IMOS Integrated Marine Observing System

Australian Ocean Data Network (AODN)

Coastal Wave Buoys – WORKFLOW

Version 1.0

9th December 2024

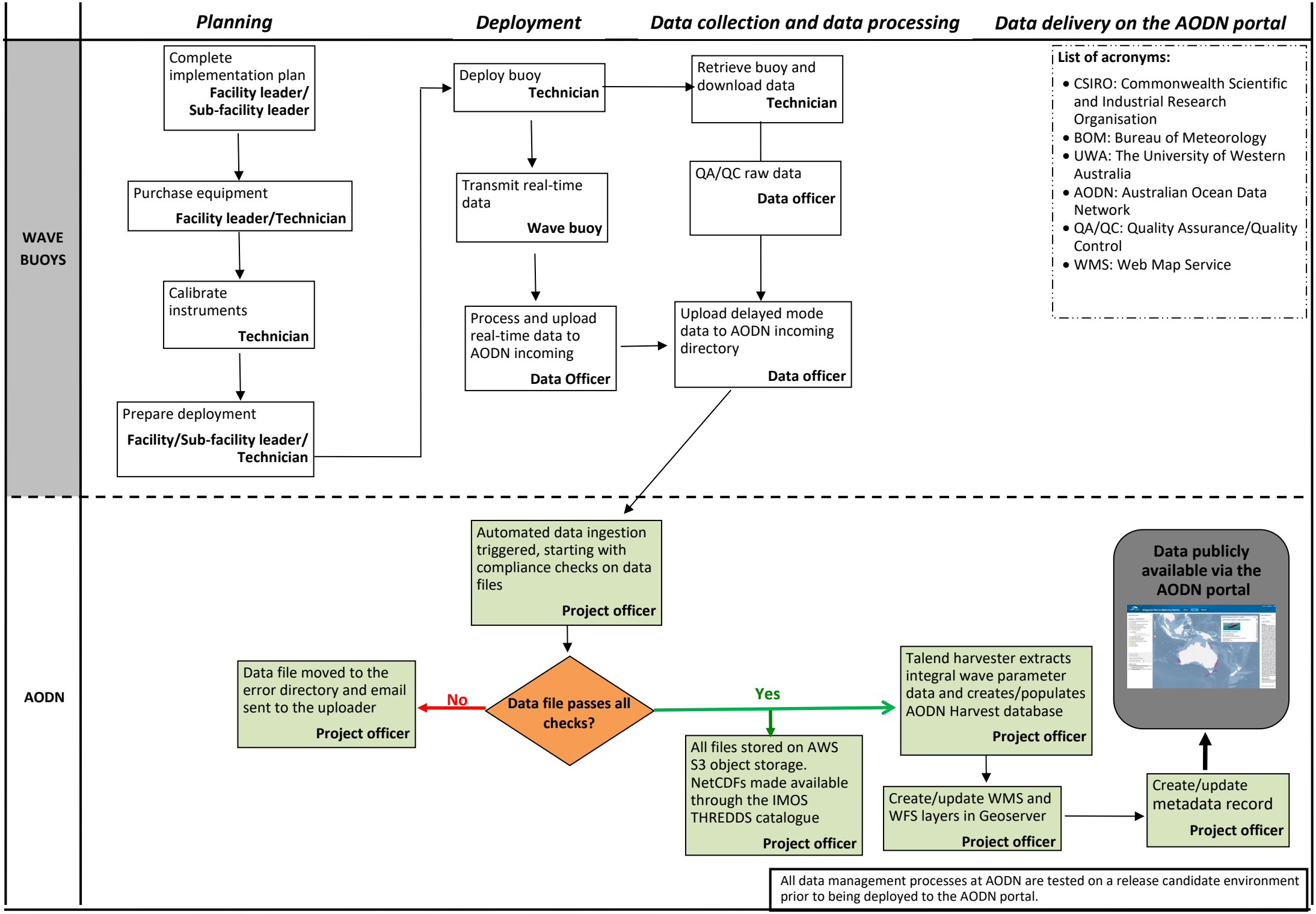
Data Workflows

The AODN, in managing the data for IMOS, has developed workflows for each IMOS sub-facility to describe the flow of IMOS data from planning through data collection to data delivery and public data access.

