National Oceanography Centre

PASS-SWIO FINAL REVIEW
5TH MAY 2024
WP3000 – SEA LEVEL DATA PROCESSING – TIDE GAUGE DATA

WORK PACKAGES, TASKS AND DELIVERABLES

WP3100 – Tide Gauge Data Processing

TASKS:

1. Acquire, quality control (QC) and process historical Toamasina tide gauge data (2010 onwards)

2. QC and processing of Portagauge data

Jointly delivered with DGM (enabled by WP1200 training)

DELIVERABLES:

D3.1 – Data Sets

D3.2 – Validation Report

D3.3 – Report on Sea Level Variability

For D3.1 Datasets, QC and process:

- Historical Toamasina sea level data (2010 to date) from SHOM tide gauge

- Portagauge conventional sea level data and geocentric sea level from GNSS-IR

- Cross-validate the two time series to acceptance test Portaguage performance

SHOM Tide Gauge

Portagauge

Historical Toamasina sea level data

- Tide gauge data processed to March 2022 by DGM following online training by NOC in October 2023, but SHOM tide gauge offline thereafter.

- Unavailable for cross-validation during common observation period, but comparison of key tidal constituents supports acceptance testing process

- Automatic data download directly from the IOC Sea Level Monitoring Facility website using linux commands

- Data processed using NOC's in-house TASK Tidal Analysis, Quality control and Data Visualisation software.

