INFOMAR
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
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Department of Climate, Energy and the Environment
Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann
Marine Institute
Foras na Mara

Marine Geoscience Report 017

Valentia Island

Overview

Valentia Island, located off the south-west coast of Ireland, forms part of County Kerry and is connected to the mainland by a bridge. The island is noted for its rich geological history, particularly its Old Red Sandstone formations and significant fossil discoveries. Most notably, Valentia Island is home to one of the most important fossil sites in Ireland – the Devonian tetrapod trackway, which provides evidence of some of the earliest land-dwelling vertebrates, a salamander-like animal (Jackson, et al., 2010).

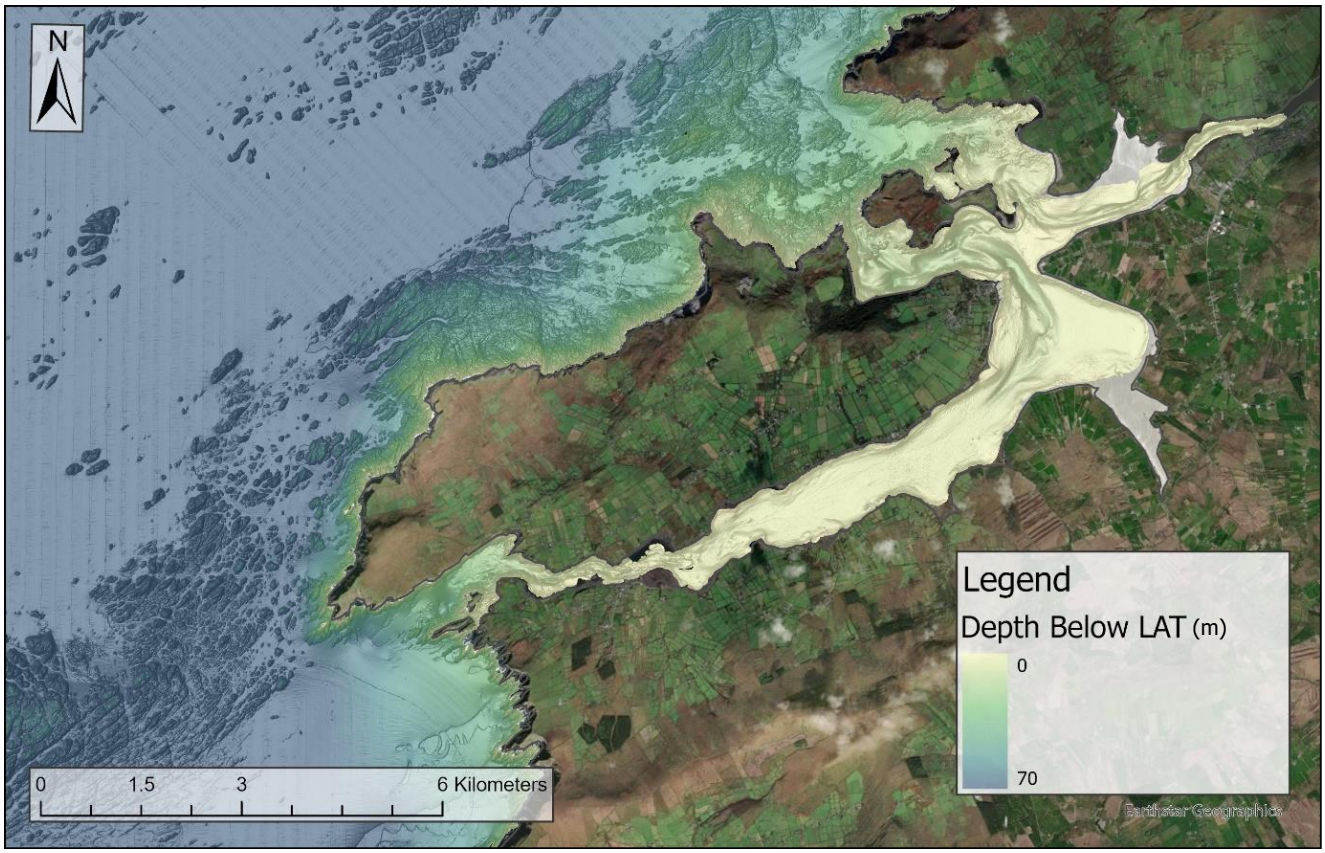

Figure 1: Bathymetry around Valentia Island. Depths are referenced to Lowest Astronomical Tide (LAT).

Valentia is also renowned for its high-quality slate, which has been widely used in construction because of its durability and aesthetic appeal (Jackson, et al., 2022). The surrounding marine environment is complex, with exposed bedrock, palaeochannels and prominent tidal scour features. Understanding the island's geological history and seabed morphology provides insights into the tectonic, sedimentary and glacial processes that have shaped the region.

