

# Introduction to the Grampian Highlands

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Stephenson, D, and Gould, D. 1995. British regional geology: the Grampian Highlands. Fourth edition. Reprint 2007. Keyworth, Nottingham: British Geological Survey.

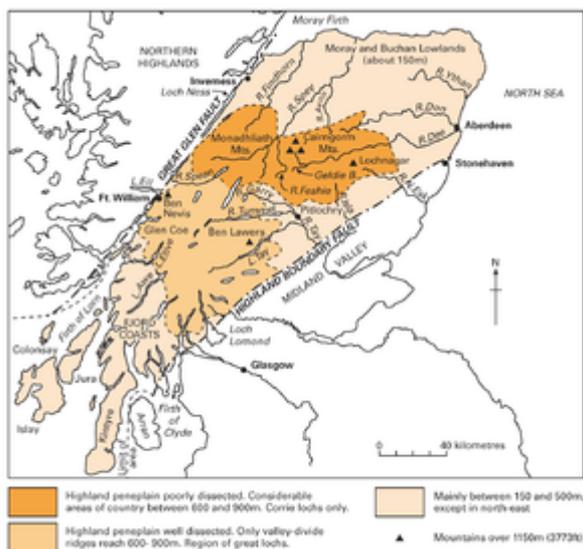
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## Introduction

The boundaries of the region described in this Regional Guide are set by well-defined natural features. On the north the limit is the deep trench of Glen Mor—the Great Glen of Scotland—which traverses the whole of the Highlands from the Moray Firth to the Firth of Lorn and whose floor never rises more than 40 m above OD. On the south the margin is the Highland Border, a line running from Stonehaven in the north-east to Arran and the lower estuary of the Clyde in the south-west, along which the relatively subdued topography of the Midland Valley of Scotland abruptly gives place northwards to the more rugged and elevated hills of the Scottish Highlands. Both these major topographical features follow, or largely follow, lines of faults of major structural importance—the Great Glen Fault and Highland Boundary Fault respectively. The area is thus clearly determined geologically as well as topographically ([P915409](#)).

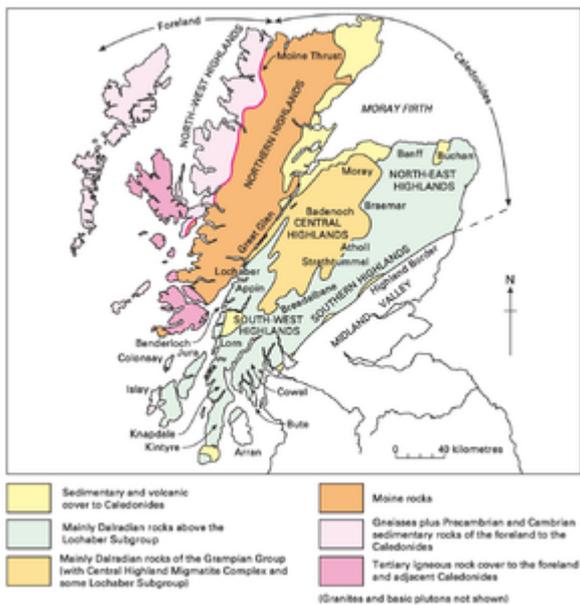


Physiography of the Grampian Highlands.  
P915409.

The name Grampian Highlands or 'Grampians' is strictly applicable only to the central mountainous part of the region but for this guide the name is also applied to the fiord coastal region in the south-

west and the low-lying ground inland from the Moray Firth and Aberdeenshire coast.

In early days the 'high land' was known as 'the Mounth' (Gaelic— Monadh) and this name was in use (at least for certain parts) as late as the cattle-droving times of the late 18th and early 19th centuries. In 1526 Hector Boece, the Scottish historian, identified the Mounth with the Mons Graupius (or Grampius) in whose south-eastern foothills an important battle was fought in AD 86 at the time of a Roman foray into what is now Scotland. In Blaeu's 'Atlas' (1662) a reference is made to 'Grampios Montes', showing that the name was understood in at least some quarters by that time, but just when the term 'Grampians' came into general use is not clear. The areas covered by the geographical terms used in this account are shown on [P915410](#). They are largely based on the old Scottish 'Lordships' and are still in fairly common use, if not too clearly defined. Many have been used in geological descriptions of the Grampian Highlands and are familiar to most geologists.



Main geological divisions of the Scottish Highlands and geographical areas within the Grampian Highlands as used in this volume. P915410.