- Outputs: **Quality controlled time series to validate Portagauge and satellite altimetry**

  Monthly means for Permanent Service for Mean Sea Level

  Tidal constituents for tidal predictions software and cross-validation

**Portagauge conventional (radar) sea level data**

- Data from radar sensor were processed by DGM for 2023 – Feb 2024 during WP1200 training events in Oct 2023 (online) and Feb 2024 (in person)

- Portagauge in-situ data downloaded on site and reformatted using MS Excel

- Data processed using NOC's in-house TASK Tidal Analysis, Quality control and Data Visualisation software.

- Outputs: **Quality controlled sea level time series to validate altimetry**

    Monthly means for Permanent Service for Mean Sea Level

   Tidal constituents for tidal predictions software and cross-validation

- Some sea level variations are so extreme that they are obviously identifiable in raw tide gauge records

- However, some variations can be masked by tides. Therefore, tidal and non-tidal components of a sea level record are often separated, making non-tidal variations and data errors more obvious.

Lerwick, Shetland Isles

28 - 30 May 2008 (GMT)
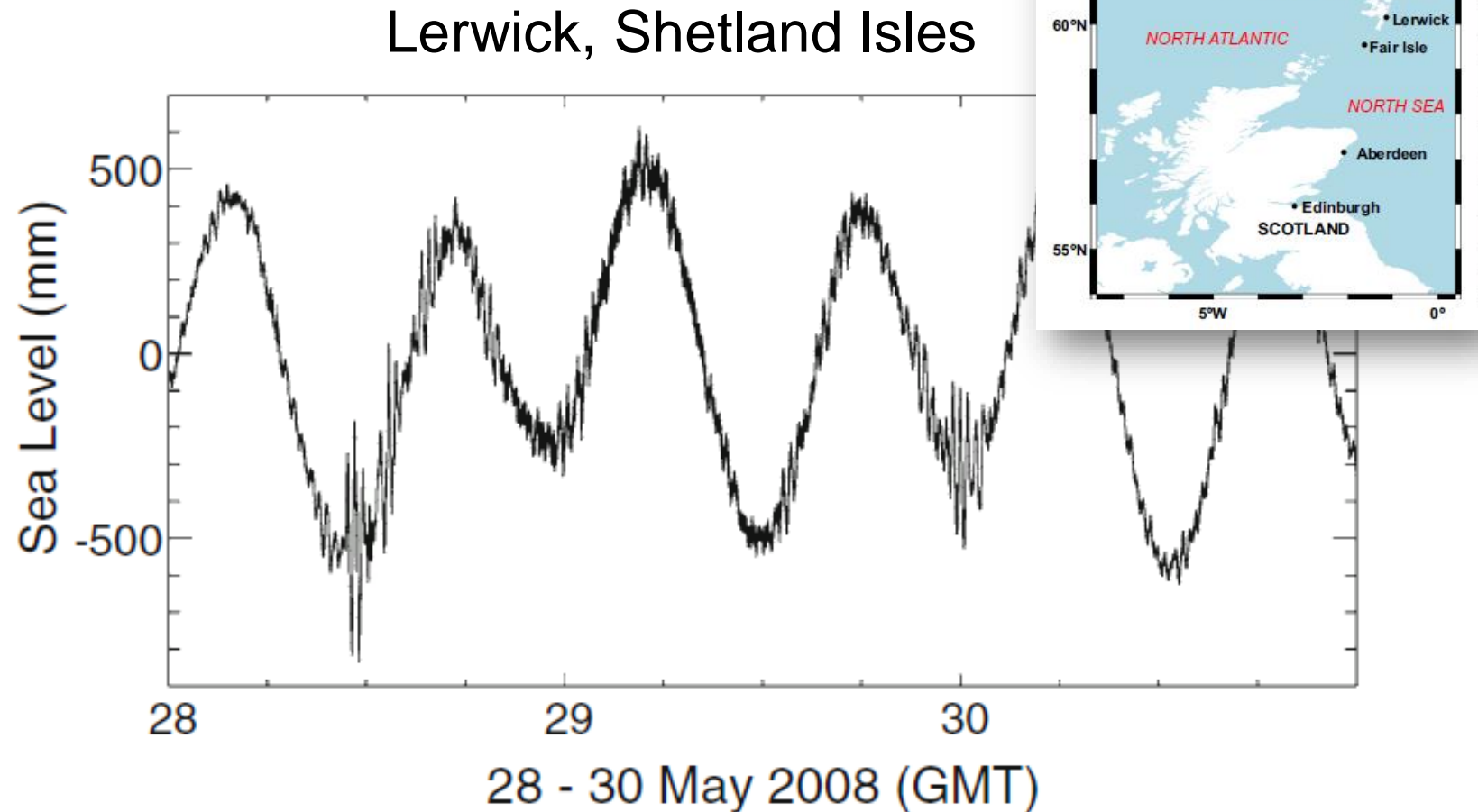
An example from Port Stanley Nov-Dec 2004

