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ATLAS OF JOVIAN SATELLITES
GEOLOGIC SERIES
LERNA REGION (Ji-4) I-2055

CORRELATION OF MAP UNITS

DESCRIPTION OF MAP UNITS

MANTLING MATERIAL

Mantling material—Thin, low-albedo deposit extending from Babbar Patera in adjacent Ruwa Patera quadrangle to near Svarog Patera (at 47°S., long 267°). *Interpretation:* Pyroclastic deposit; relatively young

FLOOR MATERIALS

Fissure material—Generally low albedo material centered at 49°S., long 305°; forms elongate features from which flows emanate. *Interpretation:* Silicate or sulfur deposits within linear vents

Patera material

Dark material—Smooth material within circular to elliptical depressions, commonly irregular in outline. Some occur with hot spots. *Interpretation:* Lava lakes of silicates or molten sulfur at various temperatures within calderas

Light material—Similar to dark material but has higher albedo. *Interpretation:* Low temperature lava lakes, possibly solidified, of silicates or sulfur within calderas

Undivided material—Smooth material within circular to elliptical depressions; no color or textural variation. Includes floors of paterae obscured by shadows or topographic highs. Queried where poor image resolution prevents definitive identification. *Interpretation:* Similar to dark unit

FLOW MATERIALS

Fissure material—Associated with linear to curvilinear fissures. Overlies plains units. Albedo generally low but varied, lobate margins. Material near (at 80°S., long 330°) associated with inferred hot spot. Individual deposits probably of different ages, but lack of superposition relations precludes unique age determination. *Interpretation:* Lava or pyroclastic flows erupted from fissures

Patera material—Large, lobate, variegated flows; traceable to any one of a number of source paterae; association with source paterae either certain or apparent. Younger and older units recognized on basis of local overlap relations. (Not all deposits of younger (or older) material necessarily of same age.) *Interpretation:* Lava or pyroclastic flows

Younger material—Individual flow units discernible in some areas, as around Kane Patera

Older material

Undivided material—Superposition relations with other patera flow materials not obvious. Superposed on undivided plains material

Interpatera material—Lobate flows not obviously associated with specific source. *Interpretation:* Lava or pyroclastic flows from undetermined sources. Units may be different facies of same material

Medium-albedo material—Variegated, though generally medium dark

Light material—Variegated, though generally has high albedo

CONE AND MOUNTAIN MATERIALS

Cone material—Forms small conical hill at 71°S., long 296° near edge of plateau unit. Hill has circular summit depression. *Interpretation:* Hill is small volcano whose material has high yield strength; alternatively, may be erosional remnant of plateau

Mountain material—Forms isolated, high-relief, generally steep-sided features, varied in texture rough to smooth. Commonly overlaps plains and plateau materials; associated with paterae at many places. Queried where image resolution prevents definitive identification. *Interpretation:* Volcanoes of varied ages composed of material of high yield strength, probably silicic

PLAINS AND PLATEAU MATERIALS

Plains materials—Occur at relatively low elevations; surfaces appear generally smooth and flat; albedo varied. *Interpretation:* Polygenetic materials composed of lava and pyroclastic deposits

Younger plains material—Albedo variegated. Embays older plains material; superposed by fresh and degraded fissure flow material

Older plains material—Cut by curvilinear features, possibly grabens. Appears to be topographically higher than younger material in area around (at 78°S., long 270°). Possibly a subunit of plateau material

Undivided material—Generally brownish yellow

Plateau material—Forms extensive, moderately high plains. Surfaces generally smooth except where crossed by grabens and ridges; bounded by scarps ranging from 150 to 1,700 m in height (Schaber, 1982) and by faults. Diagonal lines indicate areas that have been heavily eroded. *Interpretation:* Old volcanic deposits, probably largely pyroclastic, deformed by tensional tectonism and eroded

Contact—Dashed where approximately located or inferred

Fault—Bar and ball on downthrown side

Graben

Scarp—Line at top of scarp, hachures point downslope; used as contact in places. Most scarps interpreted as erosional but some may be structural

Ridge crest

Lineament or curvilineament—Origin unknown

Circular depression—Symbol used as contact; not shown where rim incomplete, possibly eroded. Interpreted as caldera

Low-albedo area inferred to be associated with hot spot—Symbol may be superposed on symbols below for inferred active vent and Voyager 1 hot spot

Vent inferred to have been active between Voyager 1 and 2 encounters

Hot spot—Identified from Voyager 1 IRIS data

Elevation in meters—Determined by photometry and photoclinometry (Schaber, 1982; Davies and Wilson, 1987)

Bright halo—Medium to high albedo; approximately concentric to paterae and mountains; also occurs at bases of scarps

Dark halo—Low albedo; circular to elongate

INTRODUCTION

Io is the innermost of the Galilean satellites of Jupiter. Io's radius of 1,820 km and density of 3,530 kg/m³ are about the same as those of Earth's Moon. However, unlike the Moon's surface, which is largely covered by impact craters and maria, the surface of Io is dominated by volcanic landforms (Schaber, 1980, 1982). Moreover, the two 1979 Voyager encounters revealed that Io's volcanism sent actively emitting materials (Morabito and others, 1979), a process that had been predicted prior to image acquisition (Peale and others, 1979). Of the nine volcanic plumes identified on Voyager 1 images, eight were also active at the time of the Voyager 2 encounter 4 months later.

GENERAL GEOLOGY

PLAINS AND PLATEAU MATERIALS

Materials of the Lerna region were mapped as dark-brown to black plains deposits by Masursky and others (1979).