## Physical features

Although the region described in this guide is by no means all mountainous ([P915409](#)) it contains the highest land in the British Isles. Ben Nevis reaches 1344 m (4406 ft) above OD, with three attendant summits exceeding 1220 m (4000 ft), while in the Cairngorms massif four mountains reach or exceed 1200 m above OD with a considerable area of hill-top over 1050 m (c.3500 ft). Of the 276 separate Dalradian mountains recognised by hill-walkers as 'Munros' (mountains exceeding 3000 ft (914.5 m) above OD), 164 are found in the Grampian Highlands.

Viewed from a distance, or from the top of any commanding height within them, the Grampians show a general tendency for ridges and mountain tops to reach up to a more or less uniform level. The impression given by the skyline is one of a plateau-like surface showing very little variation in overall elevation. The Grampians appear to have been carved by the agents of denudation from a single elevated planar surface.

That this view is too simple has long been appreciated as several workers have noted groupings of summit levels which suggest the existence of successively lower erosion surfaces. To some, the

highest surface is a plane of marine erosion with the lower summit levels formed in periods of still-stand during intermittent uplift; to others, it is an exhumed feature modified by drainage instituted on a former flat cover of Mesozoic sediments, with the lower level surfaces formed by subaerial erosion as the land was intermittently elevated.

George (1966) gives a detailed analysis of the development of the topography based on the hypothesis that the high surface was an uplifted plane of marine erosion. Sissons (1967) advocates the upwarp of the Highland block with streams originating on a widespread cover of Mesozoic rocks. His book includes a review of the extensive literature on the subject, including the ideas of George, and should be read by anyone interested in this specialist subject.

It is clear, however, that the planation and subsequent uplift of the Grampian Highlands is later than the outpourings of the lavas of the Tertiary (Palaeogene) Volcanic Province of the western seaboard of Scotland (see BGS Regional Guide—the Tertiary Volcanic Districts) since feeder dykes to former lava fields are found east of the present lava outcrop and transecting the metamorphic rocks of the Highland block up to the general level of the mountain tops. These dykes must, of course, have consolidated under at least moderate cover. A considerable thickness of lavas (and some underlying strata) has thus been eroded to form the present high Highland surface, which extends alike over Caledonian basement and Palaeogene (formerly called Tertiary) rocks.

Watson (1984) discusses in detail the tectonics of block and extension faulting which, since Palaeozoic times, has provided the control on Highland physiographic evolution. She notes that since the end of the Caledonian Orogeny the Highland block of mainland Scotland has been a stable region, with vertical movements of any great extent occurring only in the marginal areas. As a consequence, the present Highland surface is not far removed from that of the eroded Caledonian mountain belt, which was the surface on which the Palaeozoic Old Red Sandstone sediments were deposited and which is now exposed at moderately high levels throughout the Highlands. Watson considers that this old surface has been exhumed from a thin cover of Palaeozoic and Mesozoic rocks following a Palaeogene uplift of 0.5– 1.5 km, the first major uplift since Devonian times. The Highland surface extends over the Tertiary Volcanic Province and was probably the product of subaerial erosion which exhumed the old, uplifted Caledonian basement, removed several hundred metres of lavas and planated the Tertiary rocks.

Whatever the origins of the Neogene planation, it seems probable that the maximum elevation of the uplifted high Grampian Highland surface was located in the general area of the present day north–south divide, which Sissons (1967) considers to be a continuation of that in the Northern Highlands. The original consequent drainage that developed, probably instituted on a smooth, albeit thin, cover of Mesozoic rocks, included long eastward-flowing rivers. Relics of the original river drainage are preserved in the courses of some present day rivers, notably in the Don, the Dee and the Tummel–Tay river system. As the overlying cover rocks were removed by denudation the drainage pattern was then strongly modified by the NE–SW-trending ‘grain’ of the emerging metamorphic rocks. Several examples of capture of the early drainage by rivers with courses controlled by differential erosion of the heterogeneous metamorphic rocks can be identified, most notably the capture of the headwaters of the original consequent River Dee (the Geldie Burn) by the River Feshie, and the capture of the headwaters of the Don by the River Avon (P915409).

The pattern of denudation of the Grampians has also been strongly influenced by the presence of many faults, with accompanying belts of shattered, weakened rock, which trend in a general north-easterly, or northerly, direction. These narrow zones of weakened rock have been actively eroded to form deep elongated hollows.