Regional Geology

Valentia Island lies within the Munster Basin; a major Devonian sedimentary basin formed under extensional tectonic regimes. The region is dominated by Old Red Sandstone (ORS), deposited between 410 and 355 million years ago (Ma) during the Devonian period (Pracht, 1996). ORS was laid down in a fluvial environment under semi-arid conditions, with sediments eroded from highlands to the north and deposited by braided river systems. By the end of the Devonian marine transgressions – relative sea-level rises that shifted shorelines landward and flooded the basin with marine conditions – led to the deposition of muds and silts that later formed part of the Valentia Slate Formation (Jackson, et al., 2022)

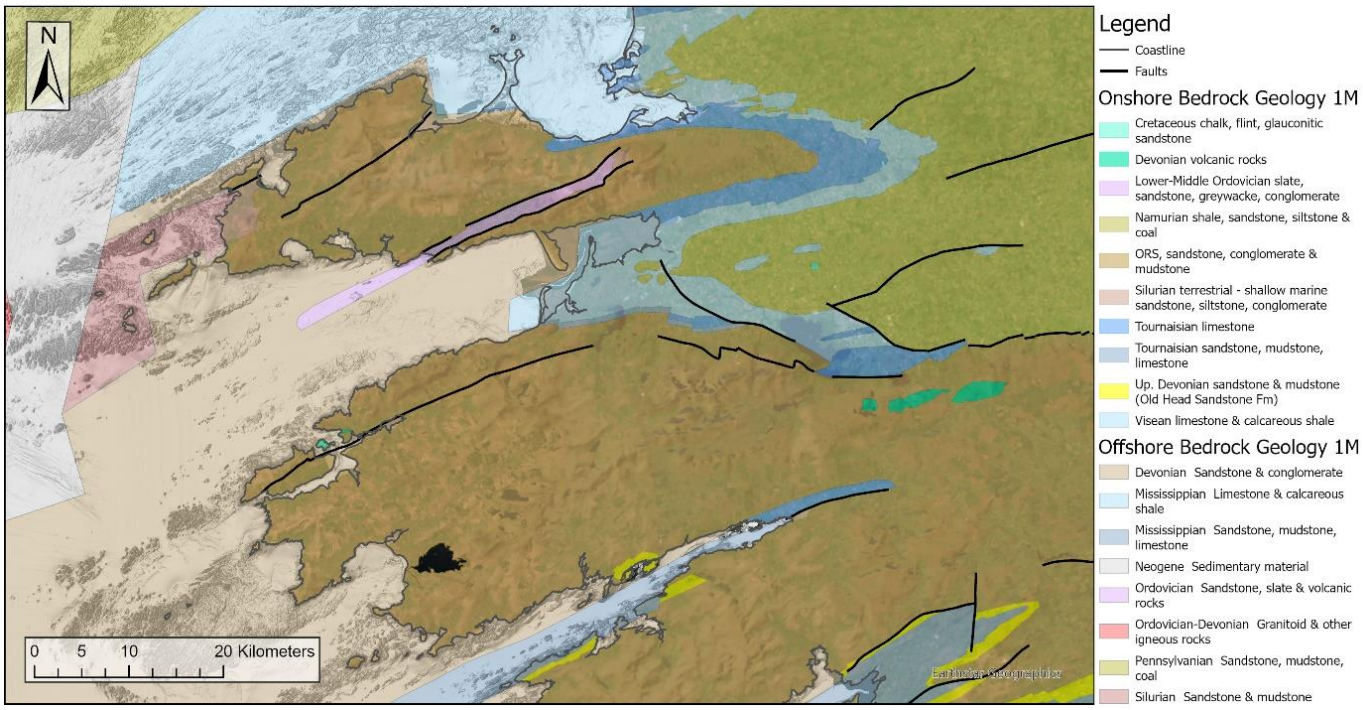

Figure 2: Regional geology of south-west Ireland.

During the Late Carboniferous, the Variscan Orogeny, a continental collision and mountain building event around 300 Ma, produced extensive folding and faulting, which strongly influenced the island's structural geology (Pracht, 1996). The dominant structural trend in the region is south-west to north-east, with several faults cutting through the island and extending offshore.

A secondary set of north-north-west to south-south-east faults adds further complexity. Variscan deformation also subjected the fine-grained mudstones and siltstones to low-grade metamorphism, realigning mineral grains and imparting a pervasive slaty cleavage so that the rock splits readily into thin, flat slabs – the characteristic Valentia Slate Formation.

