

SWOT* bathymetry and the search for small seamounts in the Porcupine Abyssal Plain

Peter Croker, The M Horizon (UK) Limited, January 2025

(*Surface Water and Ocean Topography mission)

References

Cameron, J. et al (2002) The Wreck of DKM Bismarck – A Marine Forensics Analysis.

Croker, P.F. (2011) Extending Ireland’s continental shelf jurisdiction to the outer limits in the Porcupine Abyssal Plain: progress, issues and experience to date. Presentation to OPRF International Seminar “Extension of the Continental Shelf and National Ocean Policy - lessons learnt from precedent cases of establishing the limits on the basis of recommendations”, Tokyo, Japan, 9 February 2011.

Hartman, S.E. et al (2021) Enduring science: Three decades of observing the Northeast Atlantic from the Porcupine Abyssal Plain Sustained Observatory (PAP-SO). Progress in Oceanography, 191.

Lampitt, R.S. (2013) Cruise Report No. 22, RRS James Cook Cruise 71, 29 April – 12 May 2012. Porcupine Abyssal Plain: sustained ocean observation. BODC archive, NOC.

Sandwell, D. et al (2024) Gravity, Bathymetry, and Seafloor Tectonics from SWOT. SWOT Science Team Meeting, Chapel Hill, NC, June 17-21, 2024.

