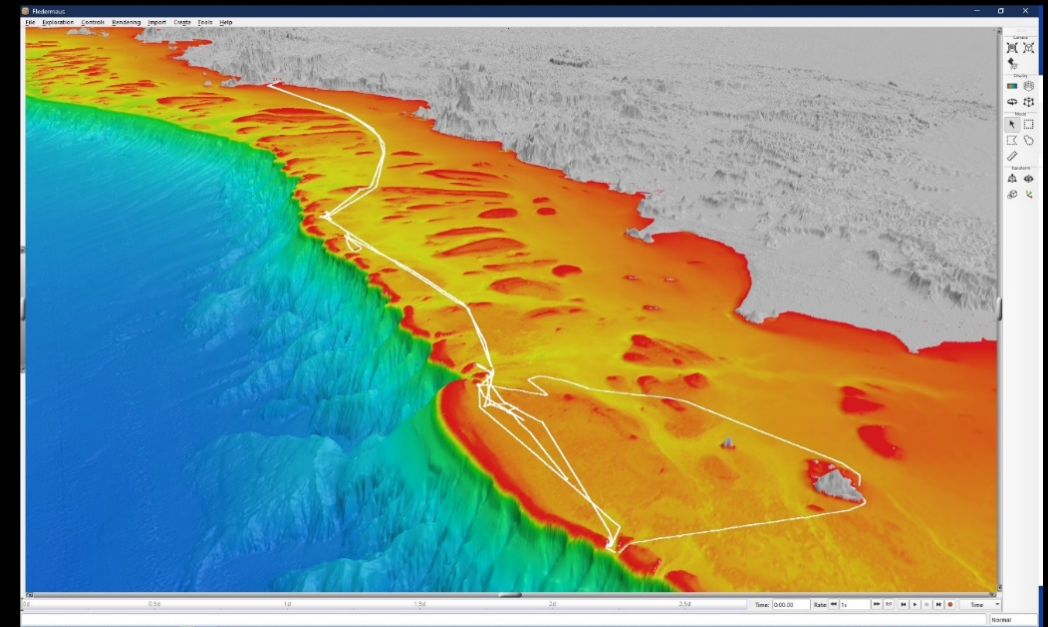
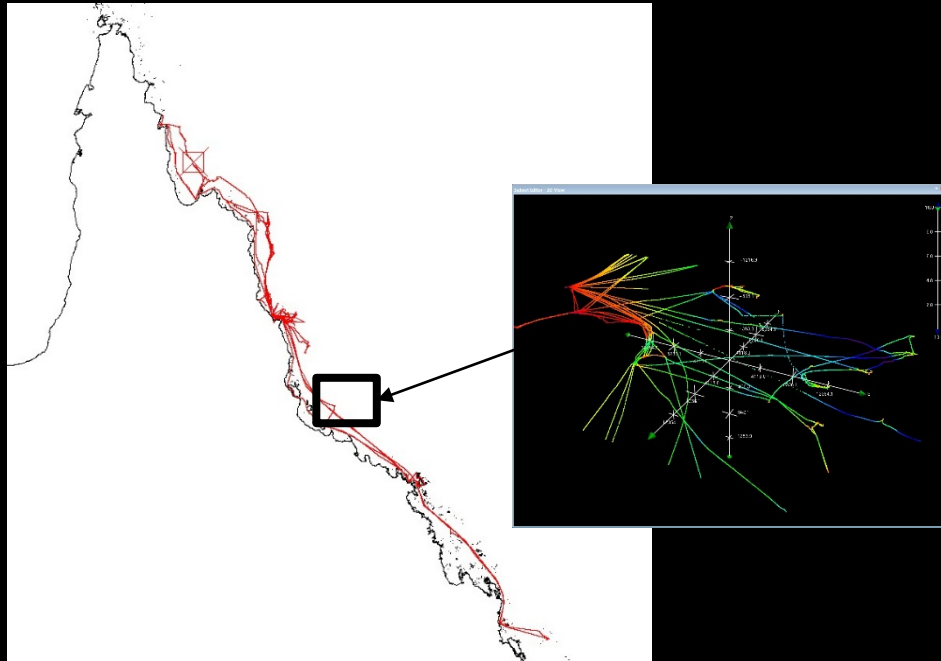
```
latitude,longitude,date,time,speed,course,depth
-16.8013717,145.7184117,20200306,203053.00,0.98,326.33,0.56
-16.8013633,145.7184017,20200306,203055.00,0.78,324.90,0.57
.7183933,20200306,203057.00,0.78,322.28,0.57
.7183833,20200306,203059.00,0.79,319.91,0.59
.7183783,20200306,203101.00,0.74,318.39,0.60
.7183700,20200306,203103.00,0.59,318.39,0.62
.7183633,20200306,203105.00,0.43,318.23,0.61
.7183617,20200306,203107.00,0.38,317.21,0.60
.7183567,20200306,203109.00,0.33,316.43,0.61
.7183533,20200306,203111.00,0.27,315.71,0.60
.7183517,20200306,203113.00,0.00,314.43,0.60
.7183483,20200306,203115.00,0.00,314.29,0.60
.7183450,20200306,203117.00,0.00,314.29,0.61
.7183433,20200306,203119.00,0.00,314.29,0.60
.7183400,20200306,203121.00,0.00,314.29,0.60
.7183367,20200306,203123.00,0.00,314.29,0.61
.7183350,20200306,203125.00,0.00,314.29,0.61
.7183400,20200306,203127.00,0.00,315.22,0.61
.7183450,20200306,203129.00,0.00,328.47,0.61
.7183517,20200306,203131.00,0.00,341.55,0.61
.7183567,20200306,203133.00,0.00,344.20,0.61
.7183583,20200306,203135.00,0.00,344.20,0.61
.7183617,20200306,203137.00,0.00,344.20,0.61
.7183600,20200306,203139.00,0.00,344.20,0.62
.7183617,20200306,203141.00,0.00,344.20,0.60
.7183633,20200306,203143.00,0.00,344.20,0.61
-16.8013100,145.7183600,20200306,203145.00,0.00,344.20,0.61
-16.8013100,145.7183583,20200306,203147.00,0.00,344.20,0.61
-16.8013100,145.7183567,20200306,203149.00,0.00,344.20,0.61
```