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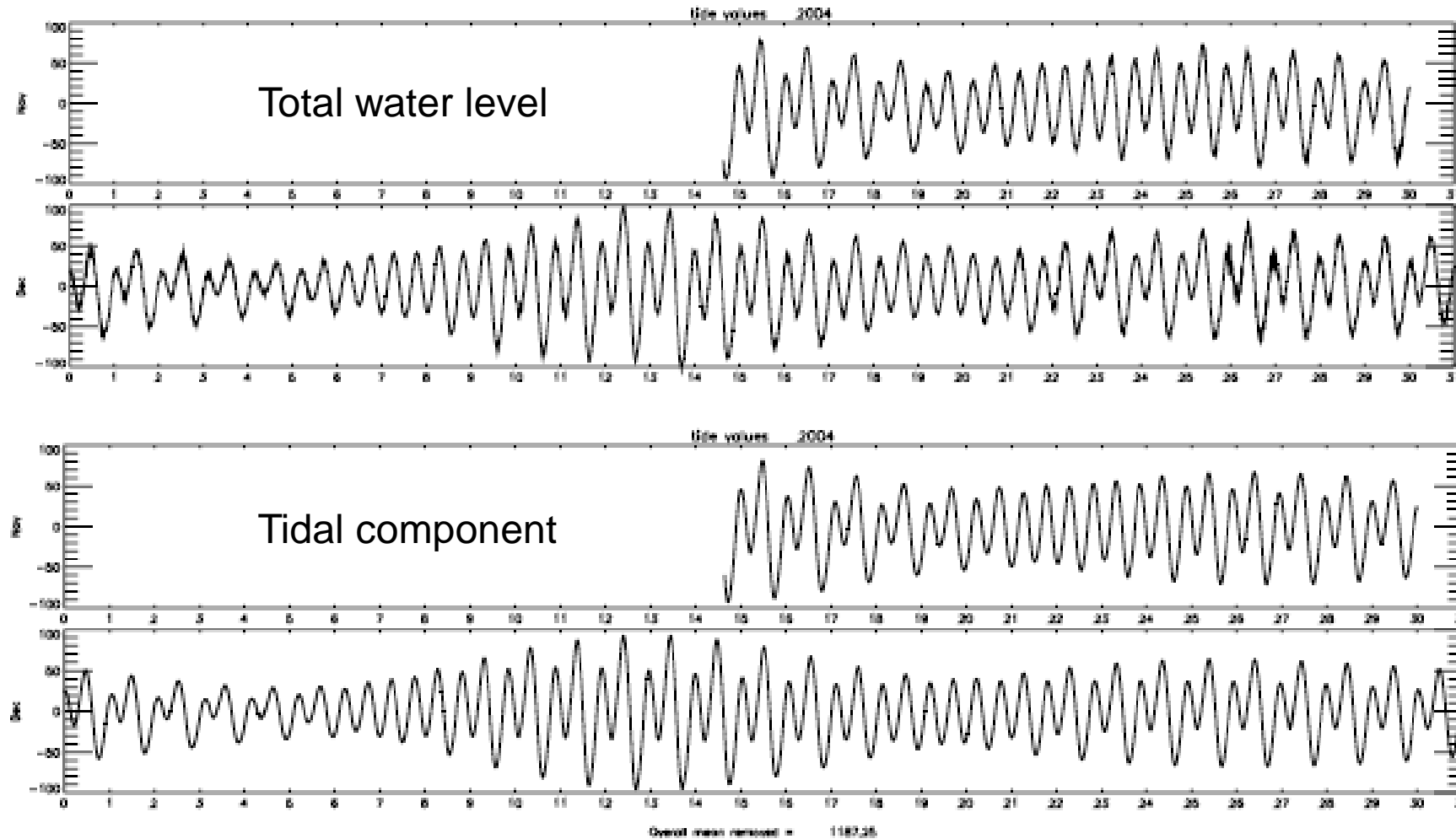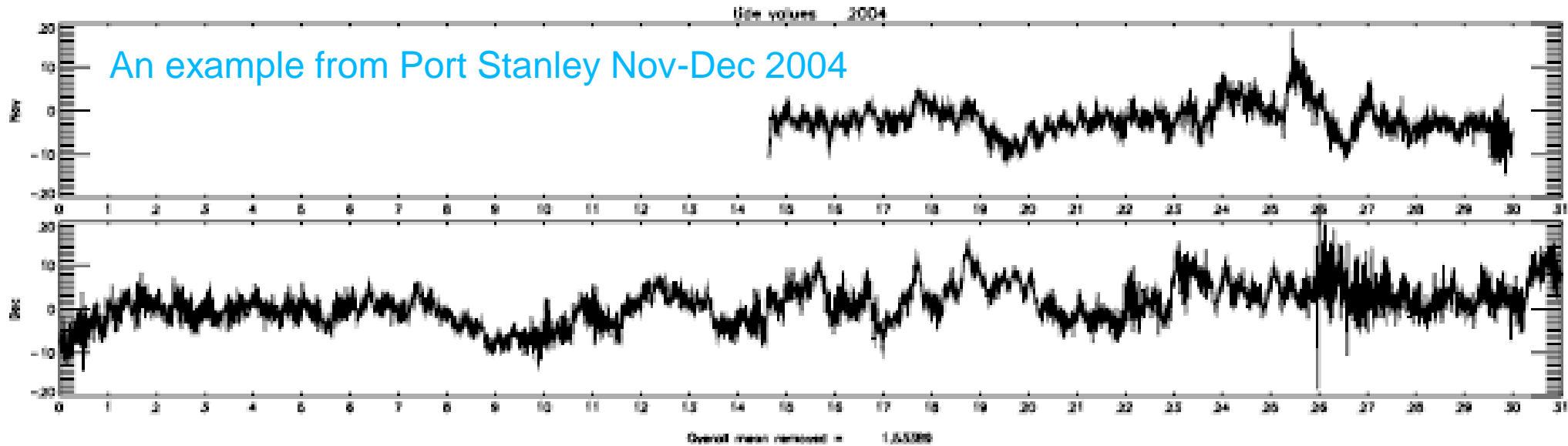
Non-tidal record shows:

