Managing acoustic telemetry data

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GENERAL INTRODUCTION TO AQUATIC ANIMAL TRACKING
ETN COST Action Training School
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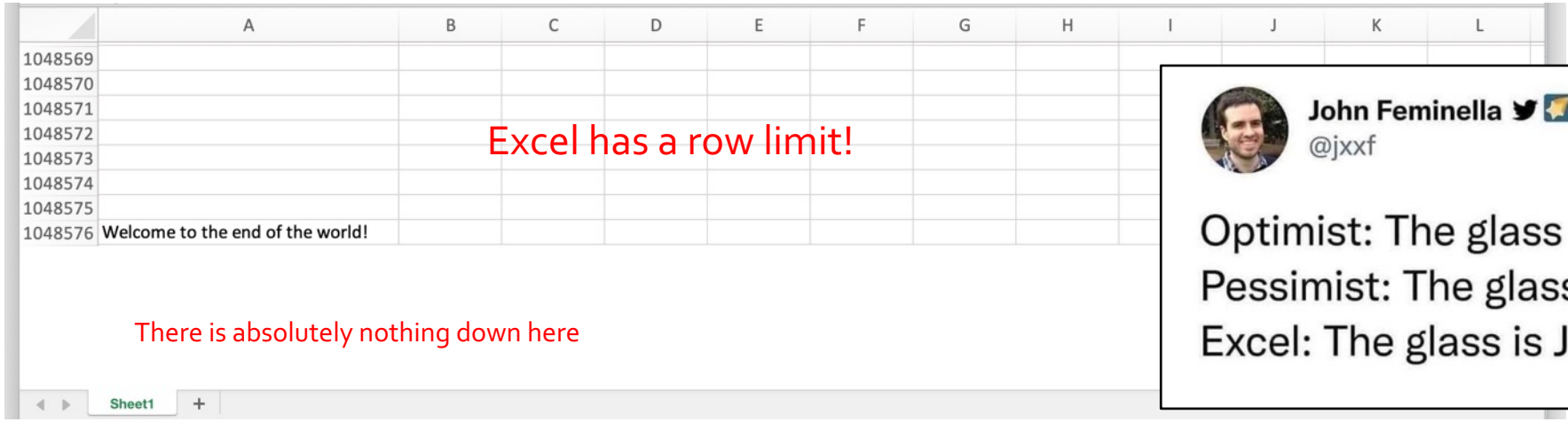
1. Issues related to acoustic telemetry data

Main issues related to acoustic telemetry data

- AT produces vast amounts of data (10-100 M detections)
  - Difficult to manage with common office programs (e.g. Excel)

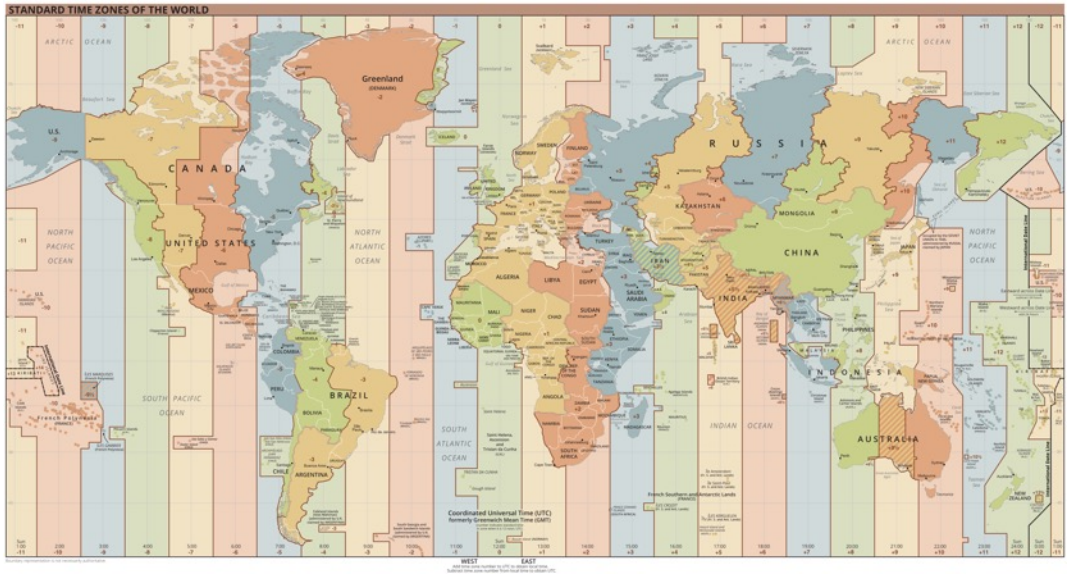


- Data is split in several sources that will be regularly updated through the project
  - Receiver log files + metadata files
  - We need to keep track of all the changes
  - We need to automatize the routines to merge and matching all the data sources

