PASS-SWIO Final Review

WP1000 – User Engagement and Capacity Building

Work Packages

WP1100 – Training in Portagauge installation and operation.

WP1200 – Training in satellite and tide gauge data processing and validation

WP1300 – Engagement with other agencies in Madagascar

WP1400 – Set up and maintain project web page

Deliverable

D1.1 Training Material

WP1100 – Training In Portagauge Installation and Operation

- Ensure Portagauge end users are fully trained in its set up and use of the data alongside altimetry
- Face to Face instruction during installation 12-16 June (see WP2000)
  - Report from DGM staff during visit in February 2024
- Portagauge manual (in English and French) WP2000 D2.2 – available online on project website
- Ensure other agencies interested in accessing and using the data are aware of its availability
  - Available online through project website
  - Communicated during discussions with Madagascar Stakeholders in February 2024

WP1100 – Training In Portagauge Installation and Operation

Feedback from DGM Staff:

- There were no major problems in the installation process. The installation manual was clear and comprehensive.
- Main difficulties were in setting up data transfer
- It is a long distance from the DGM office to the port, so many repeat visits in a short time are difficult. A lightweight tablet to test the wifi connections and download the data would be a very useful asset.
- The base of the packing case has sustained some damage and so would need repair before further use.
- It was queried if any spare parts would be needed over a longer period of installation.

WP1200 – Training: Data processing and validation

Objectives

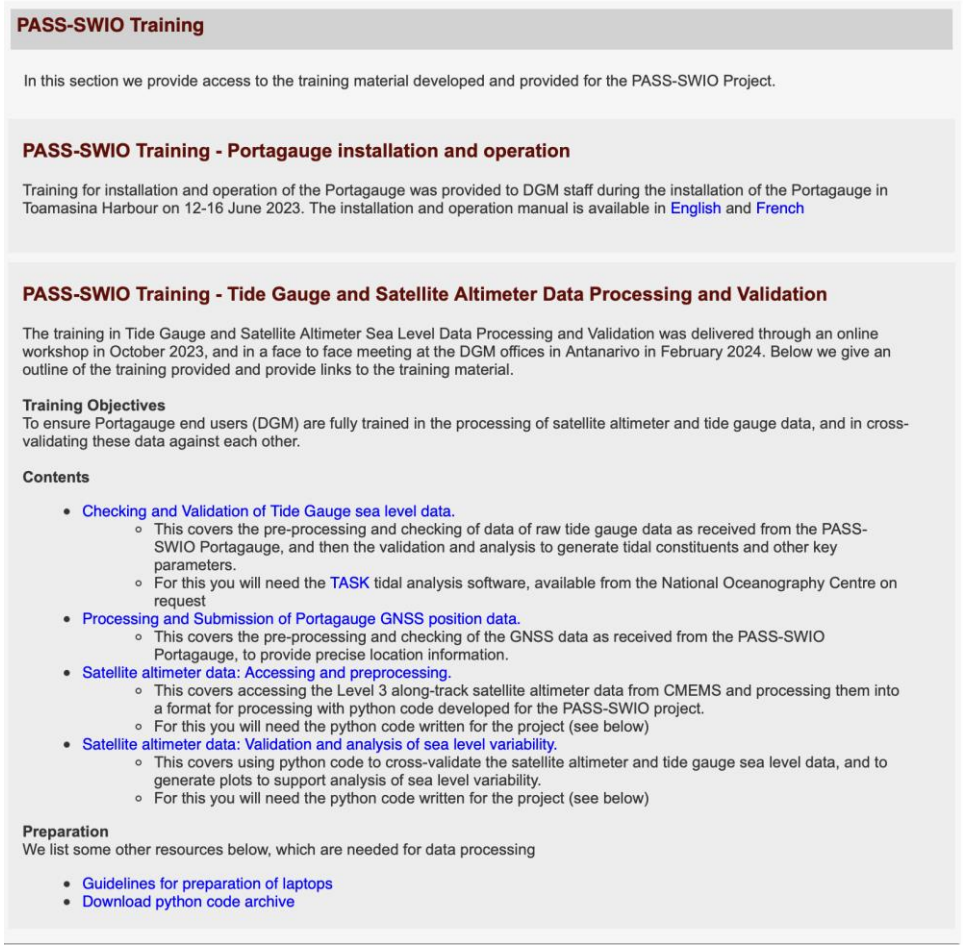
- Ensure Portagauge end users (DGM) are fully trained in the processing of satellite altimeter and tide gauge data, and in cross-validating these data against each other

