

GEOLOGIC SETTING OF LESOTHO KIMBERLITES FROM AN ORBITAL PERSPECTIVE

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ABSTRACT

This study evaluates ERTS-1 satellite imagery with reference to earlier airborne multisensor, kimberlite surveys of Northern Lesotho conducted for the United Nations Development Program. A kimberlite photo linear association is significant in that it implies a deep basement tectonic process.

ERTS-1 imagery resolution (approximately 50 feet at best) is not sufficient to directly define the known kimberlite diatremes, approximately this size or smaller, or the much smaller kimberlite dykes. Geochemical alteration haloes generally associated with epithermal mineral emplacement are lacking for the kimberlite bodies which are essentially a low temperature gas blowout. However, analysis of this imagery and in particular the MSS-7 band (photographic infrared ≈ 1 micron) reveals major linear patterns with E-W and NW-SE orientations. Kimberlite diatremes in northeastern Lesotho occur in connection with dyke swarms with a generally NW-SE trend in both the Hololo sandstones and the younger Drakensberg basalts. The tectonic framework provided by the trend may control the zones of actual kimberlite emplacement by providing the relative zones of weakness. The relative density of this conjugate faulting is greatest in Northern and Southern Lesotho. Subsidiary results of the interpretation are the fact that the sparsely vegetated alpine, basaltic terrane may be distinguished from the sedimentary units and deeply incised drainage features by virtue of their lesser reflectance in the MSS-7 band. Further, due to the low sun angle employed by ERTS-1 in photography, at least some resistant dykes (dolerite) may be recognized by the shadows they cast.