Geology of Valentia Island

Valentia is primarily composed of the Valentia Slate Formation, a sequence of purple mudstones and siltstones that are part of the broader Old Red Sandstone Group. The Valentia Slate Formation is known for its fine-grained, well-cleaved nature, which has historically made it a valuable quarrying resource (Jackson, et al., 2022). Valentia Island's slate quarry, opened in 1816, is the oldest slate quarry still in production in Ireland (Jackson & Caulfield, 2025).

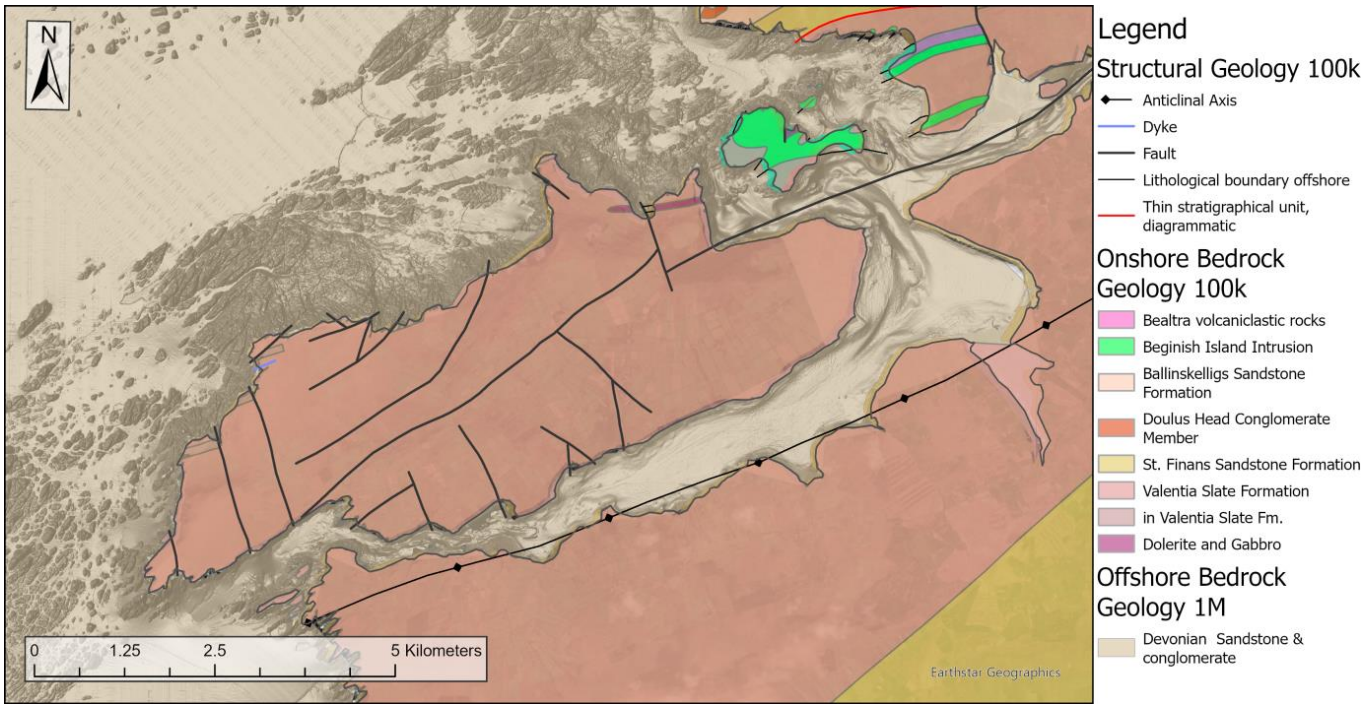

Figure 3: Onshore and offshore geology of Valentia Island.

Valentia slate has been widely used in construction, including for roofing and flooring, due to its durability and aesthetic appeal. Notable structures, both in Ireland and internationally, have incorporated Valentia slate, highlighting its importance as a heritage stone (Jackson, et al., 2022).

Figure 4: Valentia Slate Quarry. Image from (Jackson, et al., 2022).

A major south-west to north-east trending fault crosses the island, accompanied by smaller faults of similar trend and north-north-west to south-south-east structures. These continue offshore and are visible in seabed bathymetry, where they influence the development of bedforms, steer sediment transport and focus zones of erosion and deposition.

