

Paper for Consideration by ENCWG3

Active submarine volcanos and ENC display

Submitted by:	Australian Hydrographic Office
Executive Summary:	Portrayal of Active Submarine Volcanos in ECDIS
Related Documents:	S4 B-355.1 and B-428.4
Related Projects:	ENC display subWG; S-101 Portrayal

Introduction / Background

In the last months, 'Carnival Australia' has reported in different forums their concern regarding the way active submarine volcanos display on ECDIS. In particular, they refer to an area in the Solomon Islands where pictures (see below) say more than words.



Photo of an eruption sequence from Kavachi on 10 June 2014 taken from a cruise ship. Courtesy of EYOS Expeditions.

Due to the unpredictable nature of these events and the fact that some volcanos erupt breaking the surface of the sea projecting ashes and other volcanic materials into the air, the AHO thinks it's time to asses if these events could be better encoded and displayed using the current specs and/or think ahead in relation to new encoding and portrayal opportunities using S-101.

At the moment there's no specific encoding guidance in S-57Appendix B.1 Annex A (UOC) and the only charting reference is in S4.

Analysis/Discussion

The submarine volcanos currently charted are based on more than 20 years old mariners' reports and their quantity and position are not accurately known.

Each volcano has been charted as OBSTRN point features and the whole area is covered by a CTNARE area feature.

The OBSTRN encodings contains::