Table Of Contents

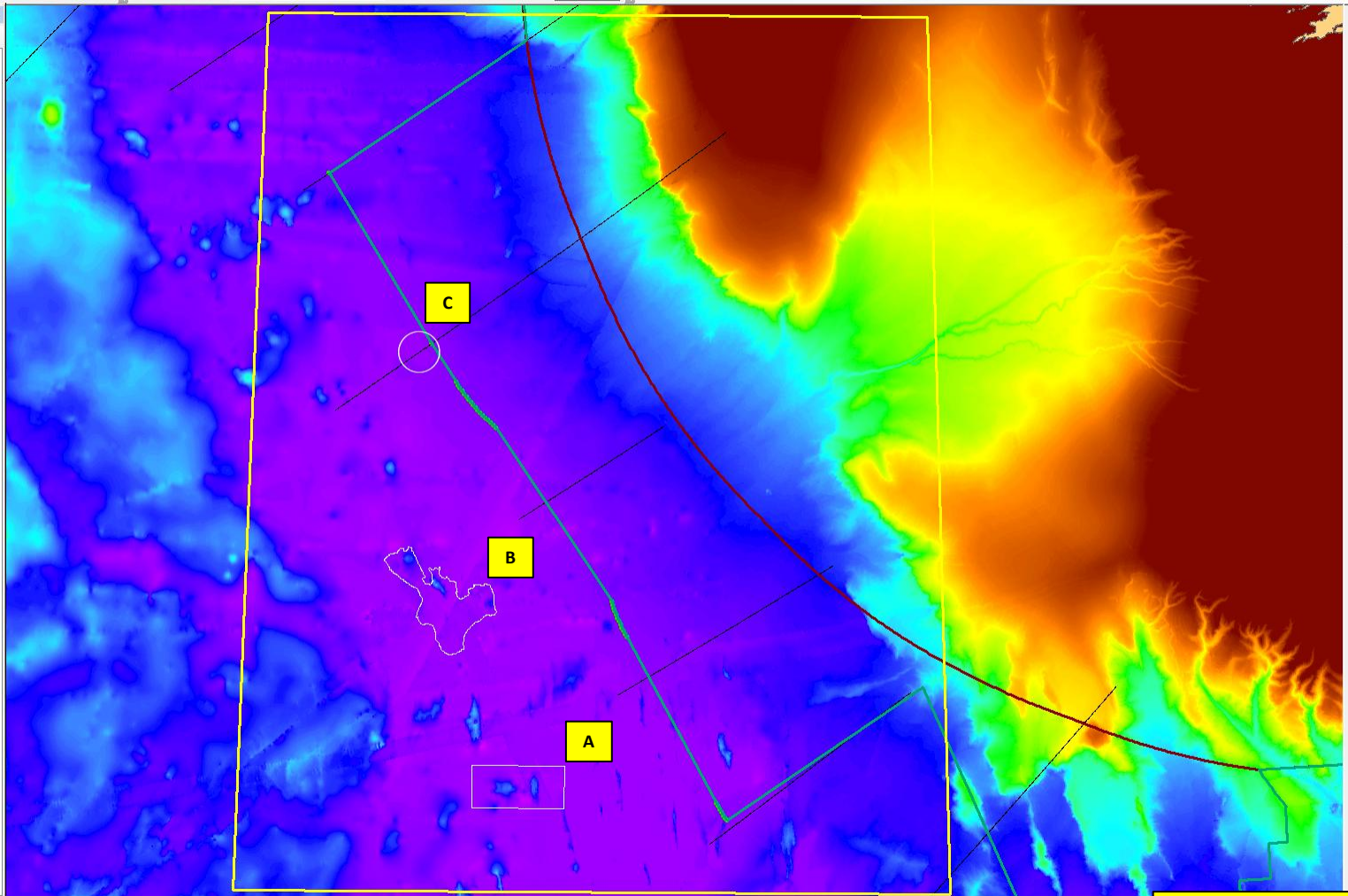
Layers

- PAP_unnamed_seamount
- EMODnet_Bathymetry_2022_SR_PAP_SO
- Ireland_PAP_BSA_box
- Ireland_PAP_AOI_line
- Coastline
- IRL_CS_Designated Area
- IRL_EEZ
- 1995_09_PAD_ECS survey
- Ireland_PAP_Points_Recommendations_2007
- INFOMAR_Seabed_Survey_Coverage_January_2024
- VGG_Curv_SWOT_02.nc
- VGG_Curv_V32.1.nc
- Ireland_PAP_SO
- Bismarck_W
- IRL_2014_Regional_Seismic_Survey
- IRL_2013_Regional_Seismic_Survey
- EMODnet_Bathymetry_2022_SR_BW
- SR_2022_v2
- SYNBAATH_V2.0
- NCEI_Mosaic.tiff
- SRIM_15Plus_V2.6
- SRIM_15Plus_SID_V2.6
- INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
- NCEI_web_trackline_combined_dynamic
- NCEI_web_multibeam_dynamic
- GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
- GEBCO_2024_n90.0_s0.0_w-90.0_e0.0.tif
- EMODnet_2022_E2.tif
- EMODnet_2022_E3.tif