WP1200 – Training: Data Processing and Validation

Approach

- Development of resources and approach from C-RISe.
- Online zoom meetings, mix of presentations and worked examples.
- Laptops with python and tidal processing sw (e.g. POLTIPS, TASK, …) pre-installed

D 1.1 Training Material – online: https://www.satoc.eu/projects/pass-swio/training.html



PASS-SWIO Training

In this section we provide access to the training material developed and provided for the PASS-SWIO Project.

PASS-SWIO Training - Portagauge installation and operation

Training for installation and operation of the Portagauge was provided to DGM staff during the installation of the Portagauge in Toamasina Harbour on 12-16 June 2023. The installation and operation manual is available in English and French

PASS-SWIO Training - Tide Gauge and Satellite Altimeter Data Processing and Validation

The training in Tide Gauge and Satellite Altimeter Sea Level Data Processing and Validation was delivered through an online workshop in October 2023, and in a face to face meeting at the DGM offices in Antanarivo in February 2024. Below we give an outline of the training provided and provide links to the training material.

Training Objectives
To ensure Portagauge end users (DGM) are fully trained in the processing of satellite altimeter and tide gauge data, and in cross-validating these data against each other.

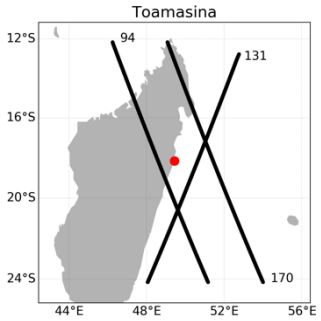
Contents

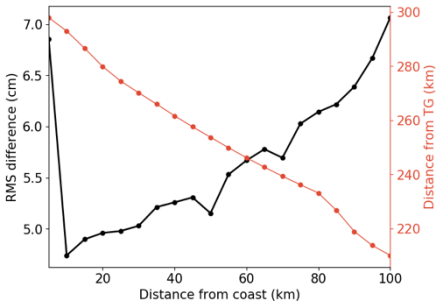
- Checking and Validation of Tide Gauge sea level data.
  - This covers the pre-processing and checking of data of raw tide gauge data as received from the PASS-SWIO Portagauge, and then the validation and analysis to generate tidal constituents and other key parameters.
  - For this you will need the TASK tidal analysis software, available from the National Oceanography Centre on request
- Processing and Submission of Portagauge GNSS position data.
  - This covers the pre-processing and checking of the GNSS data as received from the PASS-SWIO Portagauge, to provide precise location information.
- Satellite altimeter data: Accessing and preprocessing.
  - This covers accessing the Level 3 along-track satellite altimeter data from CMEMS and processing them into a format for processing with python code developed for the PASS-SWIO project.
  - For this you will need the python code written for the project (see below)
- Satellite altimeter data: Validation and analysis of sea level variability.
  - This covers using python code to cross-validate the satellite altimeter and tide gauge sea level data, and to generate plots to support analysis of sea level variability.
  - For this you will need the python code written for the project (see below)

Preparation
We list some other resources below, which are needed for data processing

- Guidelines for preparation of laptops
- Download python code archive

WP1200 – Training: Data Processing and Validation





Who?

