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## The Development of bonded Discontinuities in Basalt, and their Significance to Freeface weathering

G. R. DOUGLAS

*Menntaskólinn við Hamrahlíð, Reykjavík*

### ABSTRACT

*A system of small scale discontinuities in basalt lava flows from Iceland and Ireland is described. These are believed to have originated as brittle fractures under low stress conditions. The fractures have subsequently been bonded by secondary minerals including clay minerals. These are thought to have formed at a low temperature hydrothermal stage. Further changes occur within the bonded discontinuities under sub-aerial weathering conditions, which include new fracture propagation, and failure along these produces fragments in freeface locations. A combination of stress conditions and inherent rock properties such as mentioned, are considered to be more important than many environmental factors.*

### INTRODUCTION

The freeface environment (i. e. a near vertical rock wall), is often considered to be one where frost weathering is the predominant present day process. The Icelandic climate is sometimes regarded as being typical for this kind of activity (Tricart 1970). An accumulating literature demonstrates the importance of the freeface environment to present day denudation in a variety of countries (Rapp

1960, Bjerrum and Jorstad 1968, Luckman 1976, Selby 1980, Douglas 1980). There is also growing evidence that many factors relating to the rock itself are more important than the environment (Whalley 1974, McGreevy 1980). For example cracks and microcracks in igneous rocks have only lately received attention as a means of explanation for many weathering processes (Whalley et al. in preparation).

This paper deals with a system of discontinuities found to be widespread in extrusive basaltic rocks where they are exposed at freeface locations both in Iceland and Ireland. The essential features and possible origin of these discontinuities is described and their relevance to present day weathering discussed. The rocks studied contain a wide variety of discontinuities which include faults, joints and microfractures as well as vesicles and other non-linear cavities at crystal level. Those described here are planar in nature and can be recognised on cut surfaces or in thin section as thin dark lines or as dark coatings on freshly broken rock. They occur in the rock prisms which are the result of the cubical or columnar joint sets so common of this freeface environment.