East Butte is the easternmost of three prominent domes (Big Southern, Middle, and East Buttes) located on the Eastern Snake River Plain. It stands 350 m above the basalt flows which surround its 2.4 km base (fig. 1). East Butte is located in the southeastern corner of the Idaho National Engineering Laboratory facility, 51 km west of Idaho Falls (fig. 2).

Preliminary mapping of East Butte has shown it to be a single cumulodome composed predominantly of rhyolite which can be classified into three groups based on macroscopic structure and color. The first of these groups consists of a massive, light to moderate gray rhyolite which makes up the greatest volume of East Butte. The second group is also a massive rhyolite but is reddish to pinkish gray in color. The third group is a flow layered rhyolite with alternating pink and gray bands. Geochemical analyses of these rhyolites are being carried out to determine if the color variations are compositionally unique. Armstrong and others (1) determined a K-Ar age of 0.6 ± 0.1 m.y. B.P. for the rhyolites of East Butte.

All varieties of the East Butte rhyolites are aphanitic with phenocrysts of sanidine and quartz which range up to 5 mm in length. Vesicular reddish black inclusions of basalt up to 10 cm in length are common in the East Butte rhyolites (fig. 3). These inclusions contain euhedral laths of plagioclase phenocrysts which attain lengths of up to 2 cm. The basalt inclusions are believed to be the result of fragmentation of the material of the walls of the conduit by the rhyolitic magma as it was emplaced.

The flow layered rhyolites provide some insight into the structure of East Butte. Attitudes indicate a general inclination outward from the central, highest portion of the Butte although there is no consistency in the magnitude of these dips. Morphologically, a 250 m diameter depression is located at the top of East Butte and suggests the presence of a crater although the depression is not sharp in appearance and has walls that slope gently toward a low point in the center. Three small 3 to 5 m high mounds composed of a massive rhyolite occur around the periphery of this depression however and support the conclusion that it is indeed a crater. The mounds are believed to have formed when viscous rhyolitic magma was extruded late in the developmental history of East Butte when a viscous magma rose through bounding fractures of the crater. The fractures themselves probably resulted from collapse when magma withdrew down the conduit.

East Butte and Big Southern Butte (2) are late volcanic features which have developed by emplacement of rhyolitic magma through the accumulated Pleistocene-Holocene basalt flows which make up the Eastern Snake River Plain Province. Middle Butte, although not studied in detail, is similar although the rise of the rhyolitic dome has not been to the same extent as the others. A cap of basalt flows are still in place on Middle Butte and this distinguishes it morphologically and mineralogically from both East Butte and Big Southern Butte.

Volcanic domes are features which are not morphologically unique to the earth. The Gruithuisen and Marius Hills dome regions are two analogs found on the Moon. Although these lunar domes are generally larger than the Buttes of the Eastern Snake River Plain, they are morphologically similar. These lunar domes may have been created by processes similar to those which occur on the Snake River Plain and other terrestrial volcanic provinces. A theory explaining the existence of lunar domes is in a more viscous mafic lava, with

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possibly a slightly higher silica content, being extruded or emplaced to form a steep-sided volcanic construct.

References: