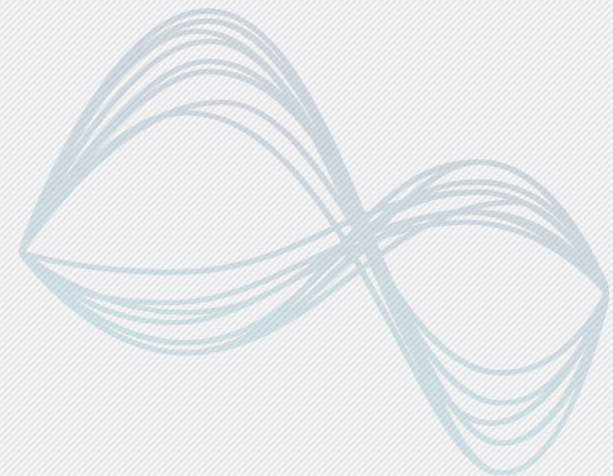# Marinet2 standard implementation: Ifremer Round Robin example

Corentin Guyot, Ifremer

@MaRINET2_EU

Outlines

- Floating wind turbine experiments carried out at Ifremer Basin in december 2019 as part of Round Robin MaRINET2 project

- Convert raw data format into NetCDF format

- Format checker

- Feedbacks on the example

Conversion process

- Input: Ascii raw data file
- Script: Python script and yaml configuration file
- Output: NetCDF file with data and metadata

Raw data → Python process → NetCDF Output
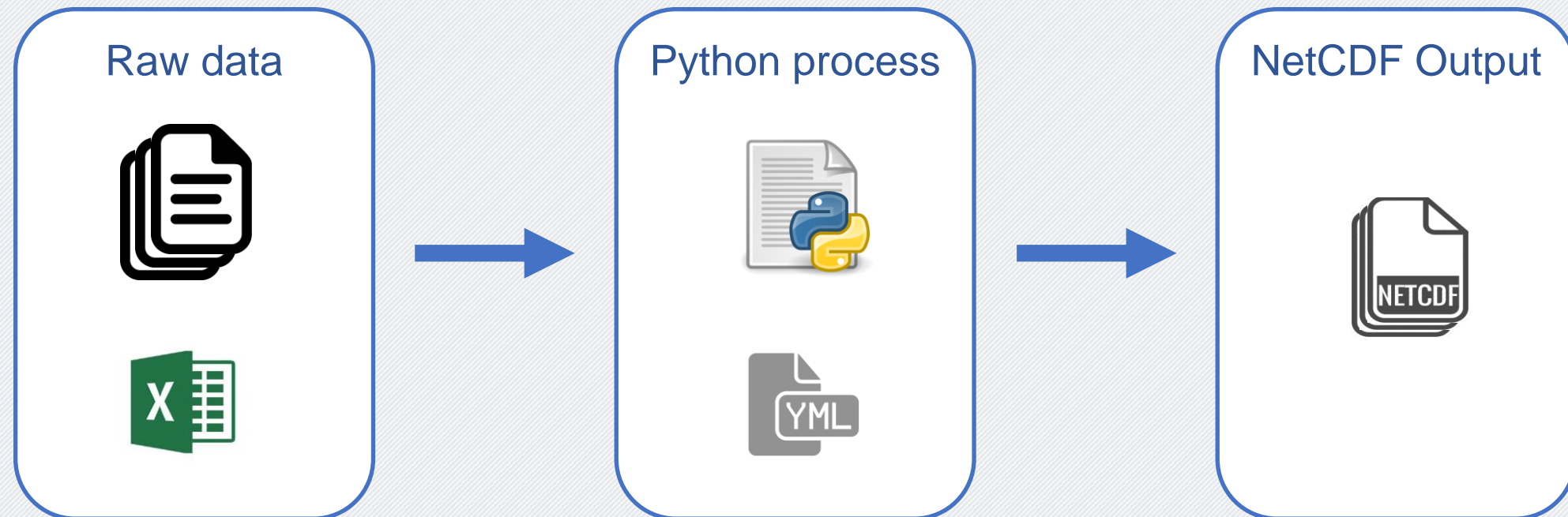
Raw format