Processing Summary:

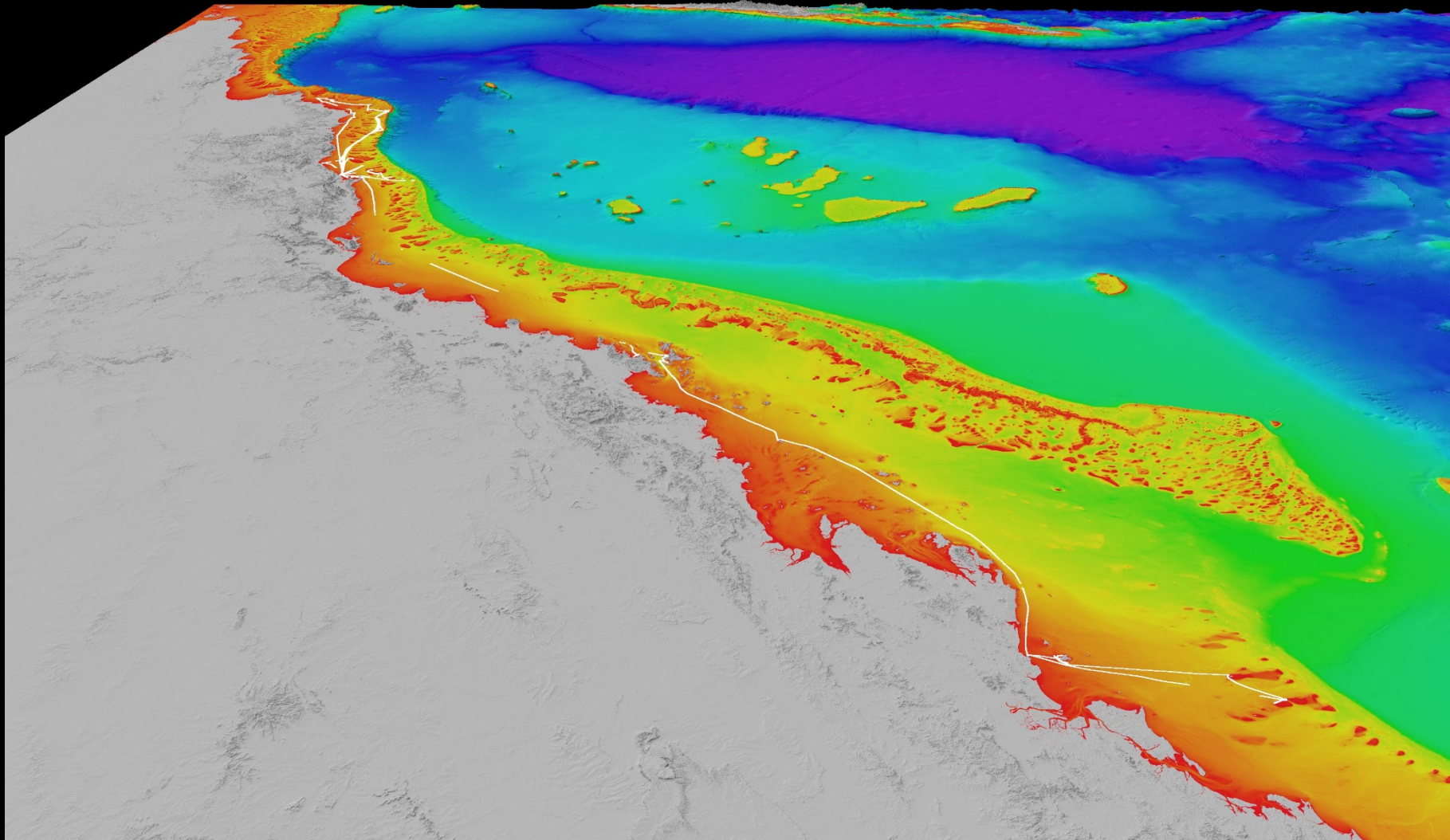
```
invalid depth (depth tag empty) - discarding, line number: 159018
invalid depth (depth tag empty) - discarding, line number: 159931
invalid depth (depth tag empty) - discarding, line number: 159944
invalid depth (depth tag empty) - discarding, line number: 160018
invalid depth (depth tag empty) - discarding, line number: 160019
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invalid depth (depth tag empty) - discarding, line number: 160030
invalid depth (depth tag empty) - discarding, line number: 160031
invalid depth (depth tag empty) - discarding, line number: 160032
invalid depth (depth tag empty) - discarding, line number: 160033
invalid depth (depth tag empty) - discarding, line number: 160034
invalid depth (depth tag empty) - discarding, line number: 160035
invalid depth (depth tag empty) - discarding, line number: 160036
invalid depth (depth tag empty) - discarding, line number: 160037
invalid depth (depth tag empty) - discarding, line number: 160038
invalid depth (depth tag empty) - discarding, line number: 160039
invalid depth (depth tag empty) - discarding, line number: 160040
invalid depth (depth tag empty) - discarding, line number: 160041
invalid depth (depth tag empty) - discarding, line number: 160042
invalid depth (depth tag empty) - discarding, line number: 160043
invalid depth (depth tag empty) - discarding, line number: 160044
invalid depth (depth tag empty) - discarding, line number: 160045
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invalid depth (depth tag empty) - discarding, line number: 160047
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invalid depth (depth tag empty) - discarding, line number: 160049
invalid depth (depth tag empty) - discarding, line number: 160050
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invalid depth (depth tag empty) - discarding, line number: 160064
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invalid depth (depth tag empty) - discarding, line number: 160087
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invalid depth (depth tag empty) - discarding, line number: 160095
invalid depth (depth tag empty) - discarding, line number: 160096
invalid depth (depth tag empty) - discarding, line number: 160097
invalid depth (depth tag empty) - discarding, line number: 160098
invalid depth (depth tag empty) - discarding, line number: 160099
invalid depth (depth tag empty) - discarding, line number: 160100
invalid data points: 43175
processing errors: 94
percentage passed: 99.783%
```