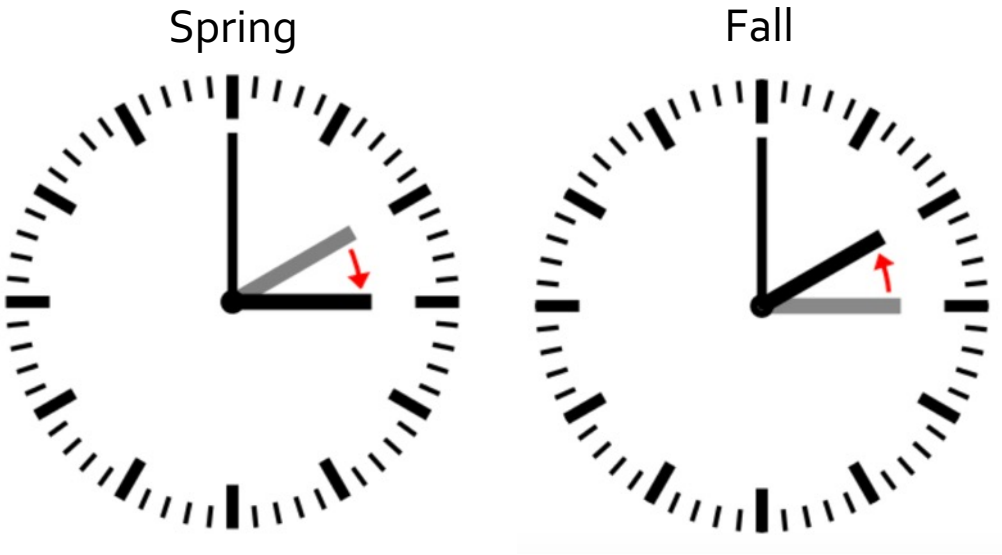
Main issues related to acoustic telemetry data

- Dealing with time

Time zones



Daylight saving time



Always leave a record of the time zone in which **you are working** (e.g., CET = UTC+1 / CEST UTC+2) and in which **the receivers are configured** (usually UTC by default).

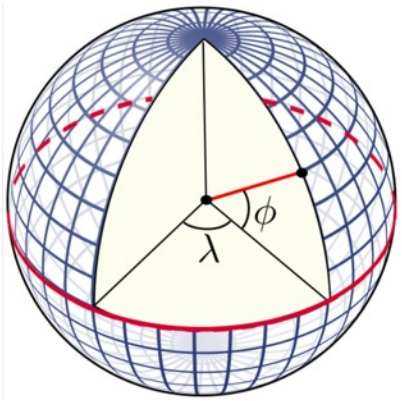
Source: https://en.wikipedia.org/wiki/Time_zone

Source: https://en.wikipedia.org/wiki/Daylight_saving_time

Main issues related to acoustic telemetry data

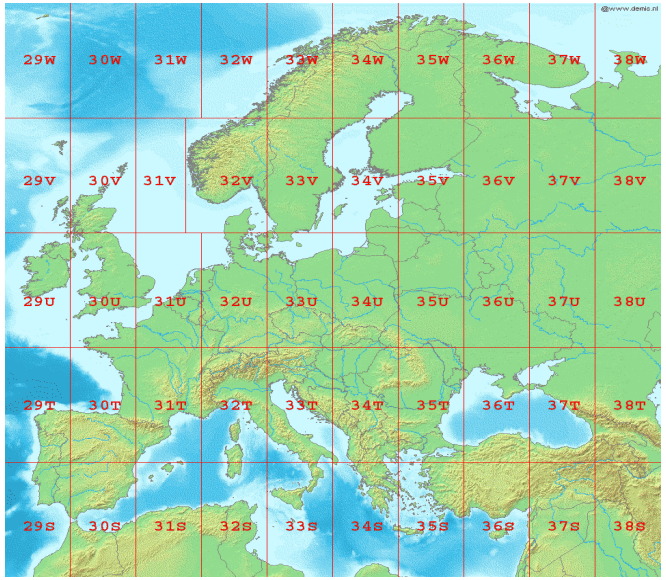
- Dealing with spatial data (spatial reference systems) – Receiver locations