- One ascii data file per test


```
%PROJECT : RRWind
%TEST N° : 1
%T0 : mardi 4 juin 2019 11:26:55
%DT : 0.010000
%VALISE FILE : D:\Mesures\RRWind\MeasSuitCase\RRWind_001.tdms
%QUALISYS FILE : D:\Mesures\RRWind\MeasQualisys\RRWind0001_6D.tsv
%CHANNEL NAMES :
%Time   M1  M2  Null    S   P   M   Amont   25m RRWind X    RRWind Y    RRWind Z    RRWind Yaw  RRWind Pitch    RRWind Roll RRWind Residual
%UNITS :
%sec    V   V   V   V   V   V   V   V   mm  mm  mm  deg deg deg mm
%
%DATA
0.000000    -24.975480  -24.973394  -22.254499  2.259685    -0.134532   3.581426    -495.890117 -343.918679 -8.402510   2.340070    -205.397270
-0.158360   -0.008930   0.105330    0.797260
0.010000    -24.975480  -24.973394  -19.973437  2.306312    -0.055071   3.655231    -494.454122 -347.232893 -7.751160   2.711370    -205.514710
-0.175740   -0.011940   0.120850    0.800060
0.020000    -24.975480  -24.973394  -19.974536  2.251468    -0.011331   3.685879    -493.721472 -347.144905 -8.870710   2.780970    -205.935740
-0.184400   0.000720    0.067720    1.259300
0.030000    -24.975480  -24.973394  -19.970399  2.346162    -0.046080   3.666698    -494.923018 -346.411672 -10.399130  2.061310    -205.908040
-0.161280   0.025780    0.018520    0.385660
0.040000    -24.975480  -24.973394  -19.942247  2.310421    -0.016191   3.678582    -495.303997 -347.702162 -10.486100  2.011870    -205.941950
-0.158840   0.029990    0.017060    0.402320
```

Raw format

- One ascii data file per test
- One excel file with some descriptions of the test conditions

Trial number	Date	Time	Type	Wave period (s)	Wave height (cm)	Thruster	Comments	Comments	Video
1	04/06/2019		Decay test calm water pitch			No	Without thruster cables connection		No
2	04/06/2019		Decay test calm water surge			No	Without thruster cables connection		No
3	04/06/2019		Decay test calm water yaw			No	Without thruster cables connection		No
4	04/06/2019		Decay test calm water roll			No	Without thruster cables connection	Push horizontally on top of the mast then push vertically on top of colum	No
5	04/06/2019		Decay test calm water pitch			No	With thruster cables connection		No
6	04/06/2019		Decay test calm water surge			No	With thruster cables connection	Test stopped automatically before expected time because of trigger pro	No
7	04/06/2019		Decay test calm water surge			No	With thruster cables connection		No
8	04/06/2019		Decay test calm water yaw			No	With thruster cables connection		No
9	04/06/2019		Calm water			Yes	7 N - 5 N - 3 N -5 N - 7 N - 8 N	Testing the thruster	No
10	04/06/2019		Decay test calm water roll			No	With thruster cables connection	Push horizontally on top of the mast then push vertically on top of colum	No
11	04/06/2019		rTp070Tq300Hs0600-600-1234			No	"Pink noise"	Test stopped automatically before expected time because of trigger pro	Yes
12	04/06/2019	18:10	rTp070Tq300Hs0600-600-1234			No	"Pink noise"		No
13	04/06/2019	19:12	Regular waves	1,8	10	No			No
14	04/06/2019	19:41	Regular waves	1,03	5	No			Yes
15	04/06/2019	20:05	Regular waves	2,39	10	No	around Heave cancelation		Yes
16	04/06/2019	20:23	Regular waves	1,29	10	No			Yes
17	04/06/2019	20:41	Regular waves	2,71	10	No	around Heave resonance (out of phase)		Yes
18	04/06/2019	21:05	Regular waves	3,45	10	No	around Pitch resonance		Yes
19	04/06/2019	21:18	Regular waves	0,86	5	No			Yes
20	05/06/2019	07:25	Regular waves	2,74	10	No	around Heave resonance (out of phase)		Yes
21	05/06/2019	07:55	Regular waves	2,86	10	No	around Heave resonance (in phase)		Yes