North-east of a line roughly joining Pitlochry and Spean Bridge the high Highland surface is poorly

dissected, with broad upland areas lying between heights of 600 and 900 m above OD. South-west of this line only narrow valley-divide ridges reach these altitudes. This variation in physiography is probably partly due to the heterogeneity of the Dalradian rocks which make up much of the latter area, in contrast to the relatively uniform lithologies of the Grampian Group, and the huge Caledonian plutons that make up much of the north-eastern portion. In addition, variation in intensity of glacial erosion also produced variation in physiography. In Pleistocene times ice accumulated in the areas of maximum elevation in the west. The Moor of Rannoch formed a huge 'ice cauldron' from which ice debouched more or less radially to begin with, but became confined to the old valley lines as time progressed. This ice eroded deeply, encroaching on the valley sides to reduce the interfluvial areas to narrow ridges. Less intense valley erosion took place in the more open, comparatively shallow valleys of the north-east and, although deep trenches were gouged locally, large areas of upland remained, smoothed off but otherwise little affected.

It was this concentration of ice in the western valleys which promoted overdeepening to such an extent that, on glacial retreat, many large lochs were left occupying the valley floors of the area. Glacial erosion was especially active along shatter belts which commonly accompany the major transcurrent faults cutting the Grampian Highlands. An example is Loch Ericht, which is 23 km in length but does not exceed 0.8 km in width, with its greatest depth of 156 m occurring where ice was concentrated in the narrowest part of the valley; the loch overlies the Ericht-Laidon Fault. Another example is Loch Ness on the Great Glen Fault.

The north-eastern and south-western sea margins of the Grampians area are totally different in character. As the sea level rose following the melting of the Pleistocene ice the overdeepened valleys on the south-western seaboard were inundated, despite isostatic uplift on removal of the weight of the ice cap, resulting in the 'drowned valley' coastline of the area. Several of these 'fjords' penetrate deeply into the Highland massif. In the north-east, although overdeepened valleys do enter the North Sea and Moray Firth, they are choked with glaciofluvial debris and later deposits; their original form is thus concealed.

The lowland areas of Moray and Buchan are the result of removal from the underlying metamorphic basement surface of the soft Mesozoic rocks (and Old Red Sandstone) which originally covered it. The rectilinear coast of Moray and Buchan trends parallel to the southern margin of the Mesozoic sedimentary basin occupying the Moray Firth Graben, a branch of the extensive fault system of the North Sea.

## Scenery

The two major boundaries of the Grampian Highlands—the Great Glen and the Highland Border—are both spectacular scenic features. Differential erosion between the softer rocks of the Midland Valley and the more resistant metamorphic rocks of the Highlands on opposite sides of the Highland Boundary Fault has resulted in an abrupt fault-line scarp which can be traced from Stonehaven in the north-east to Loch Lomond in the south-west. The feature is especially obvious when viewed across the low-lying ground between Stirling and Loch Lomond; it is the 'Highland Line' of history.

The huge straight-running depression of the Great Glen is a very obvious physical feature, [P000742](#), best appreciated from some way up from its valley floor, such as from the A82 road north of Spean Bridge or north of Drum-nadrochit. Aerial photographs provide particularly dramatic views of this spectacular linear feature, which extends across the width of the Scottish mainland.



The Great Glen, looking north-east from above Banavie. P000742.

Two contrasted types of mountain scenery are presented by the Grampian Highlands. In the Cairngorm area and around Glen Clova great relics of the original planar surface remain as broad, level moorlands cut into by deep glens and scarred by gigantic corrie-cliffs. Towards the south-west this type of mountain scenery passes into a more highly dissected type with rugged pinnacles, crests and ridges. The detail of this latter scenery depends upon the geological character and structure of the rocks. Resistant beds, such as quartzites, grits or massive gneisses, rise into linear ridges and summits. If no marked guiding planes are present, conical forms result, as in the quartzite mountains of Schiehallion, Beinn a'Ghlo and Paps of Jura. Between these resistant quartzites, grits and gneisses, belts of weaker strata such as slates, limestones and phyllites have been excavated into valleys. The tors, scree-slopes and bold corries of the Cairngorms and Lochnagar exemplify the mode of denudation of the granites which form these mountain groups. The bold cliff scenery of Glen Coe, Ben Nevis and adjacent regions is carved out of volcanic rocks or larger granitic masses.

## **[Full list of references](#)**

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