Spatial filter

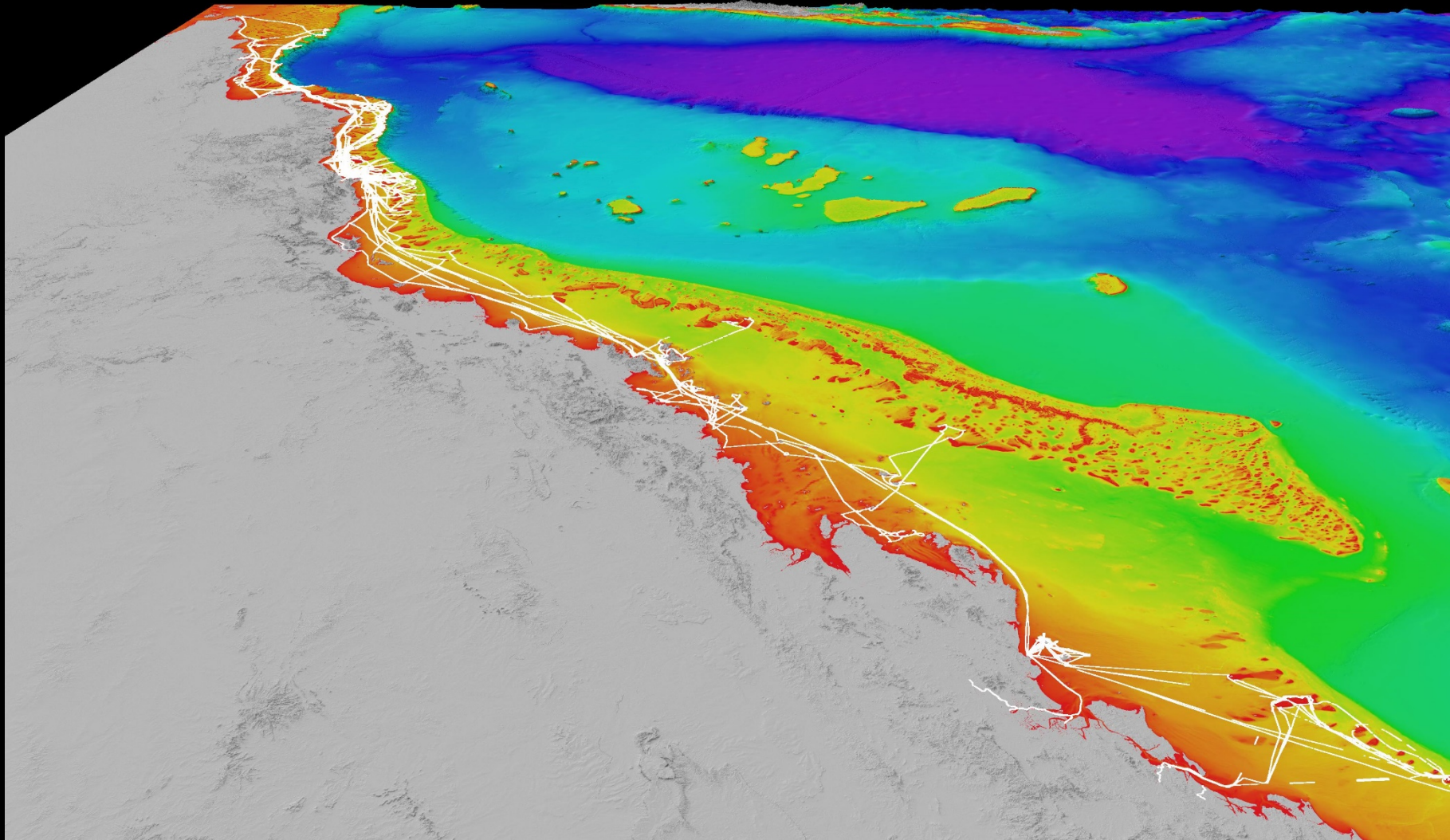
- import data tables into spatial visualisation software
 - Fledermaus, HIPS, GIS, Google Earth
 - ideally viewed as 3D point cloud
- filter and remove anomalous points
 - very little noise, e.g. few 0 m values
 - very few nav spikes (using raw GPS)
 - sound speed (usually) 1500 m/sec