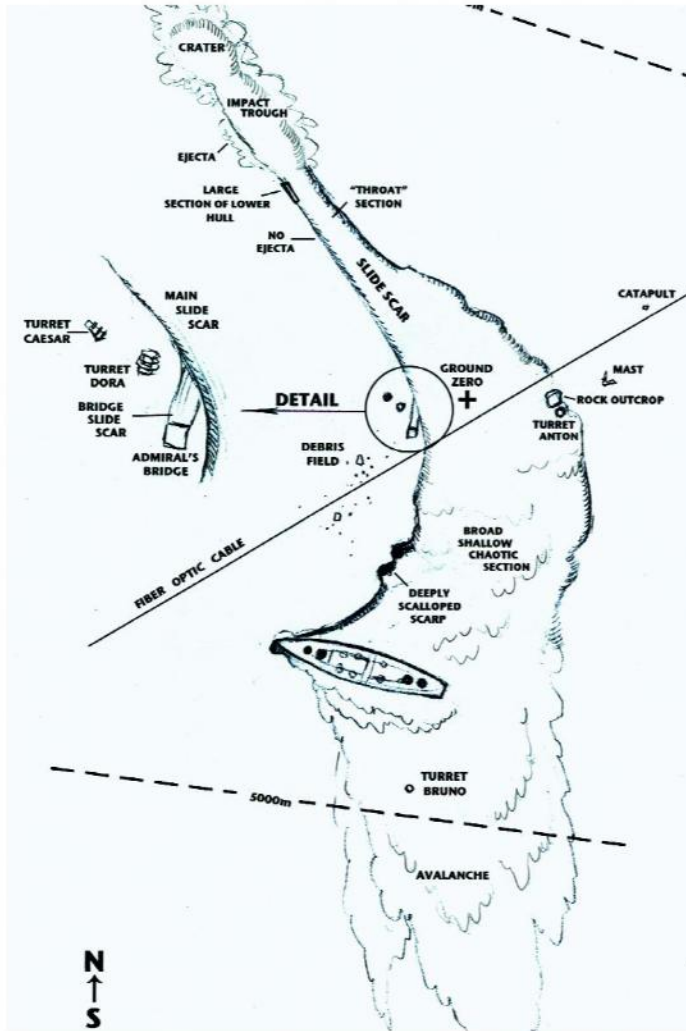
C: Unnamed seamount

B: PAP-SO area

A: Bismarck seamounts
area

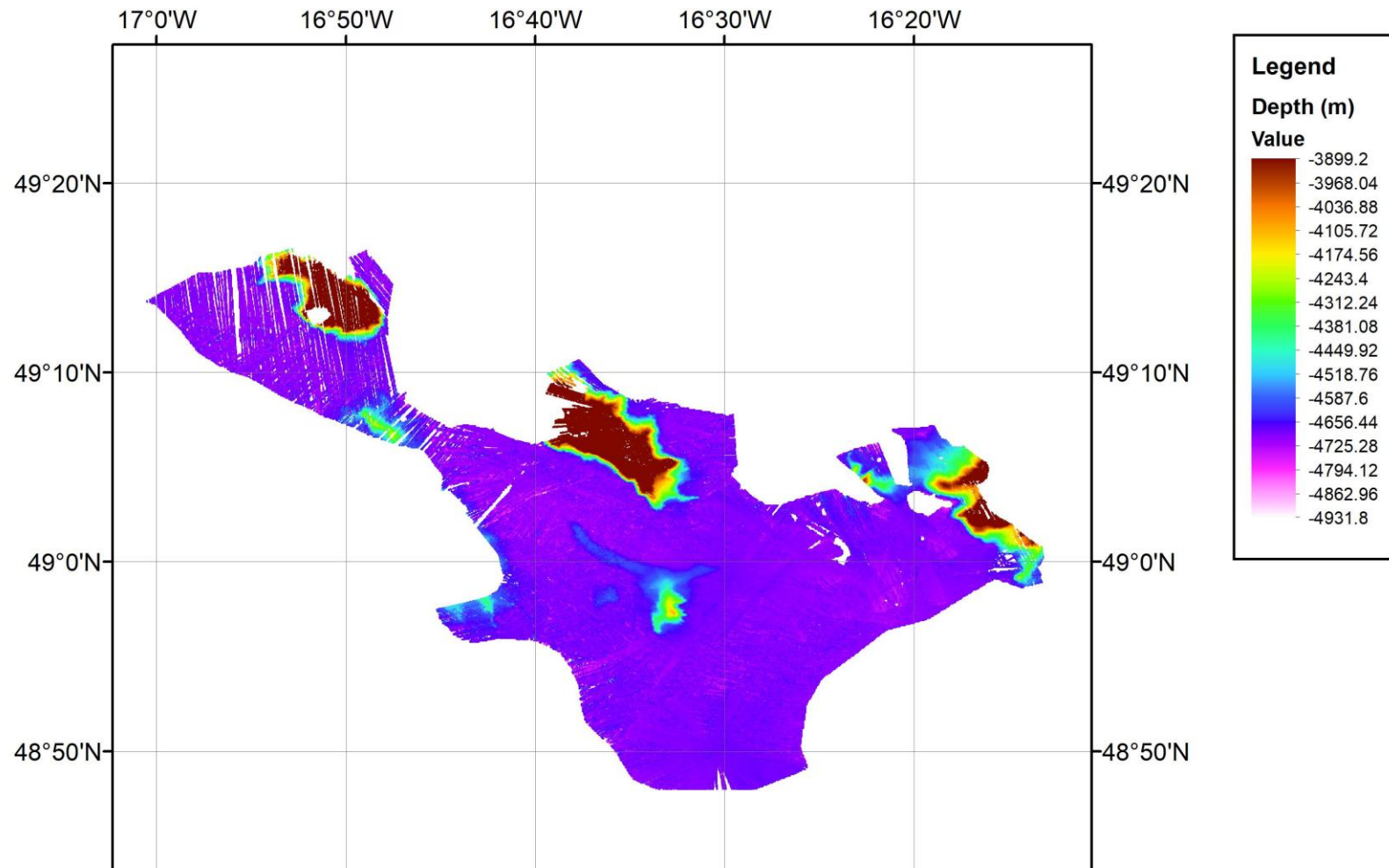


GEBCO 2024
bathymetry

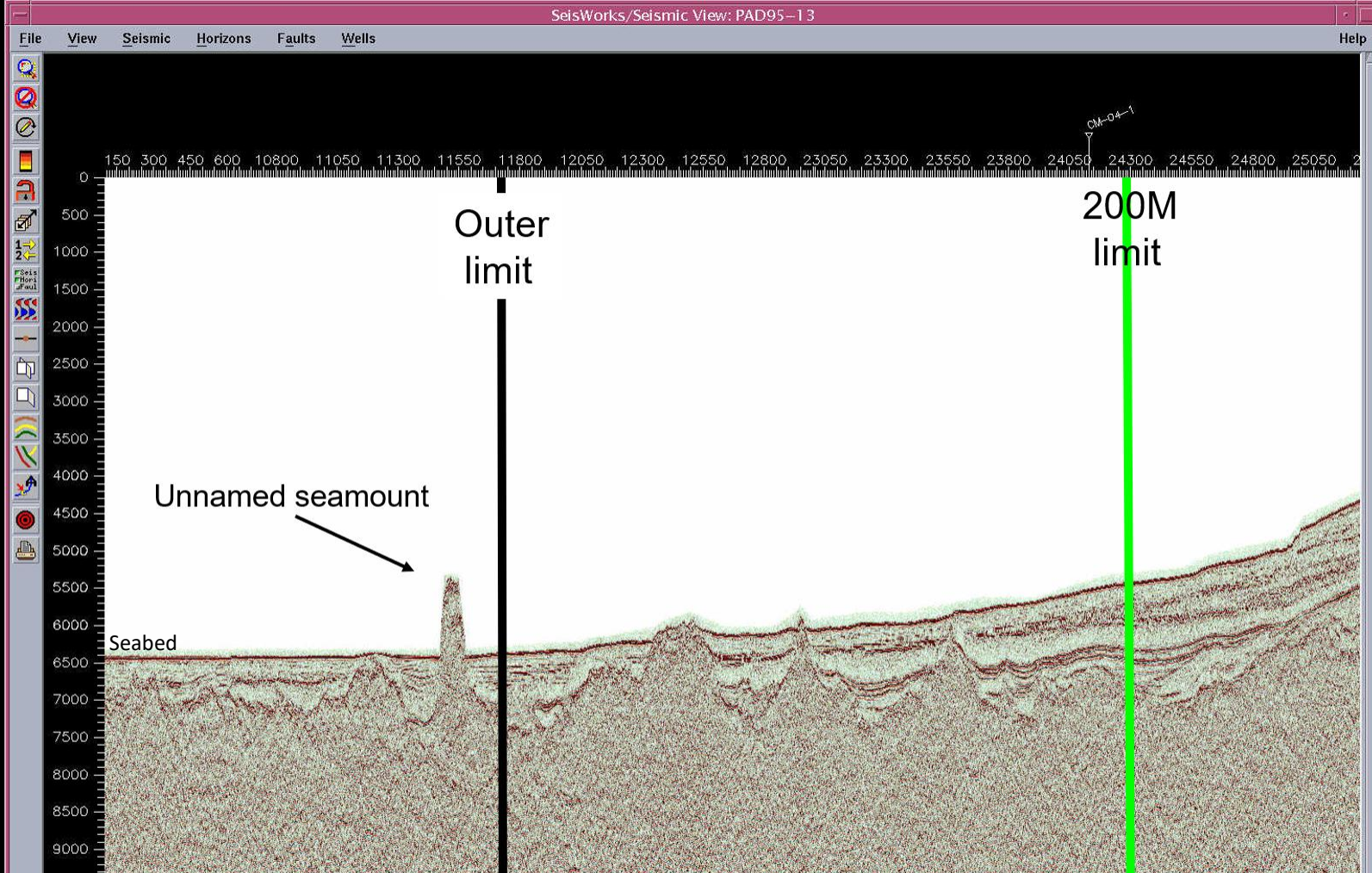


The wreck of *Bismarck* crashed into a seamount, sliding hundreds of meters down its side before coming to rest. Note the alignment of the turrets with the wreck of the Admiral's bridge.