CONE AND MOUNTAIN MATERIALS

The mountain material (unit m) is characterized by relief that locally exceeds 9±1 km (Schaber, 1982) and by extremely rugged surfaces of alternating ridges and troughs.

FLOW MATERIALS

The large extent of many flows indicates their emplacement as low-viscosity fluids.

FLOOR MATERIALS

Each deposit of the patera material is bounded by an approximately circular to elliptical, inward-facing boundary scarp or scarp system, forming paterae interpreted as calderas.

MANTLING MATERIAL

Mantling material (unit ma) has a very low albedo and forms a thin deposit that does not mask the underlying topography.

HALOS

At least three types of bright halos are found on color images of the Lerna region.

STRUCTURE

The dominant structural elements in the Lerna region are grabens.

GEOLOGIC HISTORY

The earliest event still decipherable in the Lerna region was the production of the plateau material, possibly as large pyroclastic deposits from unidentified sources.

REFERENCES CITED

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Baloga, S.M., Matson, D.L., and Peri, D.C., 1983, Autas and Io regolith outgassing by sulphur flows: Abstracts of papers submitted to the 14th Lunar and Planetary Science Conference, Houston, March 14–18, 1983, p. 15–16.

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SCALE 1:5,000,000 (1 mm = 5 km) AT –90° LATITUDE
POLAR STEREOGRAPHIC PROJECTION

INDEX TO MAPPING SOURCES

QUADRANGLE LOCATION

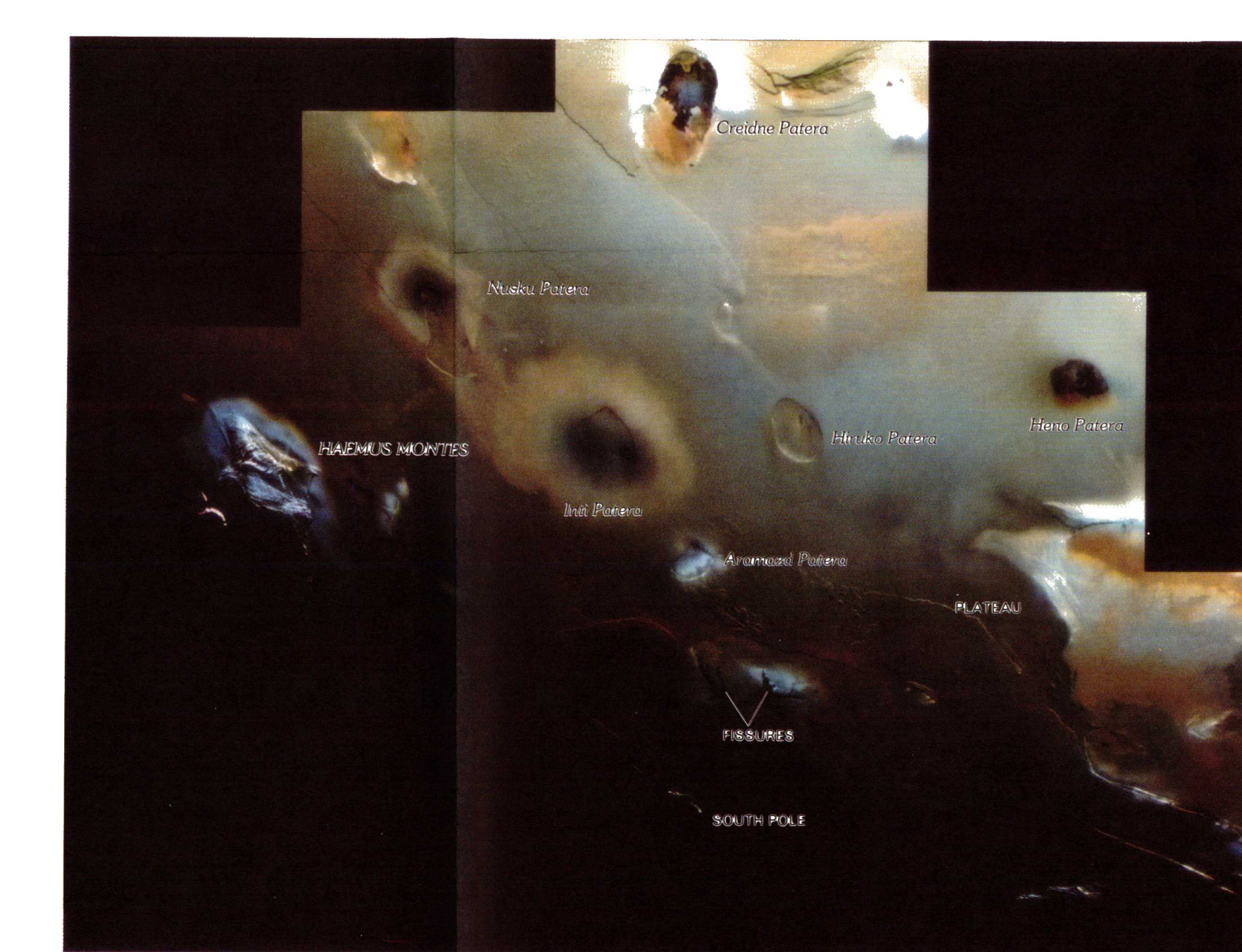Number preceded by I refers to published geologic map

Figure 1. False-color image of area near south pole of Io. Heavily dissected plateau can be seen in lower central part of image. South of the plateau are two low-albedo features. Scale about two-thirds that of geologic map. Image generated by A.S. McEwen.

GEOLOGIC MAP OF THE LERNA REGION (Ji-4) OF IO

By
James L. Whitford-Stark, Peter J. Mouginis-Mark, and James W. Head
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