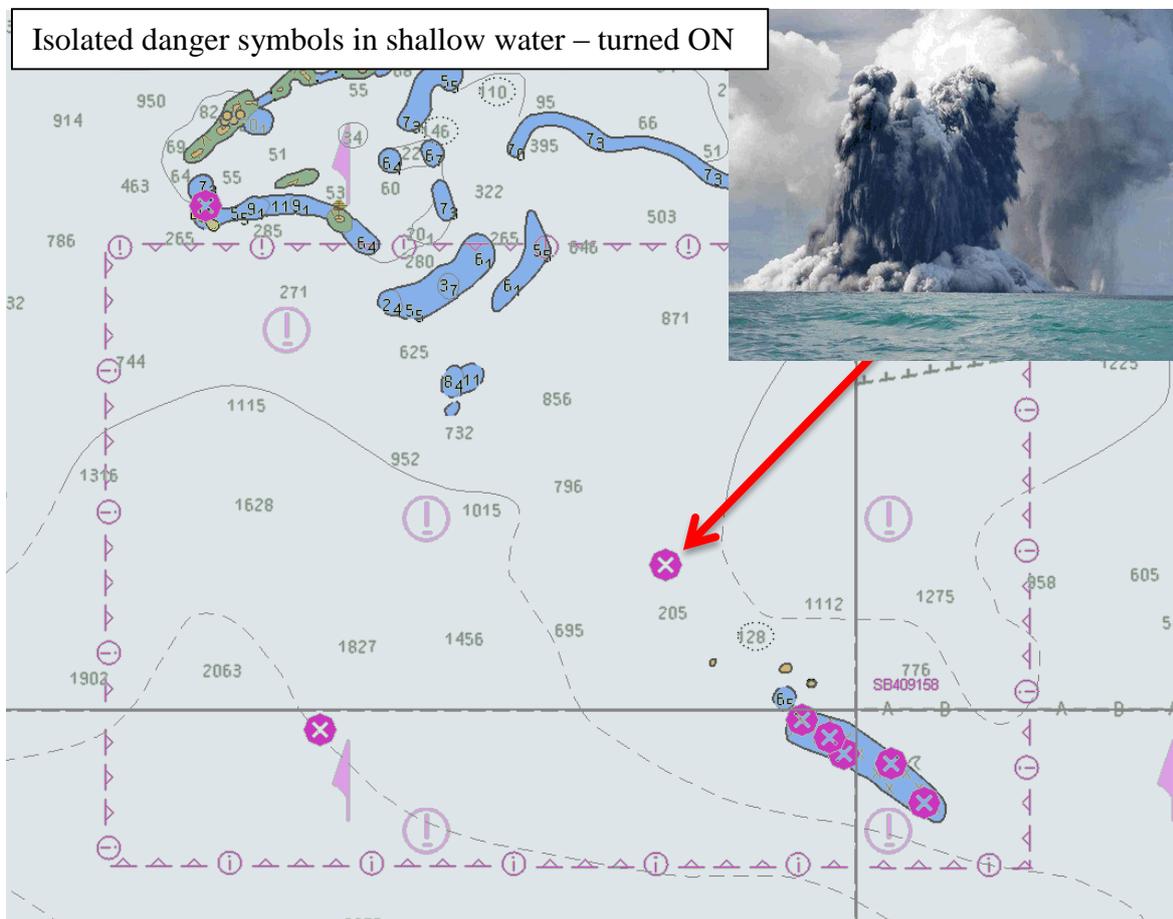
VALSOU=Unknown

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING

QUASOU=2
 WATLEV=3
 EXPSOU=2
 INFORM=Submarine Volcano
 SORDAT=1991
 NATQUA=8

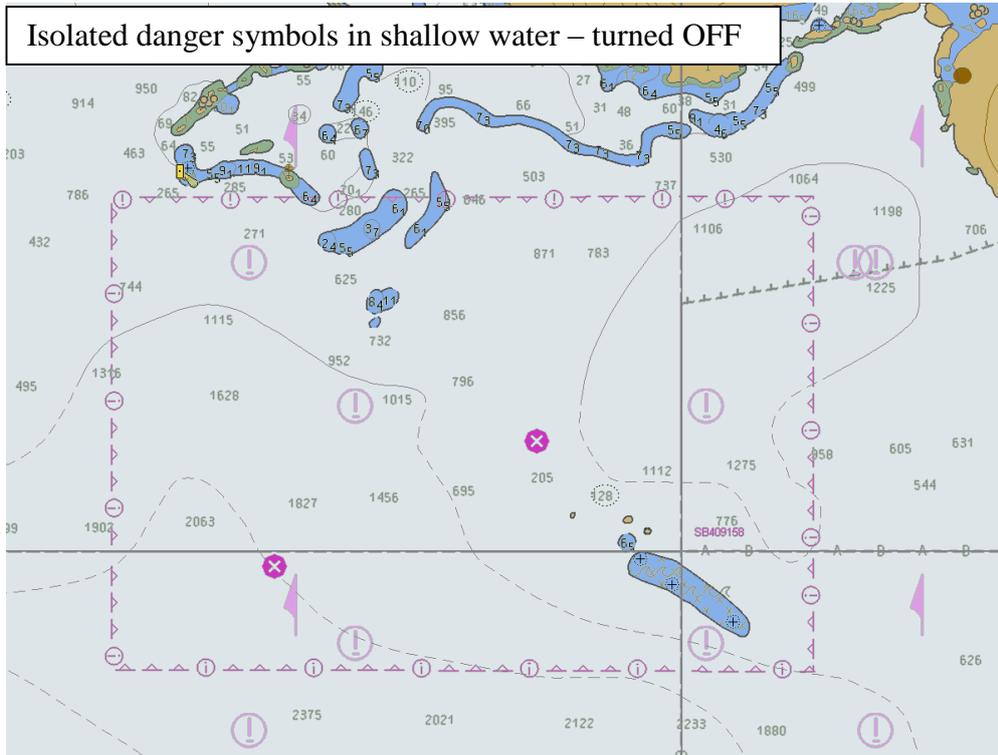
The CTNARE attributes are INFORM=Volcanic Activity and TXTDSC. The original wording of the chart note has been amended in response to Carnival's input to better reflect the event and alert mariners.

ORIGINAL	CURRENT
<p>VOLCANIC ACTIVITY Volcanic and major earthquake activity may have resulted in changes to charted depths and an uplifting of reefs throughout the area.</p>	<p>VOLCANIC ACTIVITY Active submarine volcanos exist in this area. Some volcanos have been reported to erupt breaking the surface of the sea and projecting ashes and other volcanic materials into the air. Changes to charted depths, uplifting of reefs and emerging of volcanic islets may occur throughout the area. Due to the unpredictable nature of these events mariners are strongly recommended to avoid the area.</p>



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Isolated danger symbols in shallow water – turned OFF



The AHO thinks that, based on current standards, there is not much else that can be done to encode these features differently. Display wise, the 'Isolated danger' symbol is the only S52 option for ALL submerged rocks, wrecks and obstructions where the depth is \leq than the safety contour or 'Unknown' (irrespective of any other attribute values).

Active submarine volcanos are highly unpredictable and constantly changing. Their WATLEV value can change from 3 to 1 and back to 3 in less than a month! Below is an extract from one of the latest reports:

'Every few years edifice inflation and lava flow form an ephemeral island that lasts for a few days or weeks before it is eroded by the sea and swell. The edifice can change in spectacular fashion going from 15 metres underwater to a 10-metre high island and back to 22 metres deep in a space of three weeks. Currently, the vent is 10 metres deep and erupting sporadically several times a day ...'

Conclusions

Using the current S-52 PL, ECDIS are not capable of depicting or reacting (alarm wise) differently to dangers which have their 'safety critical attributes' (e.g. WATLEV, EXPSOU) changing in an unpredictable way (e.g. submarine volcanos). At the moment ECDIS handles these features in the same manner than 'static' hazards such as submerged rocks.

In order for the current standards to differentiate and react to these events, 'S-57 Appendix A - Chapter 2 Attribute Catalogue' could be expanded to include:

- a new CATOBS attribute value 'Active submarine volcano' OR
- a new CATOBS attribute value 'Submarine volcano' and a new WATLEV attribute value 'Variable' or similar. This option would allow encoding 'active or inactive' submarine volcanos as well as (potentially) using the new WATLEV attribute value when encoding other features.

Note: S-52 should be amended accordingly in order to be able to handle these new attribute values when displaying and interacting with the product.

Recommendations

Discuss the topic and see if it warrants a different visual display or alarm response in ECDIS and set a way forward in order to implement changes to the current S57 and S52 standards and/or submit this paper to the S-101 PT for their consideration.

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Justification and Impacts

A new encoding/portrayal of hazards with any of their 'safety critical' attribute values affected by unpredictable behaviours (e.g. active submarine volcanos), would improve ECDIS display and management of alerts and warnings to mariners.

If this WG decides to move forward with the S-57 and S-52 amendments suggested in the 'Conclusions' (or any others), resources will be necessary to develop and update the existing standards. This could also impact on the work of the S-101 PT.

Action Required of NIPWG

The ENCWG is invited to:

- a. discuss the content of this paper
- b. decide on the need for a new way of encoding/displaying this type of events
- c. recommend a way forward to manage and implement changes to S-57, S-52 and S-101 (E) and (P).