The primary goals of this workflow are to:

- Improve data flow and data handoff, making tracking of data status easy and preventing data loss
- Identify and delimit precisely the responsibilities of each person involved
- Improve communication at the interface between IMOS facilities and the AODN
- Improve transparency for end users by providing more details to populate metadata records (*i.e.* limitations and processing methods applied to datasets)
- Assist in reporting planned deployments against actual deployments and data delivery

The workflow is available on the next page of this document. Additional information (*i.e.* timeline, input, output, step description) for each operation step is available in the 'Supporting Information' section. The role and contact details of people involved in the workflow are summarised in a table at the end of the document.


Planning
Deployment
Data collection and data processing
Data delivery on the AODN portal
WAVE BUOYS
AODN
Complete implementation plan
Facility leader/ Sub-facility leader
Purchase equipment
Facility leader/Technician
Calibrate instruments
Technician
Prepare deployment
Facility/Sub-facility leader/ Technician
Deploy buoy
Technician
Transmit real-time data
Wave buoy
Process and upload real-time data to AODN incoming
Data Officer
Retrieve buoy and download data
Technician
QA/QC raw data
Data officer
Upload delayed mode data to AODN incoming directory
Data officer
List of acronyms:
CSIRO: Commonwealth Scientific and Industrial Research Organisation
BOM: Bureau of Meteorology
UWA: The University of Western Australia
AODN: Australian Ocean Data Network
QA/QC: Quality Assurance/Quality Control
WMS: Web Map Service
Automated data ingestion triggered, starting with compliance checks on data files
Project officer
Data file passes all checks?
No
Data file moved to the error directory and email sent to the uploader
Project officer
Yes
All files stored on AWS S3 object storage. NetCDFs made available through the IMOS THREDDS catalogue
Project officer
Talend harvester extracts integral wave parameter data and creates/populates AODN Harvest database
Project officer
Create/update WMS and WFS layers in Geoserver
Project officer
Create/update metadata record
Project officer
Data publicly available via the AODN portal
All data management processes at AODN are tested on a release candidate environment prior to being deployed to the AODN portal.

Supporting information

Phase	Operation step	Timeline	Input	Output	Step description	Step operator
Planning	**Complete implementation plan**	**Annual**	• IMOS funding • Node Science plans	Implementation plan		**Facility leader/ Sub-facility leader**
	Purchase equipment	**Annual**	Instrument and buoy specification	Instruments and buoy available	Purchase instruments and other necessary equipment	**Facility leader Technician**
	Calibrate instruments		Instruments available	Instruments operational and ready to deploy	Ensure instruments are calibrated when needed	**Technician**
	Prepare deployment	**One week**	• Implementation plan • Buoy ready to deploy	Deployment plan	Record buoy equipment configuration for deployment.	**Facility/Sub-facility leader and Technician**
Deployment	**Deploy buoy**	**One day**	• Deployment plan • Operational equipment	• Buoy deployed	Record deployment metadata	**Technician**
Data collection and processing	**Transmit real-time data**	**Every hour**	Buoy deployed	Real-time data transmitted	Wave buoy data (Integral wave parameter, spectral data, surface temperature if available) automatically published on the SOFAR API	**Wave Buoy**
	Process and upload real-time data to AODN incoming	**Every hour**	Real-time integral wave parameter (and surface temperature if available), wave spectral data transmitted	Real-time data in NetCDF format	• Apply automated quality-control procedures to the real time data. • Aggregate dntegral wave parameter and surface temperature, and wave spectral data in monthly files and convert to NetCDF format. • Upload real time monthly files to AODN incoming directory.	**Data officer**