Python process

- Python script using different libraries like NetCDF, Panda, Xarray
- About a hundred lines of code
- Yaml configuration file to gather metadata and some script options

NetCDF output

- Dimension and variables


```
netcdf RRWind_001 {
dimensions:
    TIME = 49261 ;
    DEPTH = 1 ;
variables:
    double TIME(TIME) ;
        TIME:_FillValue = 9.96920996838687e+36 ;
        TIME:long_name = "Time" ;
        TIME:standard_name = "time" ;
        TIME:units = "seconds since 1970-01-01T00:00:00Z" ;
        TIME:valid_min = -9000000000. ;
        TIME:valid_max = 9000000000. ;
        TIME:uncertainty = " " ;
        TIME:comment = " " ;
        TIME:axis = "T" ;
    float DEPH(TIME, DEPTH) ;
        DEPH:_FillValue = 9.96921e+36f ;
        DEPH:long_name = "Depth" ;
        DEPH:standard_name = "depth" ;
        DEPH:units = "m" ;
        DEPH:valid_min = -12000. ;
        DEPH:valid_max = 12000. ;
        DEPH:axis = "Z" ;
        DEPH:positive = "down" ;
    float M1(TIME, DEPTH) ;
        M1:_FillValue = 9.96921e+36f ;
        M1:units = "V" ;
    float M2(TIME, DEPTH) ;
        M2:_FillValue = 9.96921e+36f ;
        M2:units = "V" ;
```

NetCDF output

- Global attributes

```
// global attributes:
        :dataset_id = "DOI to be defined" ;
        :dataset_id_authority = "https://wwz.ifremer.fr/" ;
        :title = "Round Robin - Ifremer\'s wind turbine experiments - december 2019" ;
        :summary = "Floating wind turbine experiments in the Brest basin performed by the Ifremer\'s Hydrodynamics Laboratory.
        These experiments are carried out as part of the \'Round Robin\' MaRINET2 and aim to assess behavior of the wind turbine
        (model on a 1/60 scale) under different wind and waves conditions (simulated simultaneously). The same floating wind
        turbine is tested in different European basins (IFREMER, University College Cork, Ecole Centrale de Nantes and University
        of Strathclyde). The wind turbine rotor model tested as part of this program is developed and produced by a team from
        DTU, who came to the Brest basin to participate in the tests." ;
        :keywords = "Round Robin, Wind Turbine" ;
        :keywords_vocabulary = "to be defined" ;
        :is_part_of = "DOI to be defined" ;
        :is_related_to = "RRWind_001.nc,RRWind_002.nc, RRWind_003.nc, RRWind_004.nc, RRWind_005.nc, RRWind_006.nc, RRWind_007.nc,
        RRWind_008.nc, RRWind_009.nc, RRWind_010.nc, RRWind_011.nc, RRWind_012.nc, RRWind_013.nc, RRWind_014.nc, RRWind_015.nc,
        RRWind_016.nc, RRWind_017.nc, RRWind_018.nc, RRWind_019.nc, RRWind_020.nc, RRWind_021.nc, RRWind_022.nc, RRWind_023.nc,
        RRWind_024.nc, RRWind_025.nc, RRWind_026.nc, RRWind_027.nc, RRWind_028.nc, RRWind_029.nc, RRWind_030.nc, RRWind_031.nc" ;
        :infrastructure_id = "Ifremer test basin" ;
        :site = "Ifremer Brest" ;
        :creator_name = "Christophe Maisondieu, Marc Le Boulluec, Julien Caverne" ;
        :creator_email = "Christophe.Maisondieu@ifremer.fr, Marc.Le.Boulluec@ifremer.fr, Julien.Caverne@ifremer.fr" ;
        :creator_id = " , , " ;
        :creator_role = "to be defined" ;
        :contributor_name = "Corentin Guyot" ;
        :contributor_email = "Corentin.guyot@ifremer.fr" ;
        :contributor_id = "" ;
        :contributor_role = "data management" ;
        :project_funder = "Marinet2" ;
        :project_name = "Marinet2" ;
        :project_id = "To be defined" ;
        :project_url = "http://www.marinet2.eu/" ;
        :data_mode = "Raw" ;
        :license = "https://creativecommons.org/licenses/by-nc/4.0/" ;
        :distribution_statement = "These data follow Marinet standards; they are public and free of charge. User assumes all risk
        for use of data. User must display citation in any publication or product using data. User must contact PI prior to any
        commercial use of data." ;
        :publisher_name = "SEANOE" ;
        :publisher_email = "codac@ifremer.fr" ;
        :publisher_url = "https://www.seanoe.org/" ;
        :citation = "These data were collected and made freely available by Marinet2 project and the programs that contribute to
        it" ;
        :update_interval = "void" ;
        :format_version = "Marinet2 NetCDF 0.1" ;
        :metadata_schema = "https://github.com/Marinet2/metadata-schema/blob/master/dataset_schema.yaml" ;
        :conventions = "CF-1.8, Marinet-NetCDF-format-manual-1.0" ;
        :feature_type = "timeSeries" ;
        :cdm_data_type = "station" ;
        :coordinate_reference_system = "EPSG:4326" ;
        :coordinate_mapping = "X:LONGITUDE, Y:LATITUDE, Z:DEPH" ;
```

NetCDF output

- Data
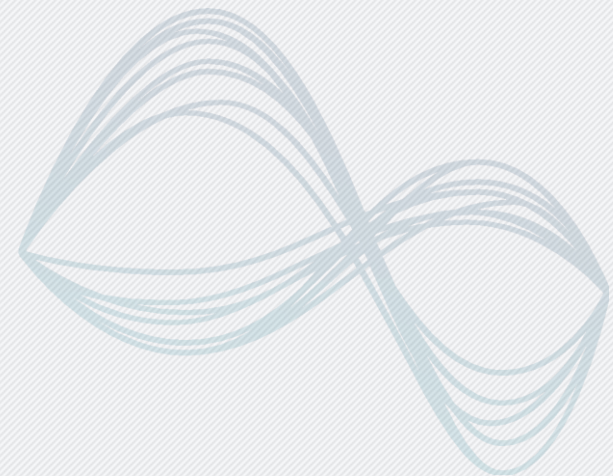
NetCDF format advantages

- Self-Describing format (store data AND metadata)
- Widely used by the scientific community and European projects (Copernicus, Argo, OceanSites)
- Great Interoperability (lots of tools and librairies to request, manipulate and visualize data)
- Easy to implement rules for a homogeneous format between institutes

Format checker
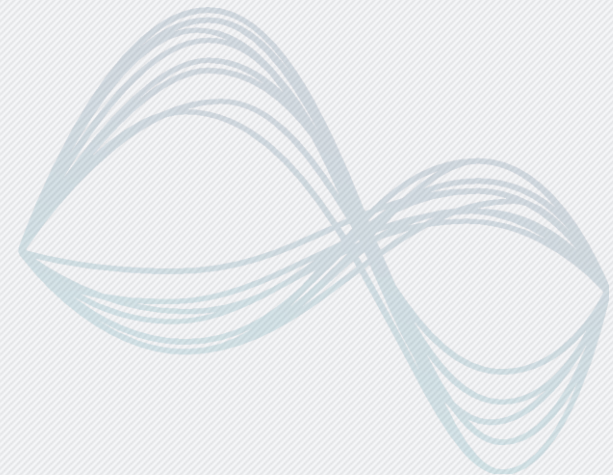
- Java application based on XML rules files
- Works in API mode or in unix command
- Check the presence of mandatory elements (dimension, variable, attribute)
- Check expected values or formats attributes (using regexp expression)
- One rule files per format version (rule file automatically applied based on key attributes in the file)

Feedbacks

- We can't work without domain specialist to describe data

- Need to use strong and robust conventions to have homogeneous format (use existing and recognized conventions if exists. If not, we will create new Marinet2 convention)

- We can support Round Robin owners in data conversion and data publication.

Questions ?