- To DGM staff
- Delivered by SatOC and NOC. Developed from training resources and experience from C-RISe project.

When / How?

- Initial training using historical data from Toamasina TG
- Online – 12, 18 October 2023
  - Accessing and initial processing of altimeter and TG data, introduction to sw and tools.
  - Cross validation of altimeter (S3, Jason 2,3 and TG data).
- Refresher – Validation using portagauge data
  - Face to Face 13, 14 February 2024
  - Assess quality of portaguage data
  - Results for dissemination / outreach?
- Training material on website (D1.1)
- Follow up support

WP1200 – Initial Online Training: Data Processing and Validation

Session 1: Thursday 12th October 1300-1500 EAT (1100-1300 BST)

Objective: Overview of Tide Gauge and Satellite Altimeter Data; Exercises for initial processing, analysis and validation.

	Time (EAT)	Presentation
1.0	13:00	Welcome – Introductions – PASS-SWIO Project overview (AB)
1.1	13:10	Review: Sea level monitoring and the need for Portagauge (AH)
1.2	13:40	Tide Gauge data overview (AH) Exercise 1: Toamasina Tide gauge data, initial processing and analysing (AH)
1.3	14:10	Satellite altimeter sea level data overview (DC)
1.4	14:30	Exercise 2: Cross validating satellite altimeter data and tide gauge data (DC)
	15:00	Close

WP1200 – Initial Online Training: Data Processing and Validation

Session 2: Wednesday 18th October 1300-1500 EAT (1100-1300 BST)

Objective: Review of Exercises, GNSS Measurements, Next Steps for PASS-SWIO

	Time (EAT)	Presentation
2.0	13:00	Welcome – Introductions (AB)
2.1	13:10	Exercise 1 Review: Tide Gauge data processing (AH) Toamasina Tide gauge data, initial processing and analysing
2.2	13:20	Exercise 2 Review: Cross validating satellite altimeter data and tide gauge data (DC)
2.3	13:40	Introduction to GNSS and GNSS-IR – data and applications (SW)
2.4	14:00	The Long-term view for the Madagascar Portagauge. (AH, DC) • Factors in deciding future locations? • Benefits for users
2.5	14:30	Next steps in the PASS-SWIO Project, Final Discussions
	15:00	Close

WP1200 – Follow up Training: Data Processing and Validation

At DGM Offices Antananarivo – 13,14 February 2024

- Checking, validation of tide gauge data (use of TASK software)
- Processing and submission of GNSS data (CSRS-PPP online system)
- Satellite altimeter data
  - Python routines
  - Accessing, processing and validation
  - Analysis of sea level variability.

WP1300 – Engagement with MDG Agencies

Objectives

- Ensure any planned development meets key requirements,
- Complements existing capability
- Sustainable in the long-term, taking into account resource requirements.

WP1300 – Engagement with MDG Agencies

- **Online meeting early in project (September 2022)**
  - Present project.
  - Invite expressions of interest.
  - Establish interest / requirements for improved sea level monitoring
- **Questionnaire (Sept – Nov 2023)**
  - User background and experience
  - Priorities and interests in sea level measurements
- **Face to Face Meetings (Feb 2024)**
  - Present results and discuss recommendations

WP1300 – Engagement with MDG Agencies

PASS-SWIO User Engagement Webinar 14 September 2022

- 24 registrations
- 5 Presentations
  - Overview of PASS-SWIO (A Becker)
  - Impacts of Sea Level Rise for Madagascar (H Razafindrainibe)
  - Measuring Sea Level – Tide Gauges and Satellites (D Cotton)
  - The Madagascar Portagauge (G Hargreaves)
  - Introduction to Sea Level Variability (A Hibbert)
  - The PASS –SWIO Questionnaire (D Cotton)
- Presentations and recording available on Project Web-Site

Webinar for Users 14 September 2022

An important aspect of PASS-SWIO is to engage with current and potential users of sea level data in Madagascar to understand the main requirements for sea level information, and gaps in current availability.