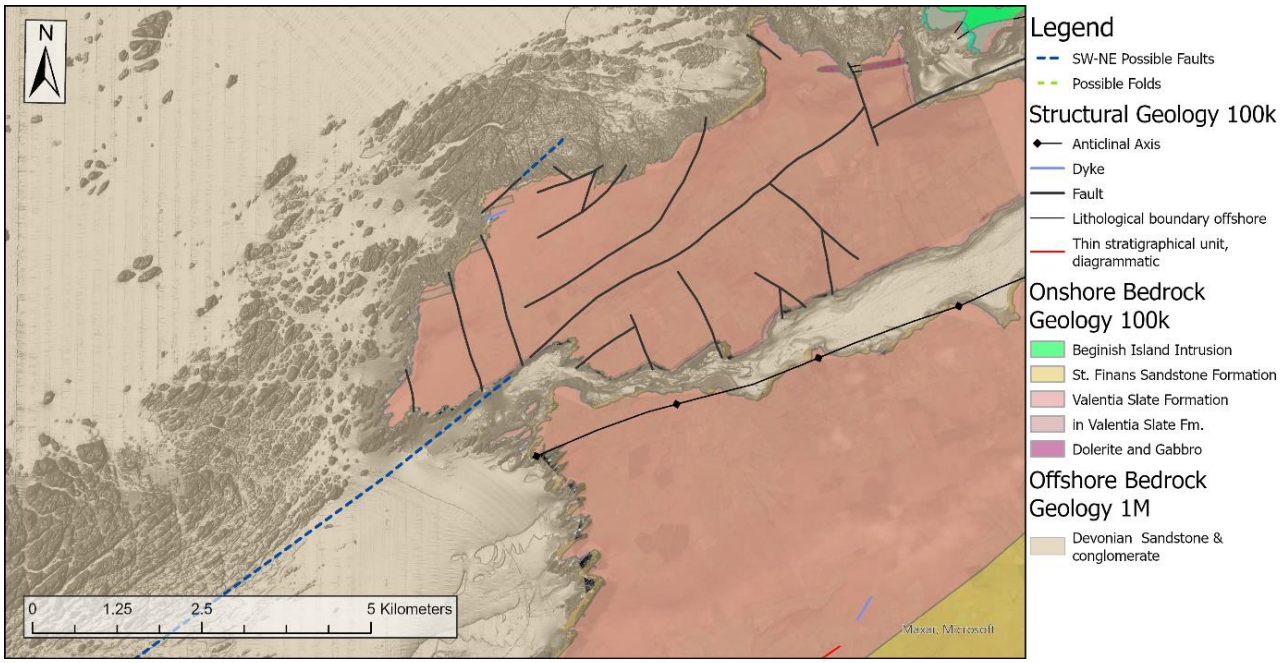

Figure 5: Possible offshore extension of faults.

Valentia Island also preserves a nationally significant Devonian tetrapod trackway to the north of the island within fine-grained beds of the Valentia Slate Formation. The Valentia Tetrapod Trackway is one of only three known trackways worldwide made by early land animals during the Devonian (Ireland's Fossil Heritage, 2023)**.** The track horizons sit within the ORS floodplain succession and are overlain by silicic tuffs dated at around 385 Ma, giving a late Middle Devonian age (Higgs, 2001). Geological Survey Ireland recognises the site as one of Ireland's most important fossils and a key record of the transition of vertebrates from water to land (Geological Survey Ireland, n.d.)**.**

Figure 6: Tetrapod trackway (~15 m long) on Valentia Island. Image from (Kowinsky, n.d.).

Seabed Features

To the north and west of Valentia Island, extensive bedrock is exposed on the seabed, indicating energetic tidal and wave conditions that limit unconsolidated sediment accumulation. Bathymetry north of the island reveals a possible palaeochannel that may represent an ancient river system drowned by post-glacial sea-level rise. Palaeochannels like this provide valuable information on past fluvial and glaciofluvial regimes. Their cross-sectional form, preserved stratified fills, and any palaeo-meander geometry can be used to infer former discharge, flow depth and velocity, as well as episodes of lowered sea level linked to deglacial meltwater routing. Paleochannels also commonly act as conduits focusing modern sediment transport (Gallagher, 2002).