Geographic coordinate systems



Datum	Latitude	Longitude
WGS 84	53.76252° N	20.45875° E
	53° 45.751′ N	20° 27,525′ E
	53° 45′ 45″ N	20° 27′ 31″ E

Projected coordinate systems



Datum	Zone	X	Y
WGS 84	34	464319 m	5957235 m

Source: https://en.wikipedia.org/wiki/Geographic_coordinate_system

Source: https://en.wikipedia.org/wiki/Projected_coordinate_system

2. Structuring acoustic telemetry databases

How to structure an acoustic telemetry database

- Three main data sources:

Deployment log (receivers)

Fish and metadata (tagged fish)

Receiver log files (detection data)

Structure of receiver log files

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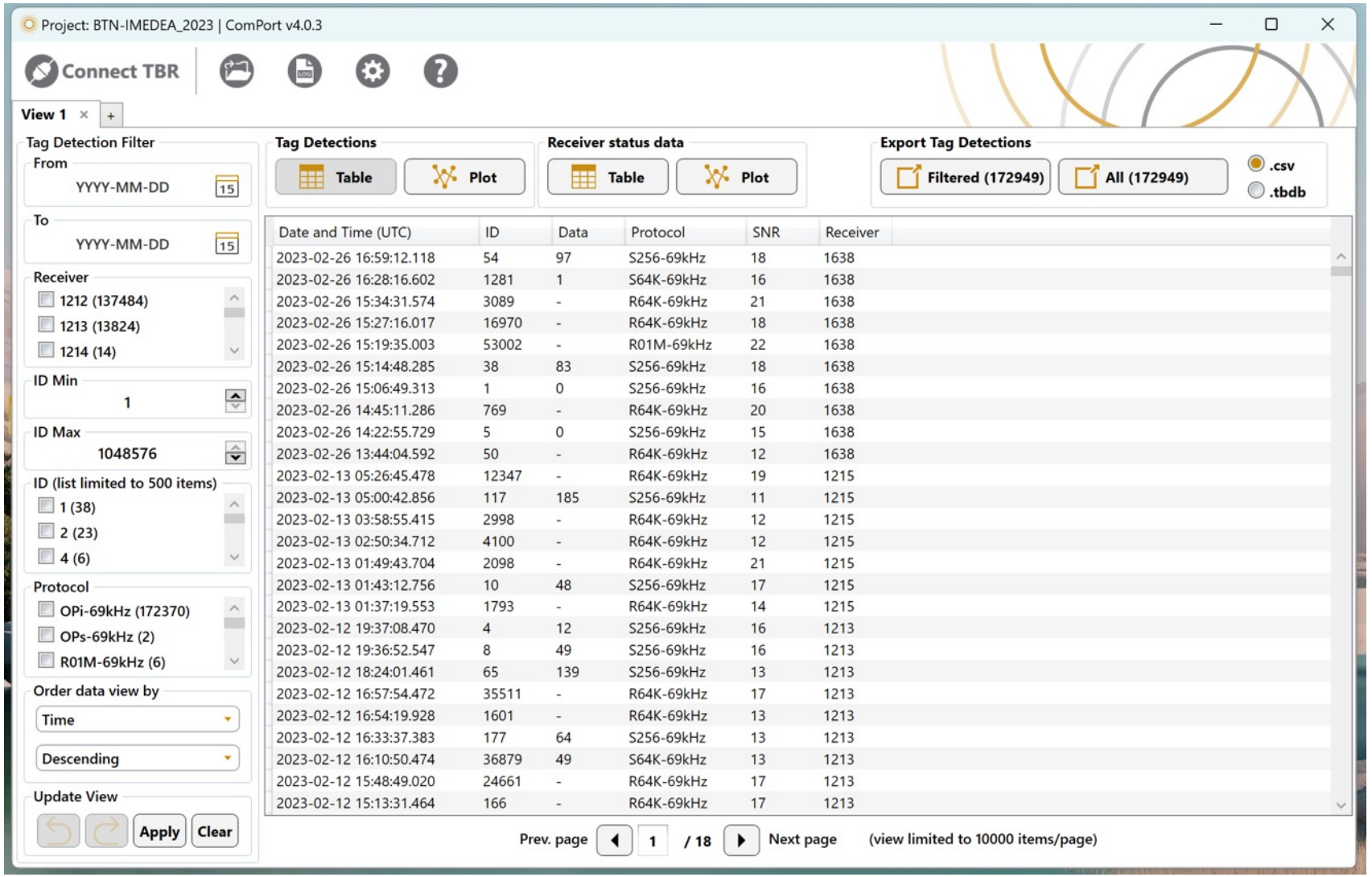
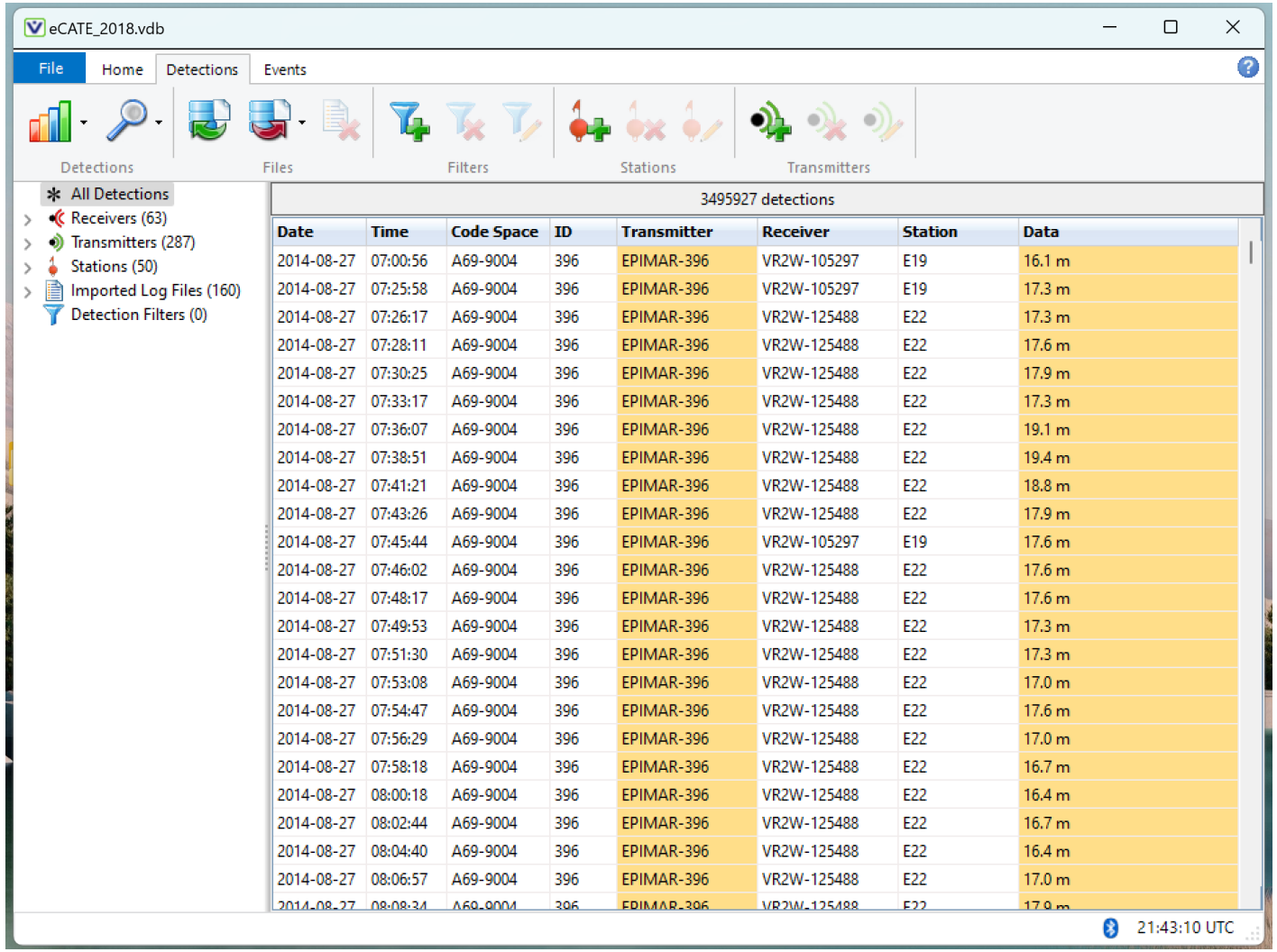