1. No big storm surges (Southern Hemisphere summer)

2. A lot of high-frequency noise of a few cm due to harbour seiches

3. On 27 December arrival of the Sumatra tsunami (15 cm or so)

➔ None of this is evident from looking at the total observed record.

- TASK – Toolkit   Format conversion, resampling, auto-QC, auto-flagging

- TASK – Analyse   Harmonic analysis module, daily, monthly anda nnual means

- TASK – Plot   Data viewing, quality control, manual flagging

- POLTIPS   Prediction, statistics, tide table production

Quality Control

It will be clear by looking at the residuals if there is:

- A spike or jump in the data due to instrumental faults

- Missing data

- A timing error

- Reference level changes
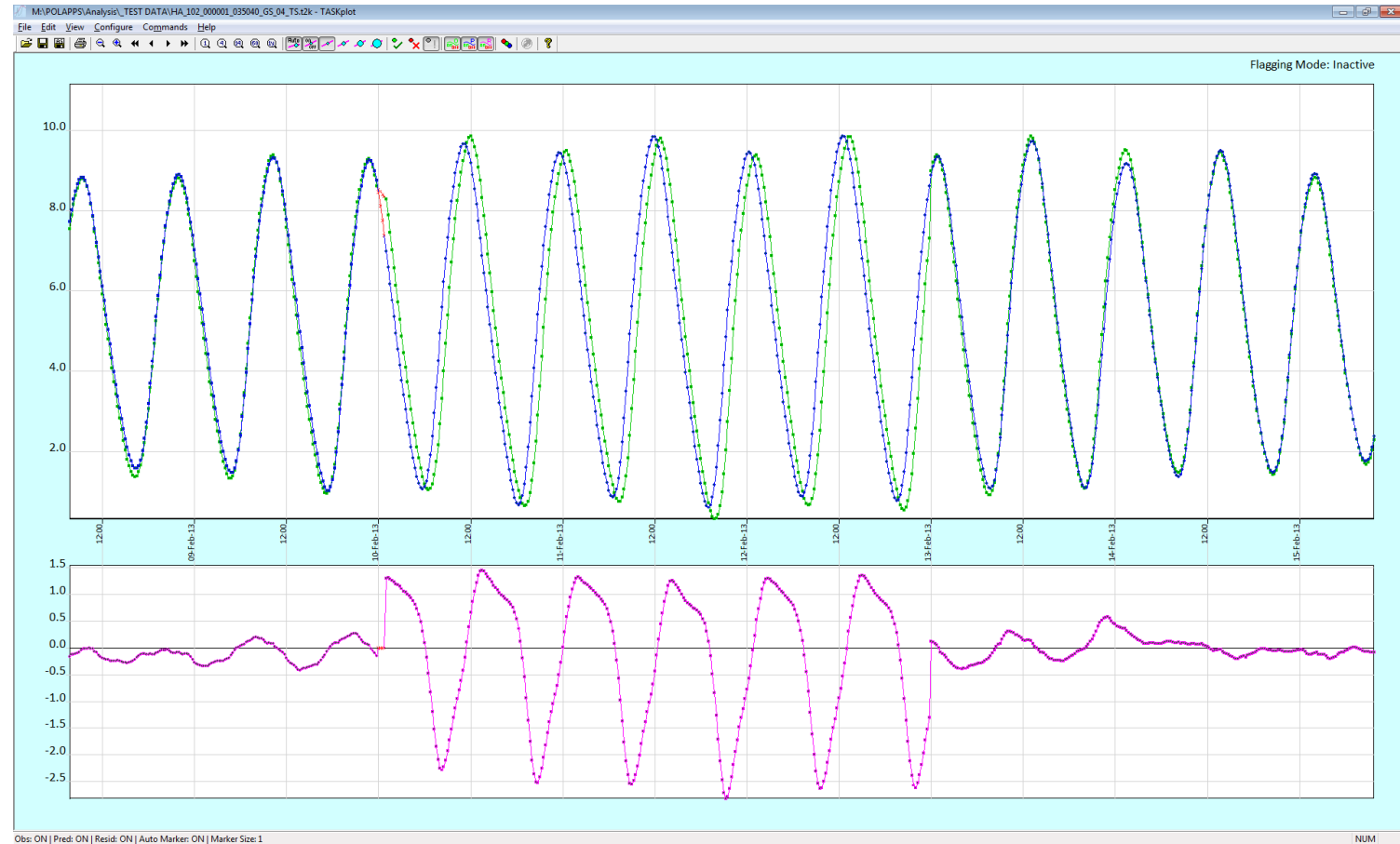
These errors can then be fixed in the data set.

- Ordinarily, the seasonal cycle (described by tidal constituents Sa and Ssa) is removed from the tide gauge data during tidal analysis.

- However, for the validation of satellite altimetry, we retain the seasonal cycle since altimetry data are detided, but the seasonal cycles are not removed.

- So we used special sets of tidal constituents that exclude Sa and Ssa (annual and semiannual components)

- Outputs: **Quality controlled time series to validate Portagauge and satellite altimetry**