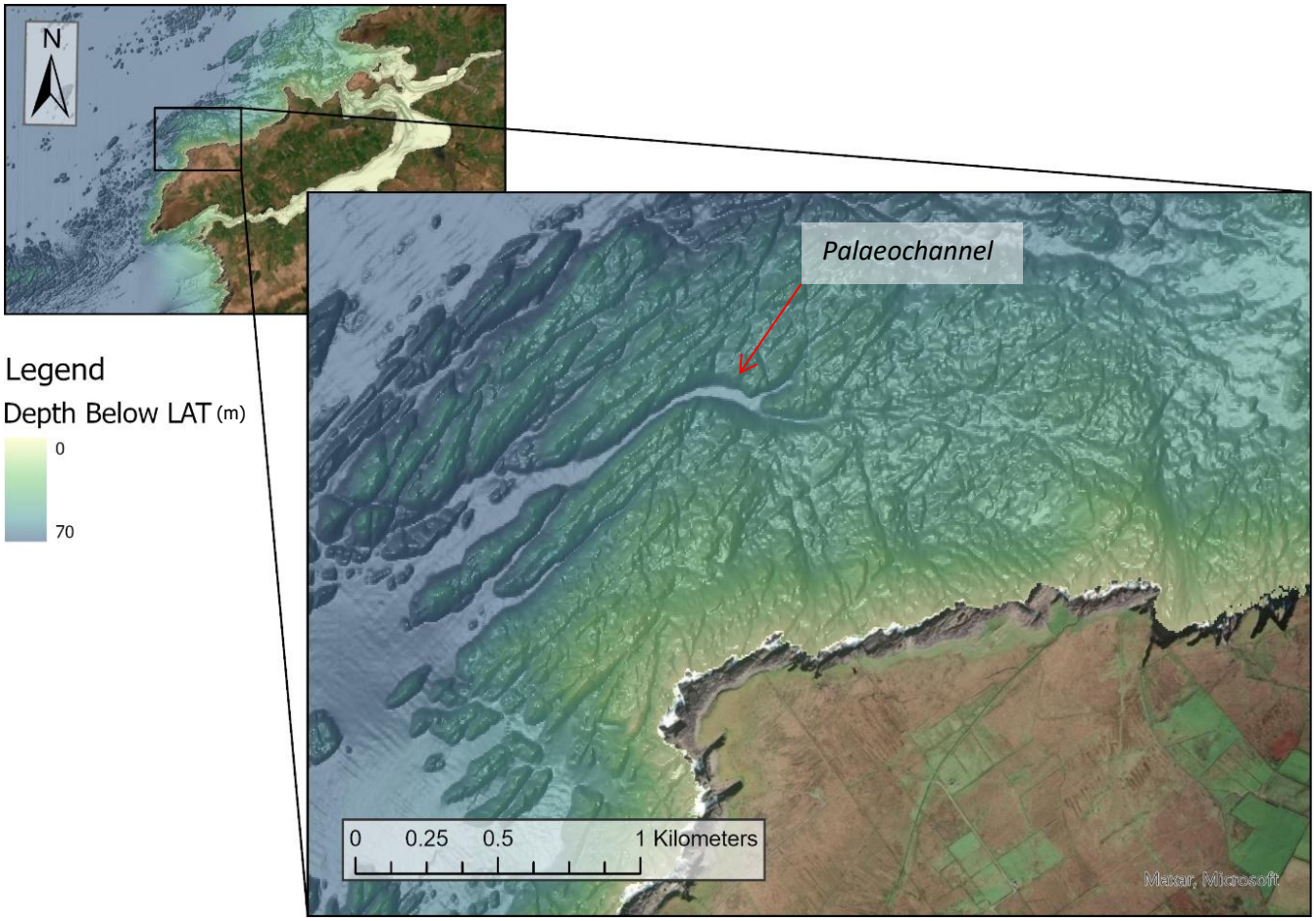

Figure 7: Possible palaeochannel in exposed bedrock.

To the east of Valentia Island, particularly in the narrow channels between the island and Beginish Island and between Valentia and the mainland, tidal currents have resulted in extensive seabed scour. These features, visible in INFOMAR bathymetry data, indicate increased flow velocity due to constriction, leading to sediment erosion and transport.