A. "Bismarck seamounts area". These two seamounts appear in all recent bathymetry compilations and the EMODnet 2022 Source Reference shows a MBES track E-W across the box outlined in Slide 6. Details of the location have been kept deliberately vague but Cameron et al (2002) included this detailed drawing of the slide down the flank of the seamount. The seamount is believed to rise some 1,000 m above the surrounding abyssal plain.



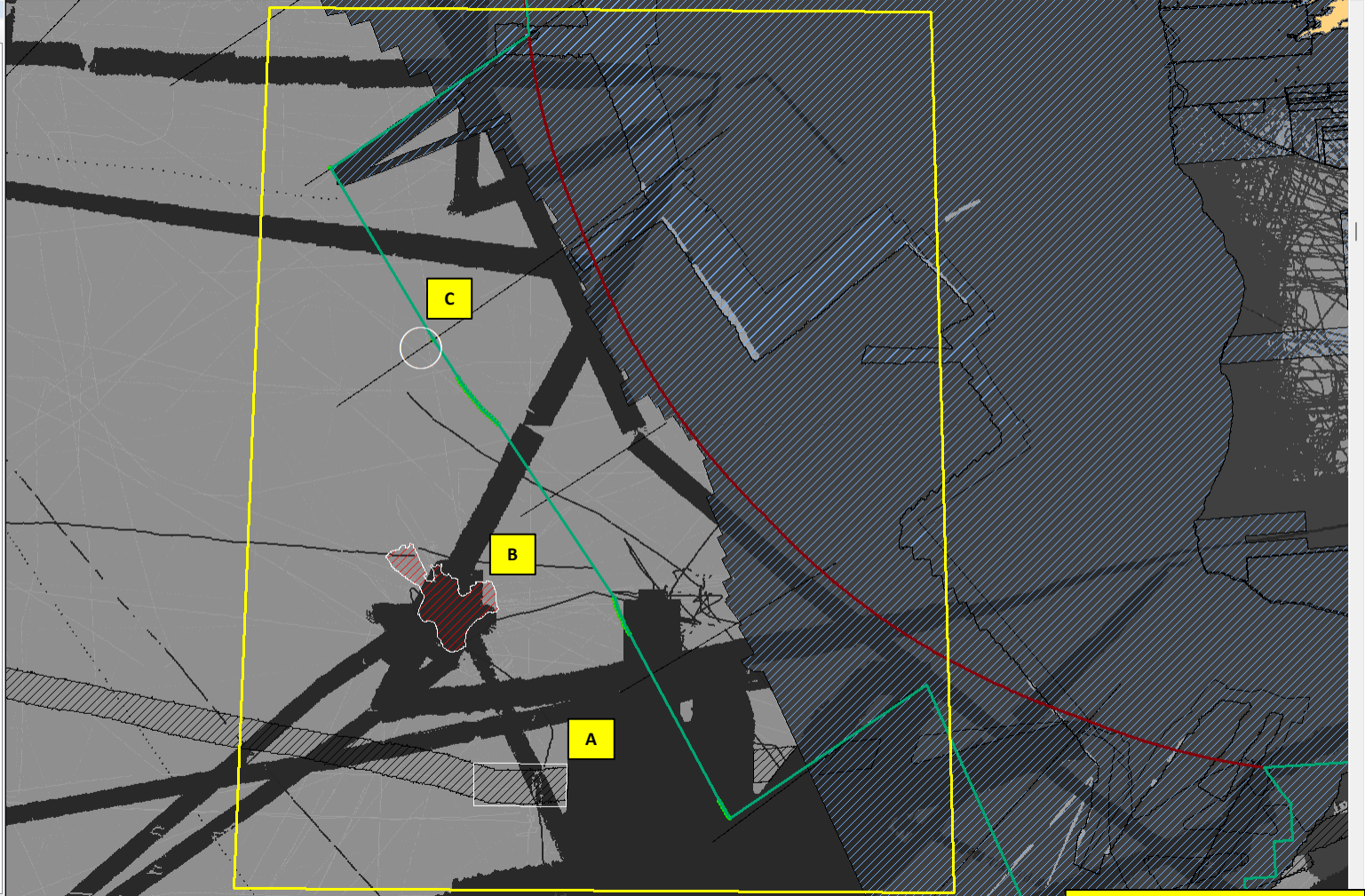
B. PAP-SO. This group of three small seamounts appears in all the recent bathymetric compilations. There are multiple SBES tracks from research vessels visiting PAP-SO as well as a R/V James Cook cruise (JC071, Lampitt (2013)) MBES dataset acquired in 2012. The central seamount ('Ben Billett') of the three in the group has a vertical relief of c. 850 metres and an average width of 6 km. See also Hartman et al (2021).



C. Unnamed seamount. This seamount does not appear on any bathymetry compilations e.g. GEBCO-Seabed 2024, EMODnet 2022, NCEI Mosaic 2024 etc. However, on the new SWOT VGG dataset (Sandwell et al, 2024) the feature becomes visible. On seismic profile PAD95-13 (Croker, 2011) top to base seamount is c. 1000 msec 2XTT which is equivalent to 750m of vertical relief (assuming a water column velocity of 1500m/s). Since only one 2D line is available, the x-dimension is unknown, but is a minimum of c. 3.75 km. Seismic section displayed with high VE.

