Geomorphic Classification of Icelandic Volcanoes

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ABSTRACT

In 1959, Thorarinsson published his first classification of the 13 principal types of Icelandic volcanoes and, in 1968, published a revision of his earlier one. Both landform classifications were based on the relationship of the type of eruptive products (lava, lava and tephra, or tephra), number of eruptions (one or more than one), and the form of the eruptive vent (circular or linear).

In 1980, Thorarinsson, working with Kristján Saemundsson, made a modification to his previous classification schemes. The number of volcanic landforms was reduced to 11 and limited to subaerial basalt volcanoes. The number of eruptions necessary to produce a given landform was eliminated. The stratovolcano (Snaefellsjökull) and the stratified ridge (Hekla) landforms were also eliminated, because they are central (composite) volcanoes.

Drawing upon this previous work, many years of direct field observation and study (ground and air), and review of the relevant literature on geomorphology of Icelandic volcanoes, a new geomorphic classification of Icelandic volcanoes has been developed. The new geomorphic classification, which includes all types of Icelandic volcanoes, distinguishes 27 discrete landforms. It relates the nature of volcanic activity (effusive, mixed, or explosive); environment during formation (subaerial, subglacial, or submarine); and form of feeder conduit (short fissure/tubular conduit or long fissure) for the three, primary compositional classes of Icelandic volcanoes: basalt (effusive: lava ring, lava shield, lava shield row, table mountain, subglacial ridge, seamount, submarine ridge; mixed: spatter cone, spatter cone row, scoria cone, scoria cone row, mixed cone row; explosive: tephra ring, tephra ring row, maar, maar row); rhyolite (effusive: flow dome); and central (mixed composition of basic, intermediate, and acidic lavas and tephra: composite cone, composite ridge, composite volcano massif). A pseudovolcano landform (explosive: pseudocraters) is also included in the classification.

INTRODUCTION

The volcanoes of Iceland have long held the interest of Icelandic and non-Icelandic scientists alike. The geological literature of Iceland is replete with reference to Iceland's volcanoes, particularly its great variety of volcanic landforms. *Thorvaldur Thoroddsen*, one of the most prolific scientists ever to study and publish on various aspects of the geology and geography of Iceland, was especially interested in the various shapes of volcanic craters. In 1905, *Thoroddsen* published sketch maps of 16 types of volcanic craters and crater groups. The eminent German volcanologist, *Karl Sapper*, in 1908 and 1910, published two papers on volcanic craters and crater rows. In his classic work on volcanoes, *Alfred Rittman* (1962), drawing upon his fieldwork in the Mývatn area during 1938-39, published sketch maps of pseudocraters and crater rows. In both his first edition (1936) and his second edition (1960) *Rittman* also published classification schemes for what he termed „Zentralvulkane" and „Linearvulkane." By central volcano and linear volcano *Rittman* meant an eruption from a central conduit and a fissure, respectively. *Rittman* also considered the quantity of magma erupted and the type of activity (effusive, mixed, and explosive) to be important in the classification of volcanoes.

CLASSIFICATION OF ICELANDIC VOLCANOES

It wasn't until the late 1950's, however, that *Sigurdur Thorarinsson*, drawing upon 25 years of field observations all over Iceland, a thorough knowledge of the geological literature of Iceland, and familiarity with the Danish geographer Niels Nielsen's classification of volcanoes in general with specific reference to Iceland (*Nielsen*