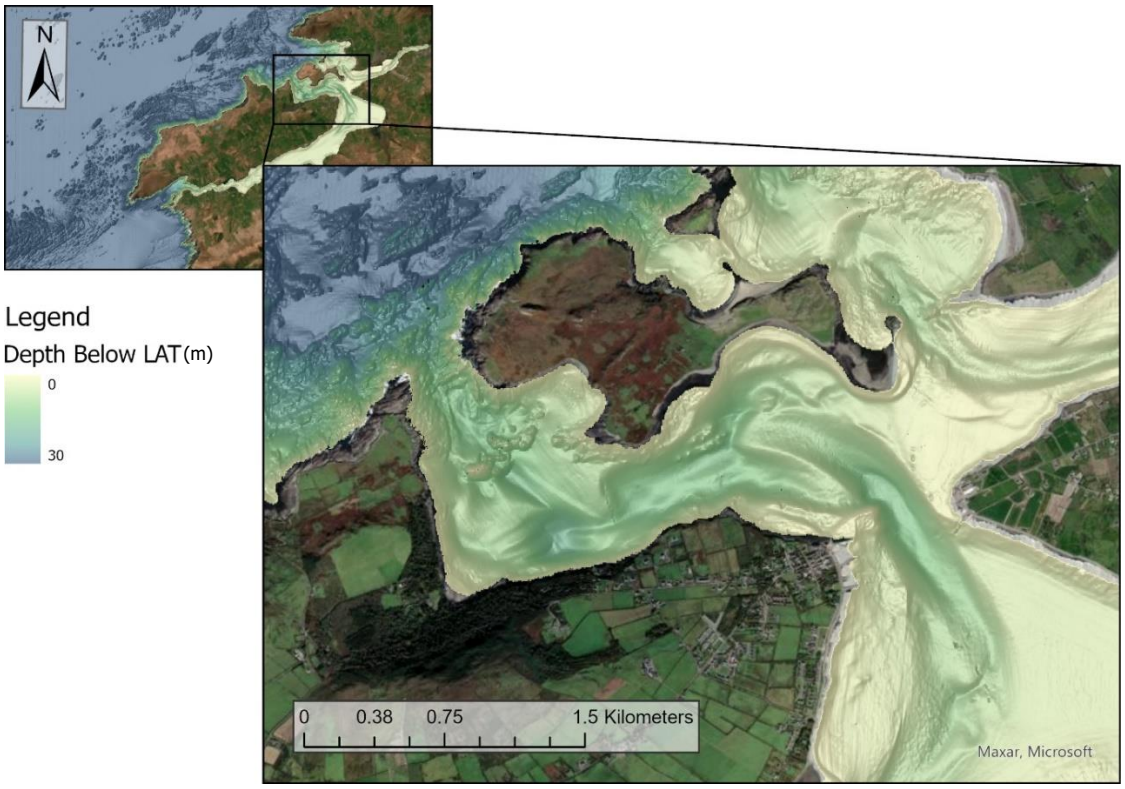

Figure 8: Scour, channels and sedimentary features between Valentia and Beginish Island.

South of the island, the seabed exhibits a variety of sedimentary structures, including sandwaves, channels, sediment ribbons and scour marks. These bedforms reflect dynamic sediment transport driven by tidal currents and wave action.

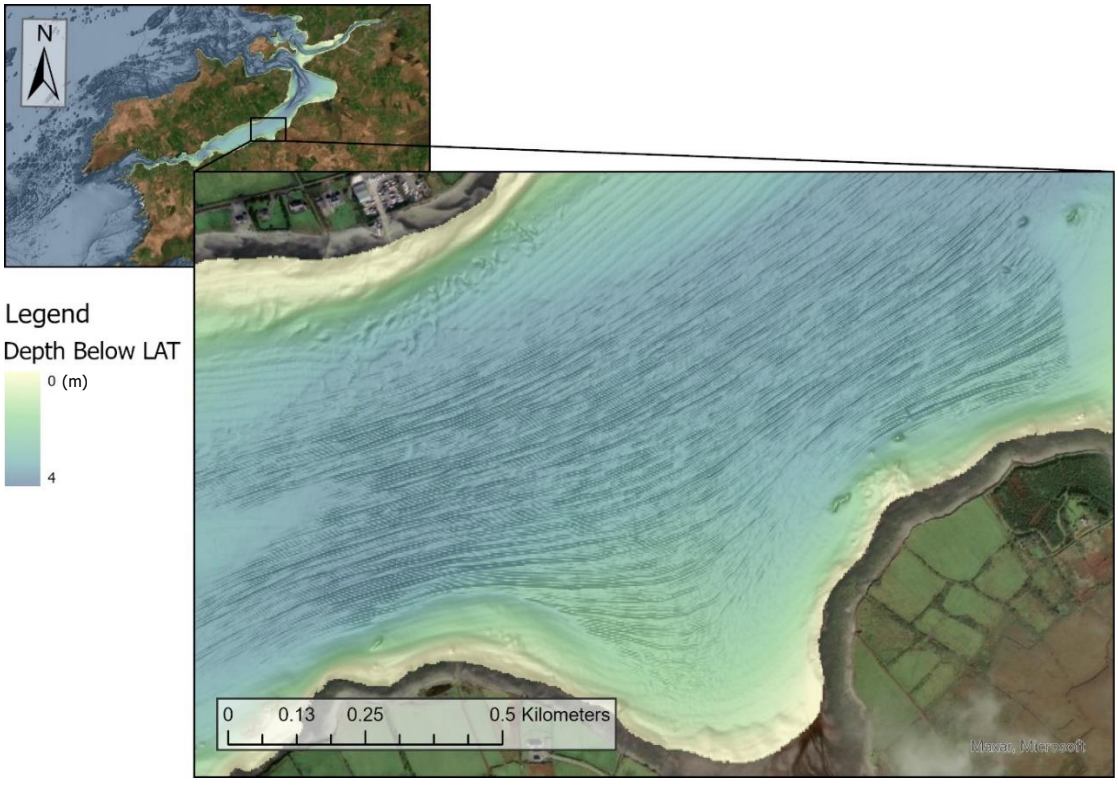

Figure 9: Sediment Ribbons to the south of Valentia Island.