Structure of receiver log files

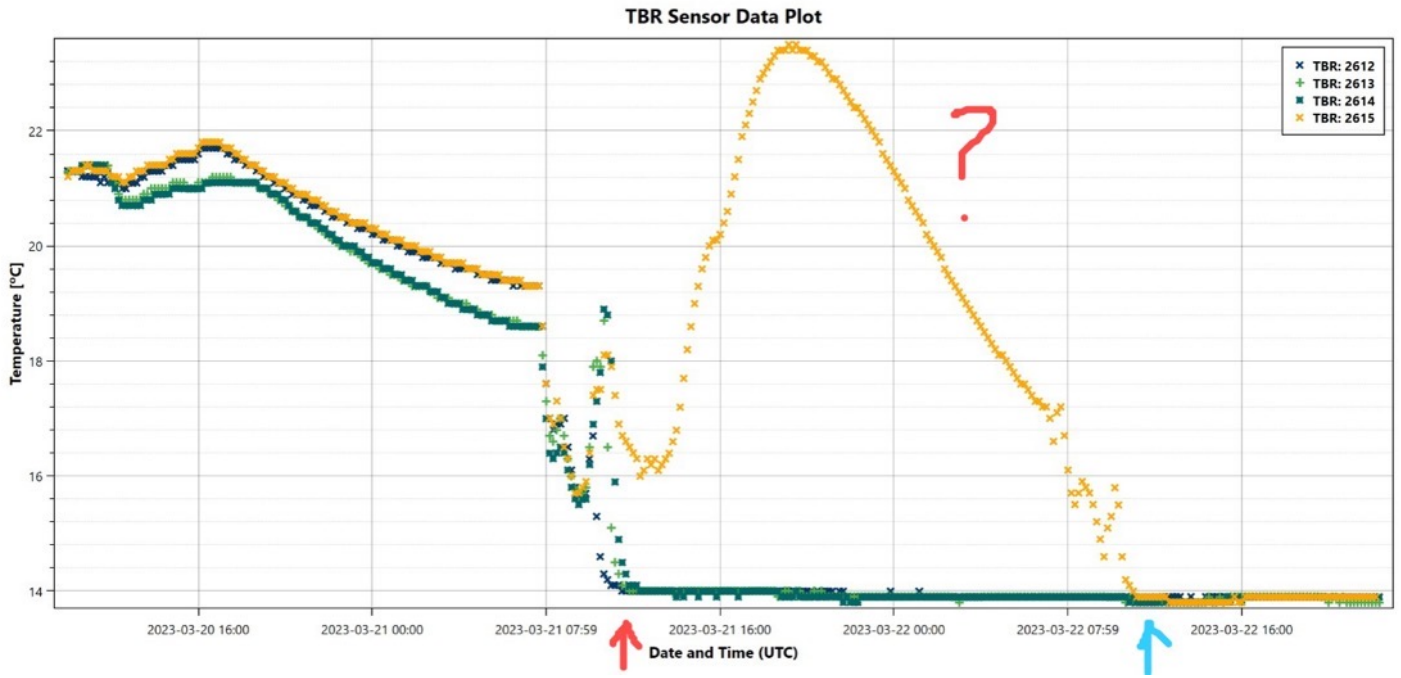


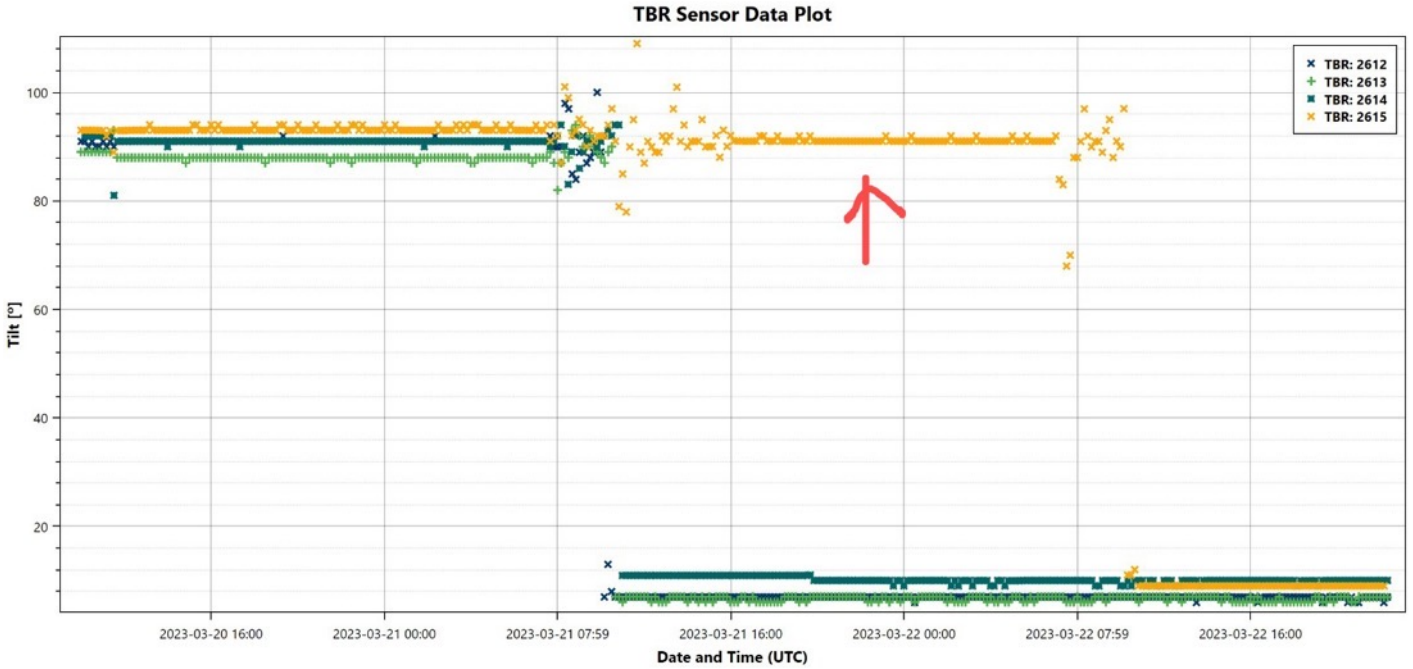
Structure of a receiver deployment sheet

- Receiver ID*
- Deployment date and time*
- Retrieval date and time*
- Latitude and longitude*
- Station ID (unique name to identify each position)
- Mooring type
- Depth
- [any other relevant information]

*** mandatory**

Each deployment should be represented in one row!


TBR Sensor Data Plot
TBR: 2612
TBR: 2613
TBR: 2614
TBR: 2615
Temperature [°C]
22
20
18
16
14
2023-03-20 16:00
2023-03-21 00:00
2023-03-21 07:59
2023-03-21 16:00
2023-03-22 00:00
2023-03-22 07:59
2023-03-22 16:00
Date and Time (UTC)


TBR Sensor Data Plot
TBR: 2612
TBR: 2613
TBR: 2614
TBR: 2615
Tilt [°]
100
80
60
40
20
2023-03-20 16:00
2023-03-21 00:00
2023-03-21 07:59
2023-03-21 16:00
2023-03-22 00:00
2023-03-22 07:59
2023-03-22 16:00
Date and Time (UTC)

Structure of a fish tagging sheet

- Transmitter ID*
- Capture date / tagging date
- Release date (and time)*
- Species name*
- Fish ID (unique ID given to each fish)
- Tagging location
- Length / weight / sex
- Tag type / emission rate / sensor type
- [any other useful information]