Table Of Contents

- Layers
- PAP_unnamed_seamount
- EMODnet_Bathymetry_2022_SR_PAP_SO
- Ireland_PAP_BSA_box
- Ireland_PAP_AOI_line
- Coastline
- IRL_CS_Designated Area
- IRL_EEZ
- 1995_09_PAD_ECS survey
- Ireland_PAP_Points_Recommendations_2007
- INFOMAR_Seabed_Survey_Coverage_January_2024
- VGG_Curv_SWOT_02.nc
- VGG_Curv_V32.1.nc
- Ireland_PAP_SO
- Bismarck_W
- IRL_2014_Regional_Seismic_Survey
- IRL_2013_Regional_Seismic_Survey
- EMODnet_Bathymetry_2022_SR_BW
- SR_2022_v2
- SYNBAATH_V2.0
- NCEI DEM Global Mosaic 3 arc seconds_PAP.tiff
- SRTM_15Plus_V2.6
- SRTM_15Plus_SID_V2.6
- INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
- NCEI_web_trackline_combined_dynamic
- NCEI_web_multibeam_dynamic
- GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
- GEBCO_2024_n90.0_s0.0_w-90.0_e0.0.tif
- EMODnet_2022_E2.tif
- EMODnet_2022_E3.tif



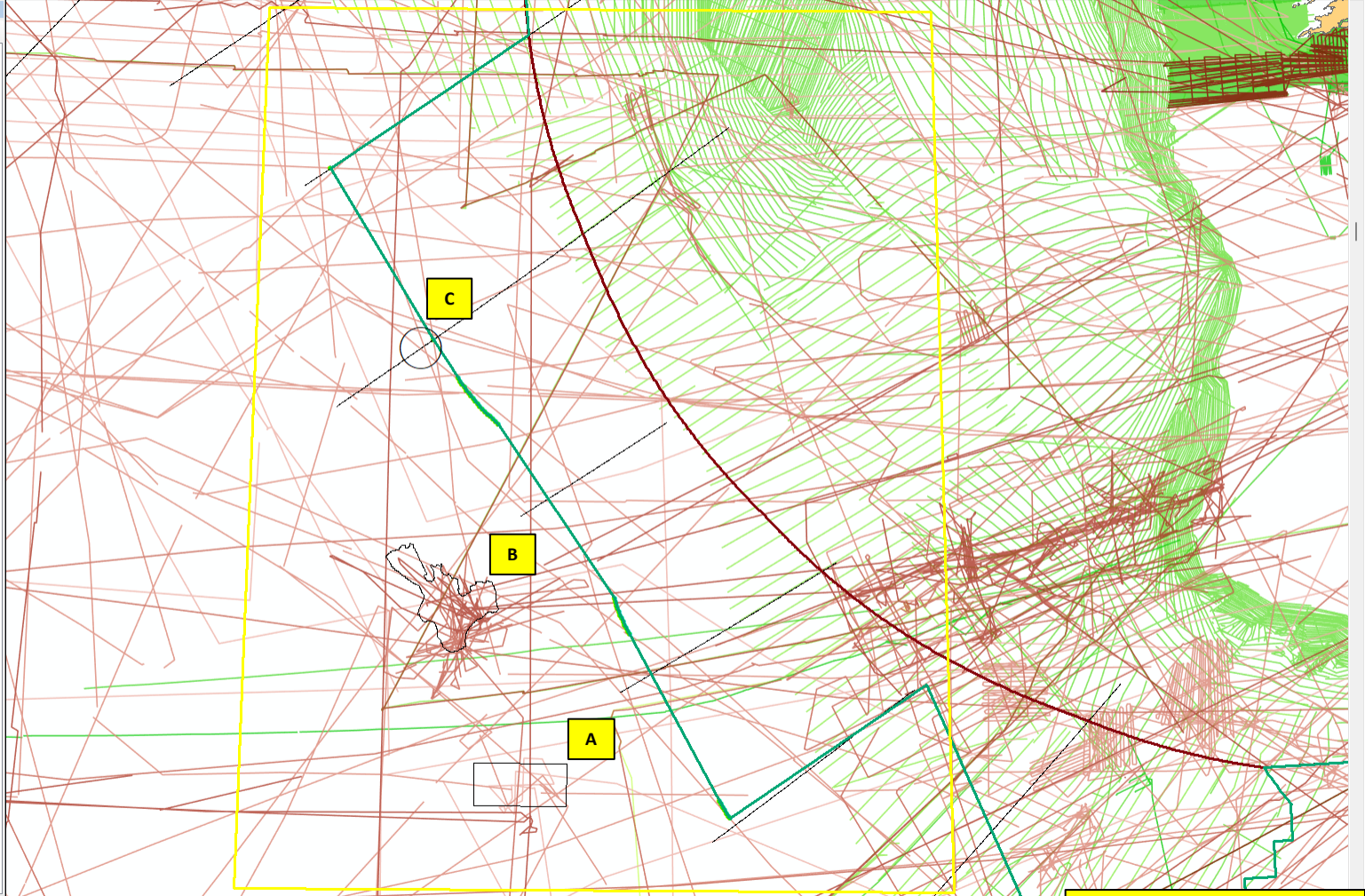
Blue hatched area is
INFOMAR MBES
coverage.

Black hatched and red
hatched areas are
EMODnet 2022
additional MBES
coverage.