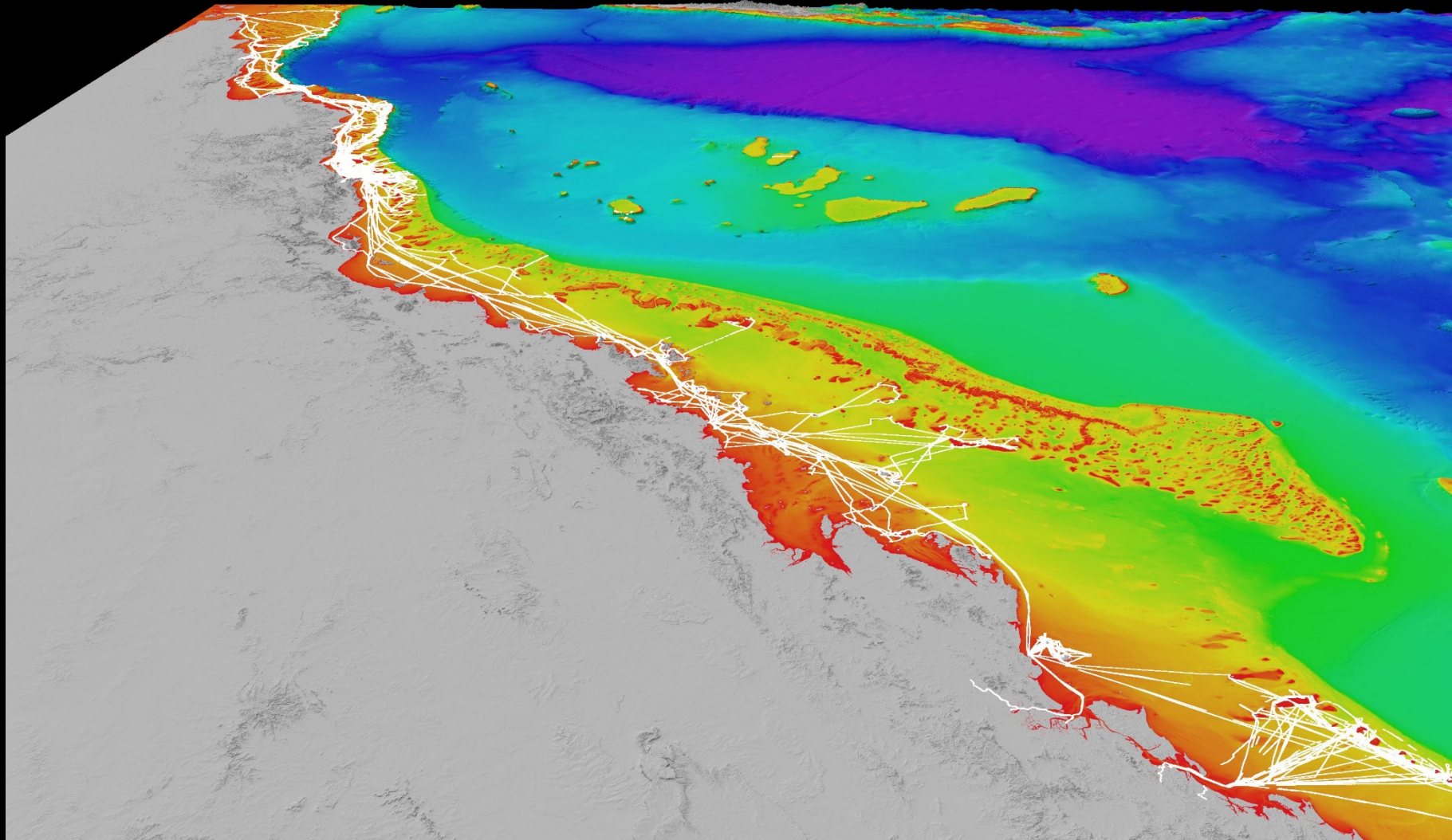
2018



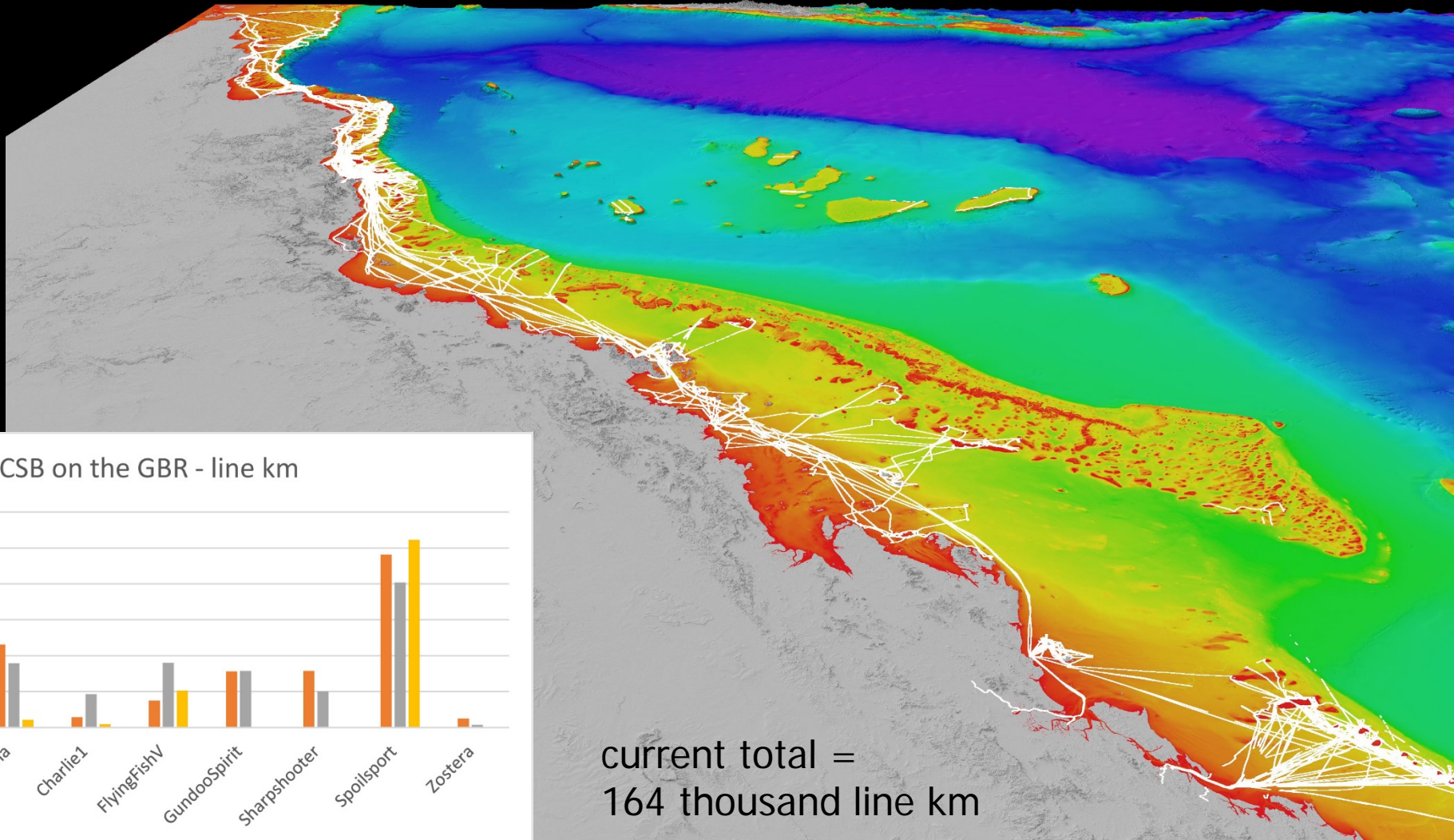
2018-2019



2018-2019-2020



2018-2019-2020-2021



Keeping track

The screenshot displays the MarineTraffic website interface. The main map shows Australia with several vessels tracked. A sidebar on the left, titled "My Fleets", includes a toggle for "Show other vessels" and a "Filter by colour" section with a green checkmark. Below this, a list of vessels is shown, including CSB Fleet, ARGO, AROONA, CORAL DISCOVERER, FLYING FISH IV, and SPOILSPORT. A "Research Vessel Fleet" option is also present. The right sidebar provides detailed information for the selected vessel, SPOILSPORT, including its status (Class