SHETLAND HERITAGE TRAILS

The Shetland ophiolite

heritage Shetland culture
Geopark Shetland

Explore the floor of an ancient ocean...

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Scottish Natural Heritage
All of nature for all of Scotland

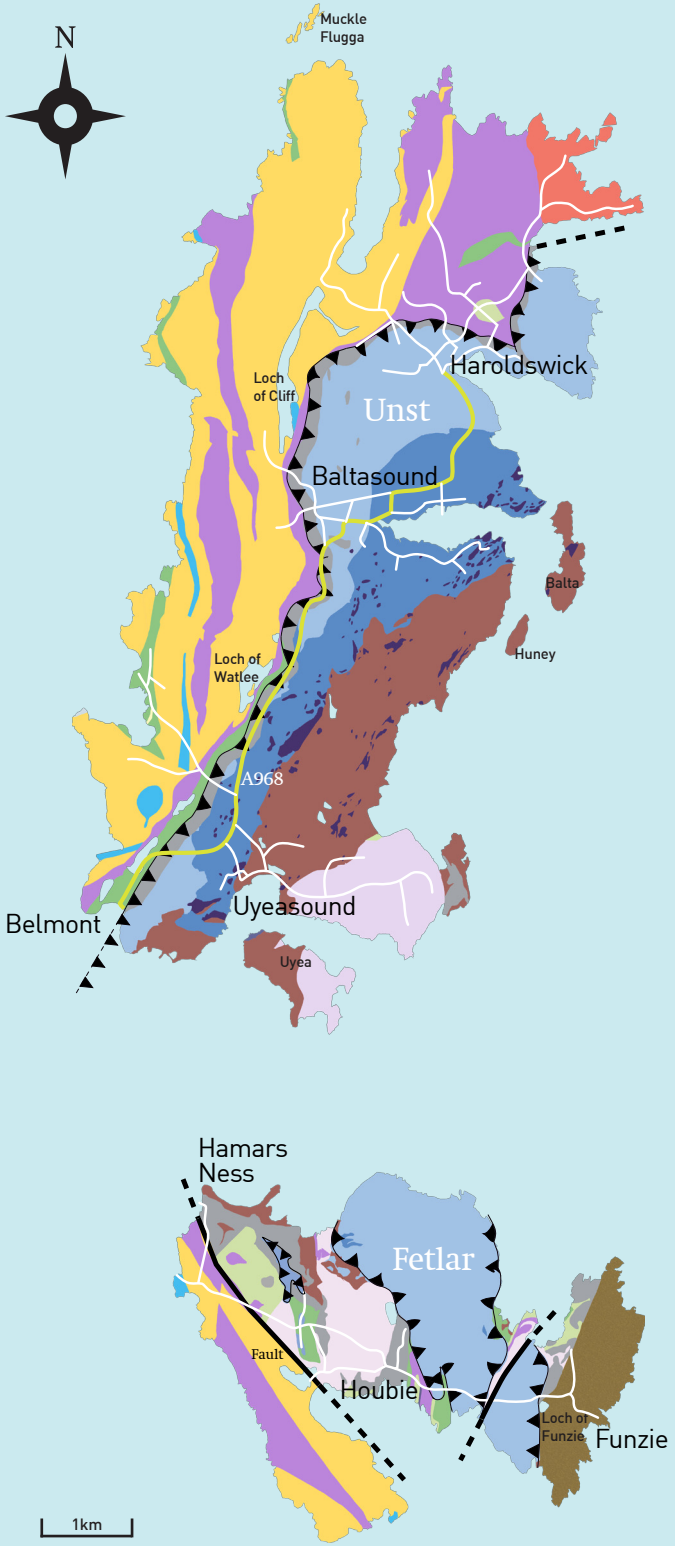
LEADER

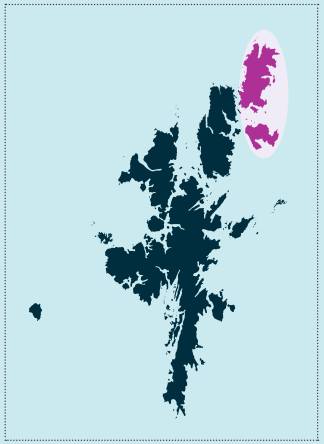
The Scottish Government

The European Agricultural Fund for Rural Development: Europe investing in rural areas

Europarc Geoparks

GLOBAL GEOPARKS NETWORK





Intrusions
- Skaw Granite

Ophiolite (upper nappe)
- Dunite
- Harzburgite
- Serpentinite / Steatite

Mid imbricate zone
- Phyllite
- Funzie Conglomerate

Ophiolite (lower nappe)
- Gabbro
- Wehrlite / Pyroxenite
- Dunite
- Harzburgite
- Serpentinite / Steatite

Continental rocks
- Greenschist
- Quartzite
- Schist
- Calcareous rocks
- Gneiss

- Fault
- Thrust
- Projected line
- Major road
- Minor road

Beneath an ancient ocean

420 million years ago, an ancient ocean called 'Iapetus' closed and the continents on either side (early versions of Europe and North America) collided. As the landmasses came together, a section of oceanic crust (the rock beneath the ocean floor) was caught between them and thrust on top of the North American continent. This stranded section of oceanic crust, called an ophiolite, now forms the east side of Unst and much of Fetlar.