GEBCO 2024
bathymetry source ID

Table Of Contents

- Layers
 - PAP_unnamed_seamount
 - EMODnet_Bathymetry_2022_SR_PAP_SO
 - Ireland_PAP_BSA_box
 - Ireland_PAP_AOI_line
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 - IRL_EEZ
 - 1995_09_PAD_ECS survey
 - Ireland_PAP_Points_Recommendations_2007
 - INFOMAR_Seabed_Survey_Coverage_January_2024
 - VGG_Curv_SWOT_02.nc
 - VGG_Curv_V32.1.nc
 - Ireland_PAP_SO
 - Bismarck_W
 - IRL_2014_Regional_Seismic_Survey
 - IRL_2013_Regional_Seismic_Survey
 - EMODnet_Bathymetry_2022_SR_BW
 - SR_2022_v2
 - SYNBAATH_V2.0
 - NCEI_Mosaic.tiff
 - SRTM_15Plus_V2.6
 - SRTM_15Plus_SID_V2.6
 - INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
 - NCEI_web_trackline_combined_dynamic
 - NCEI_web_multibeam_dynamic
 - GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
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 - EMODnet_2022_E3.tif

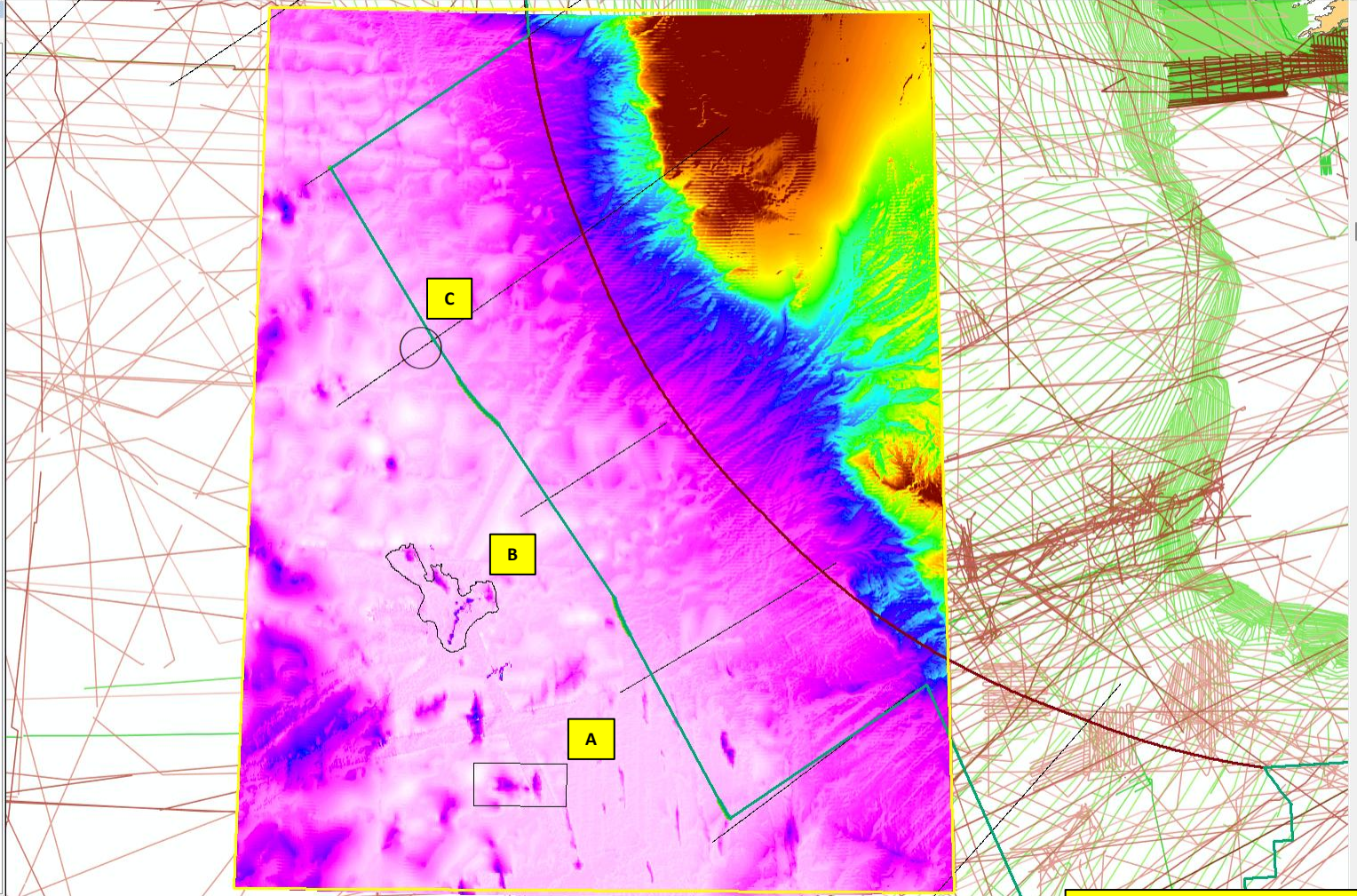


NCEI MBES and SBES tracklines



Table Of Contents

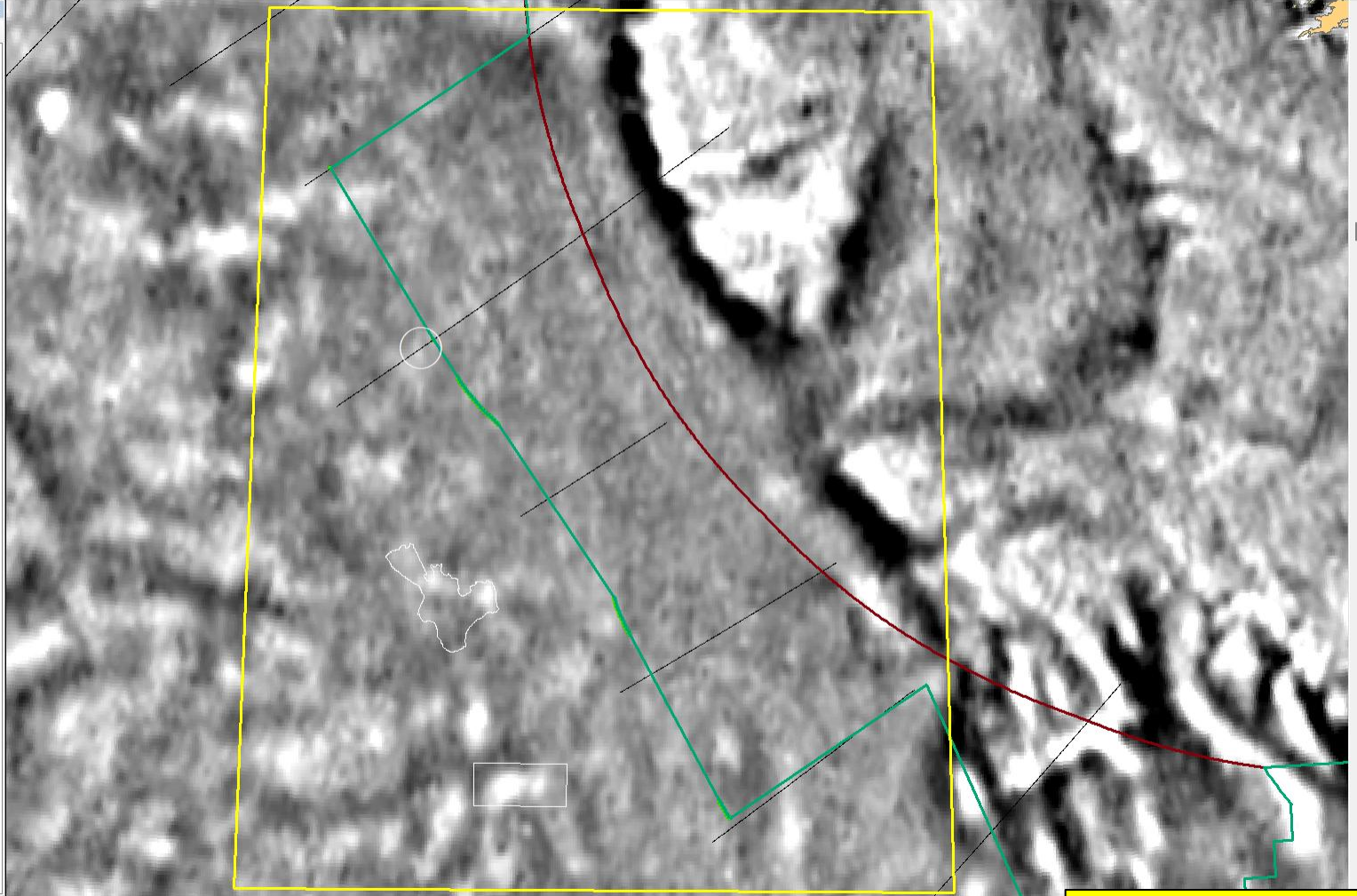
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- VGG_Curv_SWOT_02.nc
- VGG_Curv_V32.1.nc
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- Bismarck_W
- IRL_2014_Regional_Seismic_Survey
- IRL_2013_Regional_Seismic_Survey
- EMODnet_Bathymetry_2022_SR_BW
- SR_2022_v2
- SYNATH_V2.0
- NCEI DEM Global Mosaic 3 arc seconds_PAP.tiff
- SRTM_15Plus_V2.6
- SRTM_15Plus_SID_V2.6
- INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
- NCEI_web_trackline_combined_dynamic
- NCEI_web_multibeam_dynamic
- GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
- GEBCO_2024_n90.0_s0.0_w-90.0_e0.0.tif
- EMODnet_2022_E2.tif
- EMODnet_2022_E3.tif