Sediment ribbons to the south of Valentia Island reach up to 20 cm in height, as evident in the profile below. These features are not perpendicular to flow direction, but parallel, and thus are not classed as sandwaves.

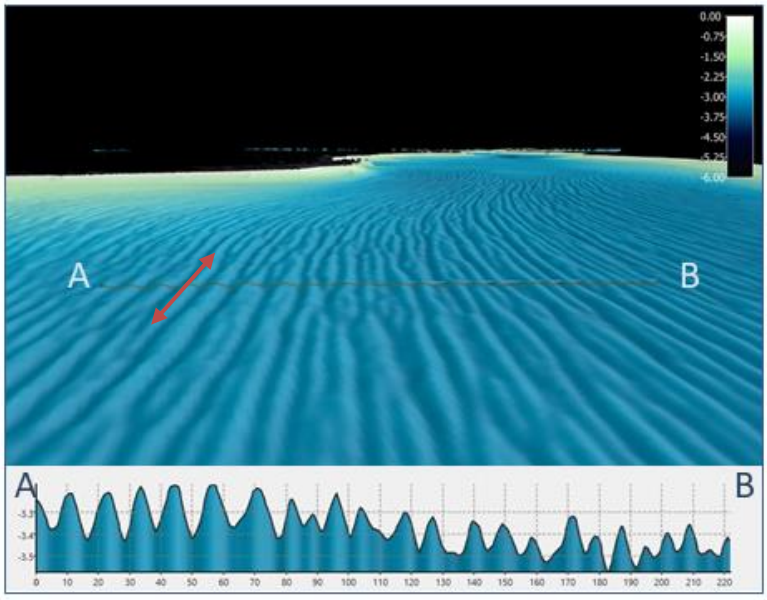

Figure 10: Profile of sediment ribbons, with bidirectional current direction indicated by the red arrow.

A distinct channel can be seen on the seabed where the River Derreen enters the marine environment, marking an area of sediment deposition and reworking.

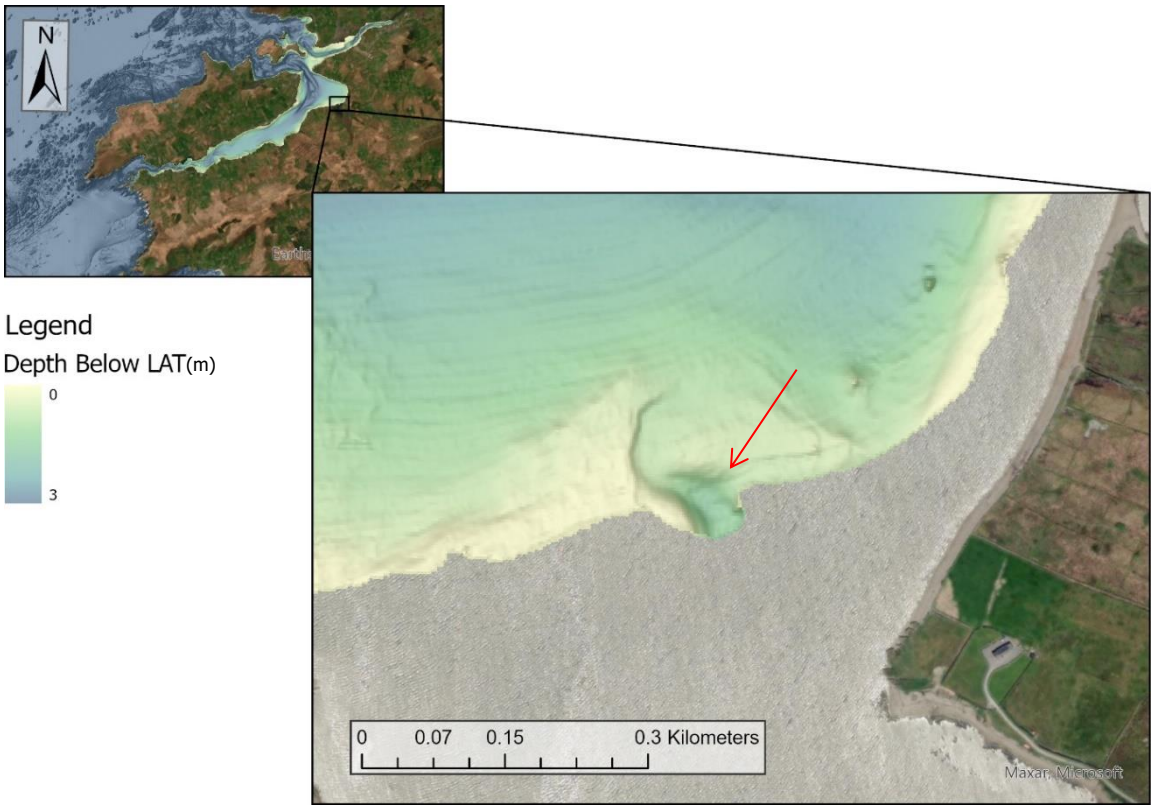

Figure 11: Channel feature in the seabed, most likely the River Derreen. Note the grey to the south is unsurveyed aerial imagery.