  Monthly means for Permanent Service for Mean Sea Level

  Tidal constituents for tidal predictions software and cross-validation

WP3100 – TIDE GAUGE DATA PROCESSING METHODOLOGY

- Outputs: **Quality controlled time series to validate Portagauge and satellite altimetry**
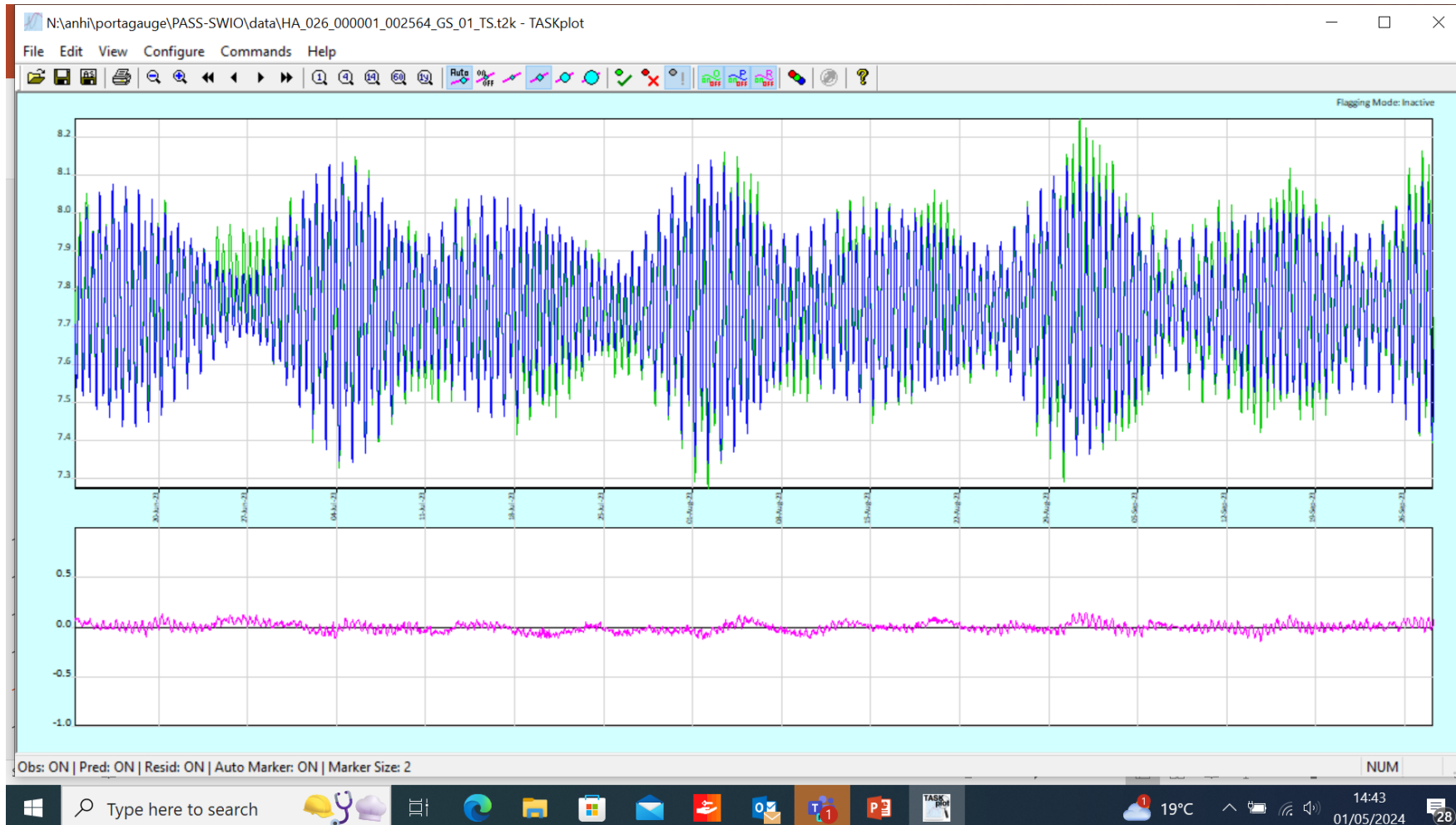
WP3100 – TIDE GAUGE DATA PROCESSING METHODOLOGY

- Outputs: **QC'd SHOM tide gauge time series to validate Portagauge and satellite altimetry**

WP3100 – TIDE GAUGE DATA PROCESSING METHODOLOGY

- Outputs: **QC'd Portagauge tide gauge time series to validate satellite altimetry and GNSS-IR**

- Excellent quality data
- No suspect data points

- Outputs: Monthly means for Permanent Service for Mean Sea Level

  Tidal constituents for tidal predictions software and cross-validation

Portagauge		**SHOM tide gauge**		
Amp	**Phase**	**Constituent**	**Amp**	**Phase**
0.03421	15.57	O1	0.03553	13.49
0.03014	47.11	K1	0.02736	33.89
0.20734	314.83	M2	0.21001	310.94
0.07805	327.31	S2	0.09235	317.51

Good agreement despite short Portagauge time series and different locations

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