B), speed/course (8.6kn / 95°), draught (N/A), and a timeline showing its last position and ETA. The bottom of the page features a footer with links to Terms, Privacy, User Agreement, and English (EN), as well as a "Support" button.

MarineTraffic: Global Ship Trac

https://www.marinetraffic.com/en/ais/home/shipid:3950919/zoom:7

Live Map Explore Community Pricing

Search MarineTraffic

My Fleets

Show other vessels

Filter by colour

Show all fleets

CSB Fleet

ARGO

AROONA

CORAL DISCOVERER

FLYING FISH IV

SPOILSPORT

Research Vessel Fleet

SPOILSPORT

Div. Vessel

OFF ON SAT Vessel Details

AU CNS

ATD: 2021-11-18 17:49 ETA: -

PAST TRACK USE ROUTE TOOL

Status: Class B Speed/Course: 8.6kn / 95° Draught: N/A

Received: 19 hours, 16 minutes ago (AIS Source: 2671)

Support

Terms Privacy User Agreement English (EN)

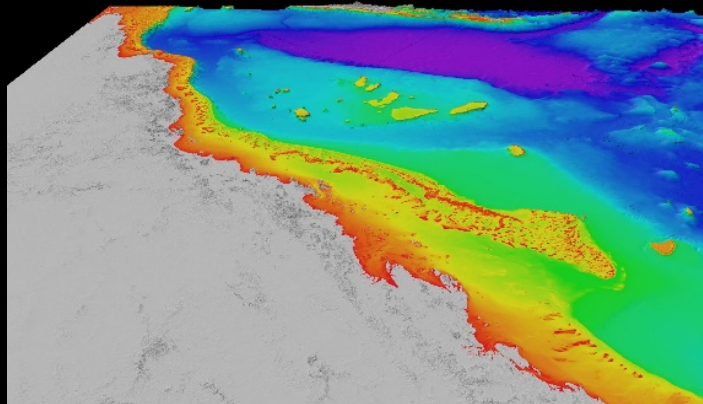
About MarineTraffic Blog Help Centre

Data delivery

JCU (Trusted Node)

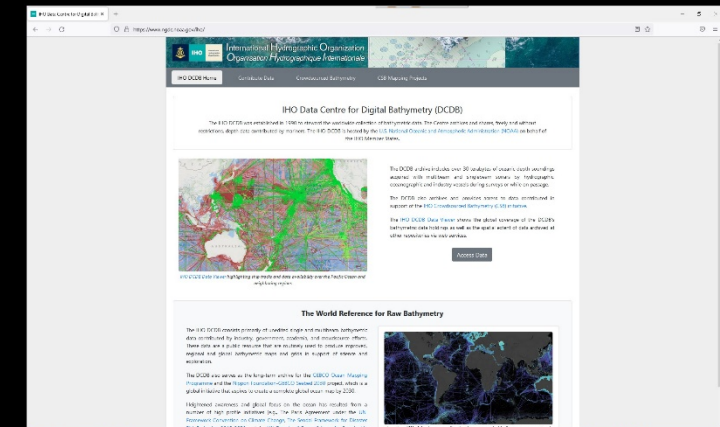
raster grids of
integrated data

Deepreef Explorer
AusSeabed Marine Data Portal



ftp transfer of xyztime
points + metadata

IHO Data Centre for Digital
Bathymetry (DCDB)



Future work

- Add more volunteer vessels to CSB on GBR project
- Put python script online for tsv-csv file conversion
- Upload more CSB on GBR data to the DCDB
- Get approval by AHO to release CSB on GBR via DCDB
- Continue advising Australian efforts for acquiring CSB data