**Use Case – Coastal Sea Level Warnings**

**ICSM**

**CANBERRA, ACT**

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# Introduction

The Bureau of Meteorology provides community forecasts of marine conditions that include sea level. When coastal sea level events are expected to pose a risk, warnings are issued. Coastal sea level warnings fundamentally involve a spatial relationship between marine data and land-based assets; but the elevation relationship between these is not accurately known around the coast.

Marine forecasts rely on bathymetric data that is related to tidal planes; either Mean Sea Level (MSL) or Lowest Astronomical Tide (LAT) for marine charts. Both tidal planes are ultimately derived from analysis of tide gauge observations.

Observations of sea level are important to coastal warnings for real time monitoring and initiation of forecast systems. This data is available from tide gauges and some satellites, but reduction of observed heights to a common reference can be problematic.

In contrast, most land-based elevations are surveyed to Australian Height Datum (AHD) and increasingly to the latest Geodetic Datum of Australia (GDA2020). Geodetic or ellipsoidal heights are rapidly becoming a standard coastal reference with the expansion of modern positioning (GNSS).

Well-defined offsets between marine and land-based reference surfaces will facilitate improved coastal warnings for Australia with respect to:

(1) spatial accuracy of hydrodynamic forecasting systems;

(2) value of sea level observations – both insitu and remote, and

(3) communication of impacts associated with coastal sea level events.

# Issue

Coastal sea level warnings combine both marine and land-based elevation data to inform significant decisions. Elevations near the coast are not routinely known relative to a single common reference, so transfer between datums is required to produce useful warnings. This transfer is currently problematic due to poorly known offsets between the references in use.

# Use Case

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| --- | --- | --- | --- | --- | --- |
| **Name of Use Case:** | Coastal sea level warnings | | | | |
| **Created By:** | AUSHYDROID WG | | | **Last Updated By:** | Andy Taylor |
| **Date Created:** | 23/12/2019 | | | **Last Revision Date:** | 17/12/2021 |
|  | | |  | | |
| **Description:** | | | Coastal sea level warnings require well-defined combination of heterogenous elevation data sources; notably between land and marine datums. At present such transfers are problematic. | | |
| **Actors:** | | | Bureau of Meteorology. Commercial weather forecasting firms. Emergency Services. Coastal councils and authorities. | | |
| **Preconditions:** | | | 1. Assets exposed to risks as a function of coastal sea level. 2. Coastal sea level risk mitigation decisions are possible. 3. Coastal sea level forecasting systems exist. 4. Warning systems rely on inputs related to a mixture of references including chart datum and GNSS ellipsoid. | | |
| **Postconditions:** | | | 1. Data suppliers can continue to utilise different elevation references. 2. Coastal actors can continue to utilise different elevation references. 3. Coastal sea level warnings accurately reflect elevations relevant to mitigation decisions. | | |
| **Flow:** | | | 1. Coastal actors measure elevation of assets relative to datums of their choice, possibly using GNSS. 2. DEM data produced relative to any datum. 3. Sea surface height observations reported relative to any datum. 4. Coastal sea level forecast system developers (e.g. Bureau of Meteorology) collate land and marine data sources and transfer to common system datum. Transfer will require a well-defined AUSHYDROID offset surface. 5. Forecasts and warnings accurately reflect relationship between assets and coastal sea level. 6. Repeated update cycle for continual improvement. | | |
| **Alternative Flows:** | | |  | | |
| **Exceptions:** | | | 1. In step 4 of the normal flow, if the AUSHYDROID offset surfaces do not exist:    1. Poorly defined transfer between forecast sea level and assets based on approximate equivalence of MSL and AHD.    2. Warnings only approximate actual impact and mitigation decisions not well-founded. | | |
| **Requirements:** | |  | | | |

Sponsor Acceptance

Approved by the ICSM AUSHYDROID Working Group:

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