*** mandatory**

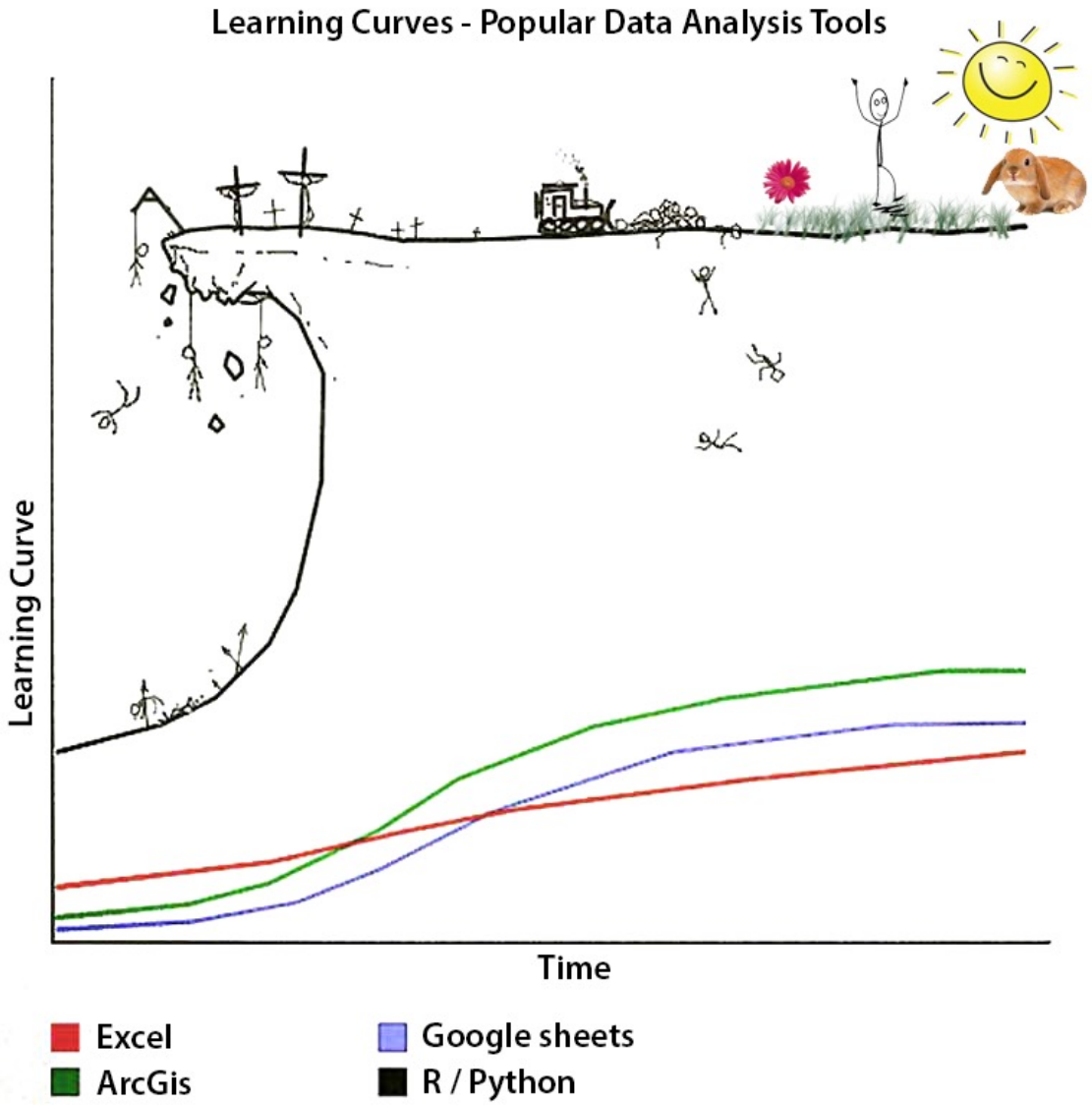
3. Practical session in R

Why to embrace R

- Open-source
- Platform-independent
- Lots of packages and an active developer community
- **Reproducibility and sharing**
- High **performance** and **versatility** in data handling and analysis
  - Statistical analysis, spatial analysis (GIS), data visualizations

But…

- Steep learning curve?



Source: https://nceas.github.io/oss-lessons/spatial-data-gis-law/1-mon-spatial-data-intro.html

Practical examples

- Example R scripts:

`ETN_TS_01_Loading_and_merging_AT_data.R`

`ETN_TS_02_Handling_AT_data.R`