NCEI DEM Global Mosaic for PAP

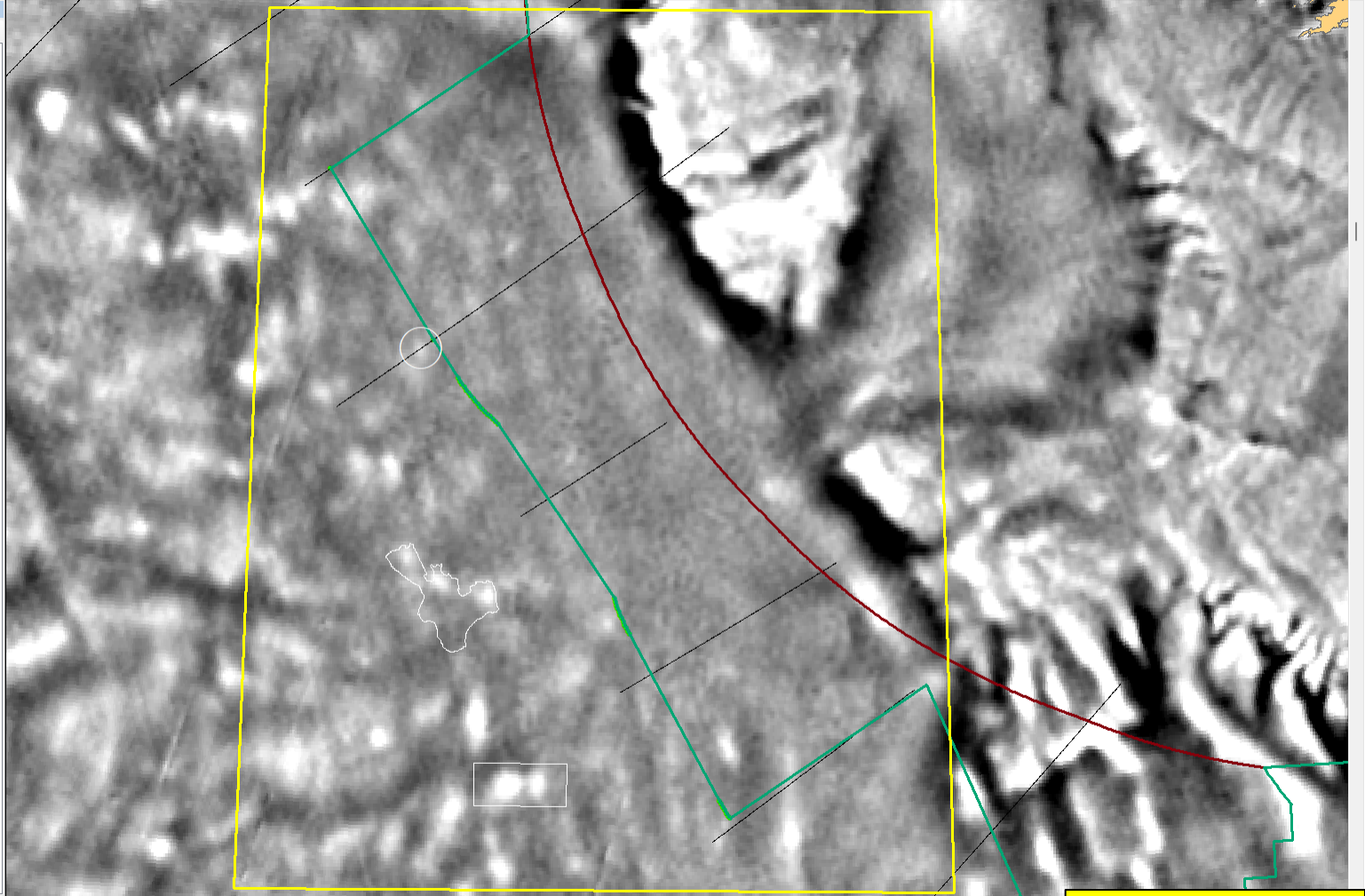
Table Of Contents

- Layers
 - PAP_unnamed_seamount
 - EMODnet_Bathymetry_2022_SR_PAP_SO
 - Ireland_PAP_BSA_box
 - Ireland_PAP_AOI_line
 - Coastline
 - IRL_CS_Designated Area
 - IRL_EEZ
 - 1995_09_PAD_ECS survey
 - Ireland_PAP_Points_Recommendations_2007
 - INFOMAR_Seabed_Survey_Coverage_January_2024
 - VGG_Curv_SWOT_02.nc
 - VGG_Curv_V32.1.nc
 - Bismarck_W
 - IRL_2014_Regional_Seismic_Survey
 - IRL_2013_Regional_Seismic_Survey
 - EMODnet_Bathymetry_2022_SR_BW
 - SR_2022_v2
 - SYNBATH_V2.0
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 - SRTM_15Plus_V2.6
 - SRTM_15Plus_SID_V2.6
 - INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
 - INFOMAR_web_trackline_combined_dynamic
 - NCEI_web_multibeam_dynamic
 - GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
 - GEBCO_2024_n90.0_s0.0_w-90.0_e0.0.tif
 - EMODnet_2022_E2.tif
 - EMODnet_2022_E3.tif



Nadir VGG (Sandwell et al, 2022)

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- Ireland_PAP_AOI_line
- Coastline
- IRL_CS_Designated Area
- IRL_EEZ
- 1995_09_PAD_ECS survey
- Ireland_PAP_Points_Recommendations_2007
- INFOMAR_Seabed_Survey_Coverage_January_2024
- VGG_Curv_SWOT_02.nc
- VGG_Curv_V32.1.nc
- Bismarck_W
- IRL_2014_Regional_Seismic_Survey
- IRL_2013_Regional_Seismic_Survey
- EMODnet_Bathymetry_2022_SR_BW
- SR_2022_v2
- SYNBATH_V2.0
- exportImage (1).tiff
- SRTM_15Plus_V2.6
- SRTM_15Plus_SID_V2.6
- INFOMAR_Bathymetry_100m_Offshore_TIFF_April_2024.tif
- NCEI_web_trackline_combined_dynamic
- NCEI_web_multibeam_dynamic
- GEBCO_2024_tid_n90.0_s0.0_w-90.0_e0.0.tif
- GEBCO_2024_n90.0_s0.0_w-90.0_e0.0.tif
- EMODnet_2022_E2.tif
- EMODnet_2022_E3.tif



Note the higher resolution of this dataset vs the Nadir VGG, with the Unnamed Seamount, the triple PAP-SO and the double Bismarck seamounts all coming into sharper focus.

SWOT VGG (Sandwell et al, 2024)