	Retrieve buoy and download data	**One day**	Deployment completed	Buoy retrieved	Buoy recovered. Memory card retrieved	**Technician**
	QA/QC raw data	**1 month after recovery**	Raw wave buoy displacements from buoy memory card	All deployment data in NetCDF file	• Raw wave buoy displacements processed to produce integrated parameters, spectral parameters, and displacement (x,y,z) timeseries • QAQC tests following QARTOD conventions applied to integrated and spectral parameters • Process quality-controlled delayed mode data to NetCDF file	**Data officer**
Data collection and processing	**Upload delayed mode data to AODN incoming directory**	**6 months**	NetCDF data files	NetCDF data files in AODN incoming directory	Upload integral wave parameter, wave spectra and raw displacement of surface elevation quality-controlled data in NetCDF files to AODN incoming directory	**Data officer**
	Automated data ingestion triggered, starting with compliance checks on data files	**Automatic (upon file reception)**	NetCDF files available in the AODN incoming directory	Valid files ready to be published, non-compliant files moved to error directory	Handling of incoming files is automatically triggered when a file arrives in the AODN incoming directory. Checks are applied to verify that each file • is a correct data product for that upload location; • is a valid NetCDF file; • is compliant with the CF and IMOS conventions. Any file that fails any of these checks is moved to an error directory and the uploader is notified by email. The steps below are only performed for files that pass all checks.	**AODN Project officer**
	All files stored on AWS S3 object storage. NetCDFs made available through the IMOS THREDDS catalogue		Valid files.	All files stored on S3 and accessible via IMOS THREDDS catalogue.	All valid data files are copied to the AWS S3 object storage. All files are then publicly available. NetCDFs are also made available on the IMOS THREDDS catalogue.	**AODN Project officer**

	Talend harvester extracts integral wave parameter data and creates/populates AODN Harvest database		Valid NetCDF files	Metadata and integral wave parameter data in database tables for access via WMS/WFS	Harvester extracts and stores in database: • the metadata required to make the files accessible via the AODN Portal • Integral wave parameter data (measurements)	**AODN Project officer**
Data delivery on the AODN portal	**Create/update WMS and WFS layers in Geoserver**	**Automatic update**	Populated AODN Harvest database tables	WMS and WFS layers created in Geoserver	• Database tables and/or views are used to create a WMS and WFS layer in Geoserver. • Configure the pop-up window (content.ftl) and filters. • Create style for WMS visualisation.	**AODN Project officer**
	Create/update metadata record		Populated AODN Harvest database tables	GeoNetwork record created and configured to support data discovery, visualisation and download via the AODN portal	• Create a metadata record with a new UUID. • Configure the newly created record (*e.g.* abstract, point of contact, parameters, timeframe). • Fill out the distribution section with links to the corresponding Geoserver WMS and WFS layers and other AODN's download services. • Talend harvester automatically updates bounding box.	**AODN Project officer**

Contact details (as at December 2024)

	Role	Name	Institution	Email address
Wave Buoys	**Facility leader (Coastal Wave Buoys)**	Michael Cuttler	UWA	michael.cuttler@uwa.edu.au
	Technician (Coastal)	Ronni King	UWA	ronni.king@uwa.edu.au
	Data Officer	Thiago Caminha	UWA	thiago.caminha@uwa.edu.au
	Technician (Coastal)	Matthew Hatcher	UWA	matthew.hatcher@uwa.edu.au
AODN	**Project officer**	Eva Cougnon	UTAS	Eva.cougnon@utas.edu.au
	Data services team leader	Benedicte Pasquer	UTAS	Benedicte.Pasquer@utas.edu.au

Supporting links

AODN Portal: http://portal.aodn.org.au

AODN Portal help page: https://help.aodn.org.au/

IMOS metadata catalogue: http://catalogue-imos.aodn.org.au/geonetwork/

Wave buoys Observations - Australia - delayed (National Wave Archive) metadata record: https://catalogue-imos.aodn.org.au/geonetwork/srv/api/records/2807f3aa-4db0-4924-b64b-354ae8c10b58

Wave buoys Observations - Australia - near real-time metadata record: https://catalogue-imos.aodn.org.au/geonetwork/srv/api/records/b299cdcd-3dee-48aa-abdd-e0fcdbb9cadc

Data upload instructions https://help.aodn.org.au/aodn-ftp-upload/ (contact AODN for access)

Coastal Wave Buoys data on S3 server: https://data.aodn.org.au/?prefix=IMOS/COASTAL-WAVE-BUOYS/

Coastal Wave Buoys data via THREDDS server: https://thredds.aodn.org.au/thredds/catalog/IMOS/COASTAL-WAVE-BUOYS/catalog.html

IMOS user code library: https://github.com/aodn/imos-user-code-library

Wave pipeline scripts on GitHub: https://github.com/aodn/python-aodndata/tree/master/aodndata/aodn_wave

IMOS website: http://www.imos.org.au/

Coastal Wave Buoys facility: https://imos.org.au/facility/coastal-wave-buoys