Panorama looking south from Saxa Vord showing geology of Unst and Fetlar

Oceanic crust is one of two types of crust that make up the Earth's surface. The land we live on is continental crust. Oceanic crust is much denser and forms dips in the surface of the Earth that fill with water and form oceans. The Earth's crust is divided into several plates that float on top of a thick semi-molten layer called the mantle.

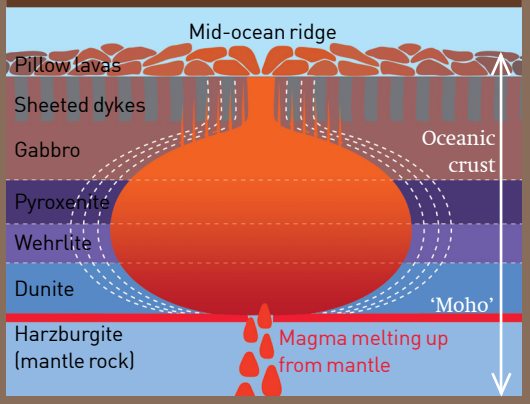
Oceanic crust is continually being recycled. New crust forms under the oceans at mid-ocean ridges. Currents in the mantle pull the plates of the crust apart. Magma rises from the mantle to fill the gap, then cools and solidifies, forming new ocean crust. Different minerals crystallise at different temperatures and pressures within the cooling magma, resulting in layers of different rock within the crust.

When spreading ocean crust cools it becomes denser and normally it sinks back into the mantle and is recycled. We call this subduction.

In Shetland, though, this did not happen. Instead a thick slab of ocean crust and mantle was thrust up over the continent and 'emplaced' upon it. The crust bent upwards so the horizontal layers of rock in the ophiolite ended up almost vertical. Later erosion exposed a section through the ophiolite at the surface, making this one of the best places in the world to see a compact vertical section through ancient oceanic crust.

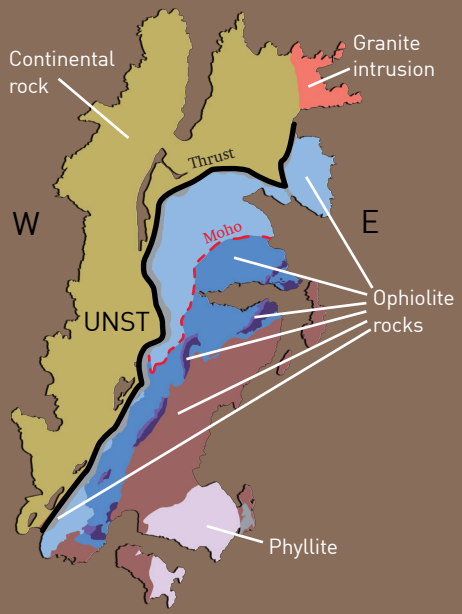
As you travel along the trails you will discover both kinds of crust. The ancient North American continent is found in the west of the islands, while you can walk across the vertically tilted layers of rock that formed the ocean crust in the east.

Layered ocean crust forms within a magma chamber at a mid-ocean ridge and spreads

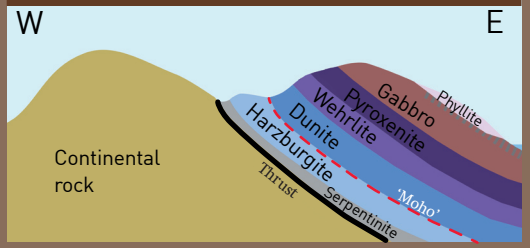


You may wish to refer to BGS Geological map of Scotland Sheet 131 (Unst & Fetlar) to help you.

Geology of Unst in relation to the layers within the magma chamber shown above



Unst cross section: ocean crust is bent upwards as it is thrust over the continent



The continental rocks are older than the ophiolite and have been metamorphosed (changed) by high temperatures and pressures. This caused their minerals to recrystallise, forming quartz and garnet-bearing gneisses. The closing of Iapetus and emplacement of the ophiolite caused alteration of the oceanic rocks too, changing some of them to serpentinite.

Billion Years Ago | **Million Years Ago**

- 4.6 — Age of the Earth
- 2.8 — Oldest rocks in Shetland are formed.
- 600 — Iapetus Ocean opens
- 420 — Iapetus Ocean closes to form Euramerica. Emplacement of ophiolite begins. Formation of Funzie Conglomerate.
- 400–350 — Devonian period. Deformation of Funzie Conglomerate. Emplacement of ophiolite completed.
- 300 — Further continental collisions result in supercontinent Pangaea.
- 60 — Pangaea splits, separating North America from Europe, and forming the Atlantic Ocean.
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