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SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND

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E74-10184) SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND. VATNAJOEKULL AREA, ICELAND: NEW VOLCANIC AND STRUCTURAL (Geological Survey, Reston, Va.) 3 p HC $3.00 CSCL 08G G3/13 00184 Unclas N74-14995

Special Report No. 3: Reprint of abstract of paper, "Vatnajökull Area, Iceland: New Volcanic and Structural Features on ERTS-1 Imagery," which was presented at the 1973 Annual Meetings of the Geological Society of America, and published in Geological Society of America Abstracts with Programs, 1973 Annual Meetings, v. 5, no. 7, October, p. 864-865.

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Publication authorized by the Director, U.S. Geological Survey and volcanic features which are partly or wholly buried under the icecap. Some of these features were previously unknown or only suspected. The morphology of Bárðarbunga, an area east of Hamarinn, and Esjufjöll suggest buried central volcanoes. Two elliptical features, one at Kverkfjöll and another at Esjufjöll are recognized as probable subglacial calderas. A line of depressions between Hamarinn and Grimsvötn is related to subglacial geothermal or volcanic activity. The easternmost depression is related to an August 1972 jökulhlaup on the Skaftá river. A chain of shallow depressions E to SSE of Grímsfjall may show the subglacial course of floodwater from the March 1972 jökulhlaup from Grímsvötn.

Two prominent volcano-tectonic lineaments can be traced across the image. One strikes N.45°E. for at least 80 km along a line of nunataks and subglacial volcanoes, calderas, and geothermal areas. The other volcano-tectonic line strikes N:35°W. along Vatnajökull's southern margin, cutting across the other alignment. This latter structural feature separates two markedly different tectonic regimes. On the southwest is an area dominated by volcanic fissures, faults, hyaloclastite ridges, and crater rows of unusual length and linearity. Northeast of this line, mostly within, but also just beyond the margins of Vatnajökull, is an area dominated by central volcano complexes.

PRINCE WILLIAM SOUND, ALASKA, A VOLCANOGENIC MASSIVE SULFIDE PROVINCE

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Recent studies indicate that the Prince William Sound, Alaska copper deposits are strata-bound massive sulfides, not post-metamorphic epigenetic vein deposits as previously reported. Host rocks consist of turbidites, and subaqueous tuffs interbedded with pillowed basalts of the Early Tertiary? age Orca Group. All rocks in the area have been dynamothermally metamorphosed to lowest rank greenschist facies contemporaneous with or following cataclasis. Close spatial relationship between the ore deposits and shear zones suggests an epigenetic origin of the ores, but this relationship is misleading.

A volcanogenic origin of the ores is indicated by the following:

1. On Latouche Island, cataclastic ore textures, confinement of ore to siltstone units, absence of post-metamorphic intrusions, lack of hydrothermal wall-rock alteration, and absence of hydrothermal veins provide evidence for the premetamorphic origin of the sediment-enclosed deposits.

2. On Knight Island, assymetrical distribution of Zn values within lensoid ore bodies, confinement of ore to subaqueous-tuff units, depletion of metals adjacent to spatially related shear zones, and lack of hydrothermal wall-rock alteration show that the deposits found interbedded with pillowed basalts are not hydrothermal veins.

Geological Society of America,
864 ABSTRACTS WITH PROGRAMS, 1973 Ann. Mtngs., Dallas, Texas, p. 864-865.

Following stillstand, Matagorda Island prograded Gulfward approximately one mile. During this progradation, four large tidal passes, which connected the Gulf of Mexico with the landward lagoon, were closed. The island was further modified by erosion and reprogradation of the island's eastern end, as well as by migration of the southern pass several miles to the west across the island's southern end.

The source of sand which makes up this barrier complex is two-fold. Prior to stillstand, erosion of Pleistocene strand plain sand and middle Holocene fluvial-deltaic sand which was exposed on the shelf, supplied most of the sediment to the early barrier. Following stillstand, with progradation, shelf sands were too deeply submerged to be eroded by Gulf waves. Sand, discharged into the Gulf by the Colorado and Brazos Rivers, and transported southwestward by longshore currents, was deposited on the beach and shoreface of Gulfward building Matagorda Island.

HEAT LOSS FROM THE EARTH: NEW ESTIMATE

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From analysis of observed heat flow values and incorporating modern tectonic models of sea floor spreading, the average heat loss from the Earth's interior is calculated at 9.2×10^{12} cal/sec (±20%) or an average of 1.8×10^{-6} cal/cm^2-sec (HFU) over the Earth's surface. This is about 20% larger than previous estimates. The principal source of uncertainty derives from unknown parameters of the oceanic lithosphere. The hypothesis of extensive hydrothermal circulation in young crustal material near active spreading mid-ocean ridges is invoked to explain why values measured by standard oceanographic techniques fail to detect the total heat flux near these ridges. With the average continental heat flow of 1.5 HFU, and oceanic of 2.0 HFU, the surface heat flux is biased toward the southern (ocean) hemisphere. This does not necessarily indicate long-term asymmetry in the cooling of the Earth. Models of the Earth no longer need be constrained by the previously accepted equality of ocean and continental heat flow. Hypotheses of the thermal history of the Earth or the relationship between Earth and chrondritic meteorite composition and heat production may be modified by the new value. The Earth's heat loss is about 5 times the rate at which man uses energy (2×10^{12} cal/sec) and about 4000 times less than the rate at which solar radiation impinges on the Earth and its atmosphere (4×10^{16} cal/sec).

VATNAJÖKULL AREA, ICELAND: NEW VOLCANIC AND STRUCTURAL FEATURES ON ERTS-1 IMAGERY

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An ERTS-1 image of the snowcovered Vatnajökull area, Iceland, acquired at 7° sun angle, reveals large structural