To support this objective, a webinar was held on 14th September 2022. The webinar introduced the PASS-SWIO project, provided scientific context to sea level change in the South-West Indian Ocean, and introduced an online questionnaire.

5 presentations were made and are available through the links below:

- Overview of PASS-SWIO (Amani Becker)
- Impacts de lelevation du niveau de la mer (Haja Razfindrainibe)
- Measuring Sea Level - Tide Gauges and Satellites (David Cotton)
- The Madagascar Portagauge (Geoff Hargreaves)
- Introduction to Sea Level Variability (Angela Hibbert)
- The PASS-SWIO Questionnaire (David Cotton)

A recording of the workshop is available on youtube at https://youtu.be/CfJy5EfaHf4

WP1300 – Engagement with MDG Agencies

PASS-SWIO User Questionnaire

English and French Versions

- Objective to understand requirements of users in Madagascar for Sea Level Data, with relevant background information
- Results in "*PASS-SWIO_UserQuestionnaire_Summary_V1.0.docx*"
- 17 Responses – 11 from government agencies, 3 from NGOs and 3 research scientists.
- Interest in sea level data for most of the Madagascar coastline
- Priorities: Coastal retreat, marine erosion, coastal protection works, livestock and marine culture, hotels, urban planning, sea level rise, tidal predictions, cyclone surges
- Problems:
  - Data Issues: Sparse data, difficult to access, no / limited real time data,
  - Resources: Lack of means and logistics for surveillance, technical and computer hardware
  - Knowledge and Skills: for analysing data

WP1300 – Engagement with MDG Agencies

Face to Face (and online) meetings – February 2024 (1)

- **IH.SM – Institut Halieutique et des Sciences Marines**
  - Based in Toliara, hosts national oceanographic data base, tide gauge programme with first oceanographic institute of China.
  - Information on plans for tide gauges.
- **DGM - Direction Générale de Météorologie**
  - National Meteorological Agency, partners in PASS-SWIO
  - Main office in Antananarivo, regional offices across Madagascar.
  - Responsibility for operating and maintaining Portagauge, and for processing data
  - Training in data processing, discussed future plans.
- **FTM - FOIBEN-TAONTSARINTANIN' I MADAGASIKARA**
  - National Geographic and Hydrographic Agency
  - Responsible for marine charts and surveying
  - Interest in GNSS data, (and improved geoid)
  - Agreed to carry out benchmark surveys for future Portagauge installations

WP1300 – Engagement with MDG Agencies

Face to Face (and online) meetings – Feb 2024 (2)

- **Ministry of Spatial Planning**
  - Responsibility for coordinating marine activities including tourism, aquaculture, and fishing.
  - Emphasised importance of data sharing.
- **APMF – Agence Portuaire Maritime et Fluviale**
  - National body responsible for the management of ports, maritime areas and rivers in Madagascar.
  - Very interested in improved tide forecasts and keen to collaborate with future actions.
- **BNGRC - Bureau Nationale de Gestion des Risques et des Catastrophes**
  - Interest in Tsunami and improved modelling of flod depth and extent
- **CFIM - Centre De Fusion D'Information Maritimes**
  - National and regional centre for integrating maritime information to support operational activities.
  - Has an interest in receiving real-time sea-level information and tidal predictions

WP1400 – Project Web Page

PASS-SWIO

Portagauge and Satellite Sea Level Monitoring System for the Southwest Indian Ocean

Home | Documents | Data | Publications | Training

PASS-SWIO is a project funded by ESA which aims to establish a sea level monitoring system for Madagascar based on the installation and deployment of a low-cost relocatable tide gauge (Portagauge). Portagauge uses GNSS interferometric reflectometry (GNSS-IR) technology alongside a conventional radar. By combining these measurements with the analysis of satellite altimeter sea level data we will provide validation and wider scale knowledge of sea-level variability.

Madagascar has very limited tidal prediction, primarily based on model data. It has no national sea level monitoring capability. There is currently only one functioning tide gauge station. A previous tide gauge, in the cyclone-prone north of the island, was destroyed several years ago.

The project partners will work with the national Madagascar Meteorological Agency (DGM Direction Generale de la Meteorologie). DGM will take responsibility for the local maintenance and operation of the Portagauge. They will also receive training to carry out the data processing and analysis of tide gauge and satellite altimeter data.

Discussions will be held with key stakeholders to review the project and agree a long-term Road Map for the sustainable implementation of a national sea-level monitoring system for Madagascar. This will serve as model for other island states and coastal countries in the South West Indian Ocean (SWIO) region and beyond.

If you would like to access any of the data sets produced, please contact the Project Manager (see below).

Latest news

Portagauge installed at Toamasina, Madagascar

The Portagauge was successfully installed at Toamasina harbour on 12-16 June 2023, by a technician from NOC(UK) with support from DGM staff. Initial assessment shows that the Portagauge is working as expected and measurements are being recorded from the tide gauge radar and GNSS-R sensor.

The Portagauge installation manual is available (in English and French) via the Documents tab at the top of this page.

The Portagauge deployed at Toamasina, Madagascar

Near Real Time data

A Data Demonstration page, set up for the C-RISe project, is available, which shows near real time satellite wind, wave and surface current data together with present model forecast conditions.

Webinar for Users 14 September 2022

Project activities

Work Package 1000 User Engagement & Capacity Building:

- Training to local DGM staff on Portagauge installation and data processing
- Engagement with stakeholder agencies in Madagascar
- Project website with links to data

Work Package 2000 Portagauge Manufacture, Installation & Operation:

- NOC will finalise the design and manufacture of the Portagauge
- NOC and SatOC will organise the shipping of the Portagauge to Madagascar and it will be installed at the first site with assistance from DGM
- Operational monitoring of the instrument and data will be carried out remotely by NOC and in situ by DGM

Work Package 3000 Sea Level Data Processing:

- Processing and analysis of sea-level data from Portagauge to output quality controlled time series
- Processing of satellite altimeter data from Jason and Sentinel-3 to output quality controlled along-track Total Water Level Envelope time series
- Cross-validation of satellite and Portagauge data
- Analysis of tidal and non-tidal sea level variability characteristics

Work Package 4000 Sustainable Implementation Road Map:

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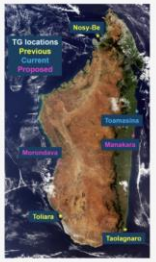
Study area

Madagascar, showing previous, current, and proposed Tide Gauge Locations, and Toamasina Harbour



Contact

Project Manager: Amani Becker, NOC (abeck at noc.ac.uk)

- Identify and document the requirements for Malagasy sea level monitoring capability through consultation with stakeholders
- Draft plan of future Portagauge deployment sites in Madagascar
- Generate road map, with input from stakeholders, for sustainable implementation of sea level monitoring

Key Dates and Meetings

Project Kick Off (May 2022): Planning and confirmation of project timetable

Stakeholder Meeting - Webinar (September 2022): (Online meeting) Introduce project, establish requirements for improved sea level monitoring

Portagauge Installation (June 2023): Installation of Portagauge in Madagascar and training for operation

Mid Term Review (July 2023): Review of progress, confirm planning for second phase

Online Training (12, 18 October 2023): Processing and validation of tide gauge and satellite altimeter data

Face to Face Training (January 2024): (in Madagascar) Processing, assessment and validation of data from installed portagauge

Stakeholder Meeting (January 2024): (In person) Presentation of project results, discuss recommendations

Final Review (February 2024): Presentation and review of project results

Project team

https://www.satoc.eu/projects/pass-swio/