Cable structures on the seabed, connecting the island to the mainland, indicate human modifications and infrastructure development in the region. These structures are visible in bathymetric data and highlight the interaction between natural and anthropogenic influences on the seabed.

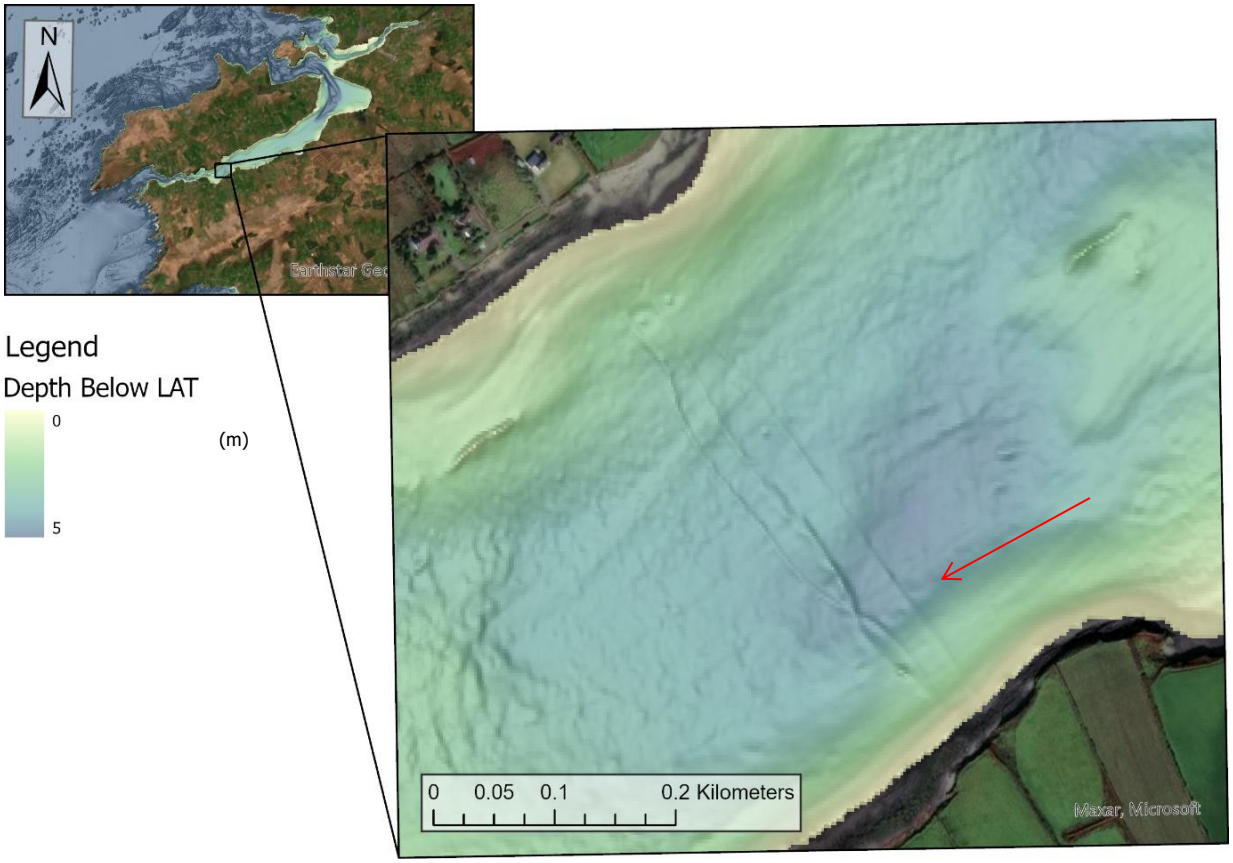

Figure 12: Cables evident in the bathymetry data.

Conclusion

Valentia Island's geology is shaped by its Devonian and Carboniferous history, with Variscan folding and faulting imprinting a strong structural fabric. The Valentia Slate Formation dominates the island's geology, with key structural features extending into the surrounding seabed. Seabed mapping reveals a range of geological and hydrodynamic features, including exposed bedrock, palaeochannels, tidal scour zones, and sedimentary structures. These elements highlight the complex interplay between tectonic history, sedimentary processes, and modern hydrodynamic forces shaping the island and its marine environment. Continued geological and seabed mapping efforts will further refine our understanding of this dynamic region, and support its conservation and sustainable management.

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