Prospects for Lava-Cave Studies in Harrat Khaybar, Saudi Arabia

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Introduction

Lava-cave entrances have been observed in several parts of Harrat Khaybar, Saudi Arabia, and one lava tube has been surveyed. Strings of collapses up to 25 km long indicate the possibility that very long caves may be found in this lava field. The fact that an important ancient caravan trail skirts the western fringe of Harrat Khaybar, suggests that archeological studies of caves in this area may prove fruitful.

Harrat Khaybar

Harrat Khaybar is located north of Medina in western Saudi Arabia, between 39° and 41° longitude E and 25°and 26° latitude N (Fig. 1). It has an area of approximately 12,000 square km. The lavas and volcanoes in Harrat Khaybar are mildly alkaline with low Na and K content and include alkali olivine basalt (AOB), hawaiite, mugearite, benmoreite, trachyte and comendite. The age of the Khaybar lavas ranges from ~5 million years old (orangish flow field) to post-Neolithic (reddish-orange lava flows), to historic (black lava flows).

Roobol-Camp reports

Roobol and Camp (1991) reported the existence of lava-tube caves up to 10 m high on Harrat Khaybar. In one of these caves—located in a flow from Jebel Qidr Volcano—delicate lava stalactites were observed. A 100-meter-long lava tube in southern Harrat Khaybar was found to contain a fumarole at its deepest point. Roobol and Camp also describe numerous collapses along whale-back formations. These strings of collapses are up to 25 km long and in some cases are situated up to 25 km from the source volcanoes (Roobol and Camp, 1991).

Dahl Rumahah

Dahl Rumahah (also spelled Romahah) is registered as number 176 in Pint, 2002 and is located 169 km NNE of Medina in the northern part of Harrat Khaybar, at 25°56′N, 39°54′E, in a black lava flow. A map of the cave is given in Figure 2.

Dahl Rumahah is described in Pint, 2004 and Pint 2006. The cave is 208 m long and has a horizontal entrance 1 m high by 1.5 m wide, set in a small depression. A long, low wall outside the entrance channels rainwater into the cave, which local people say was used as a reservoir. Most of the cave is a single, nearly flat, northwest-trending passage from 1.5 to 7 m wide and 2.5 m high. Rooms north of station 7 and south of station 11 terminate in very low crawls which may be connected. In September of 2003, it was found that dry sediment

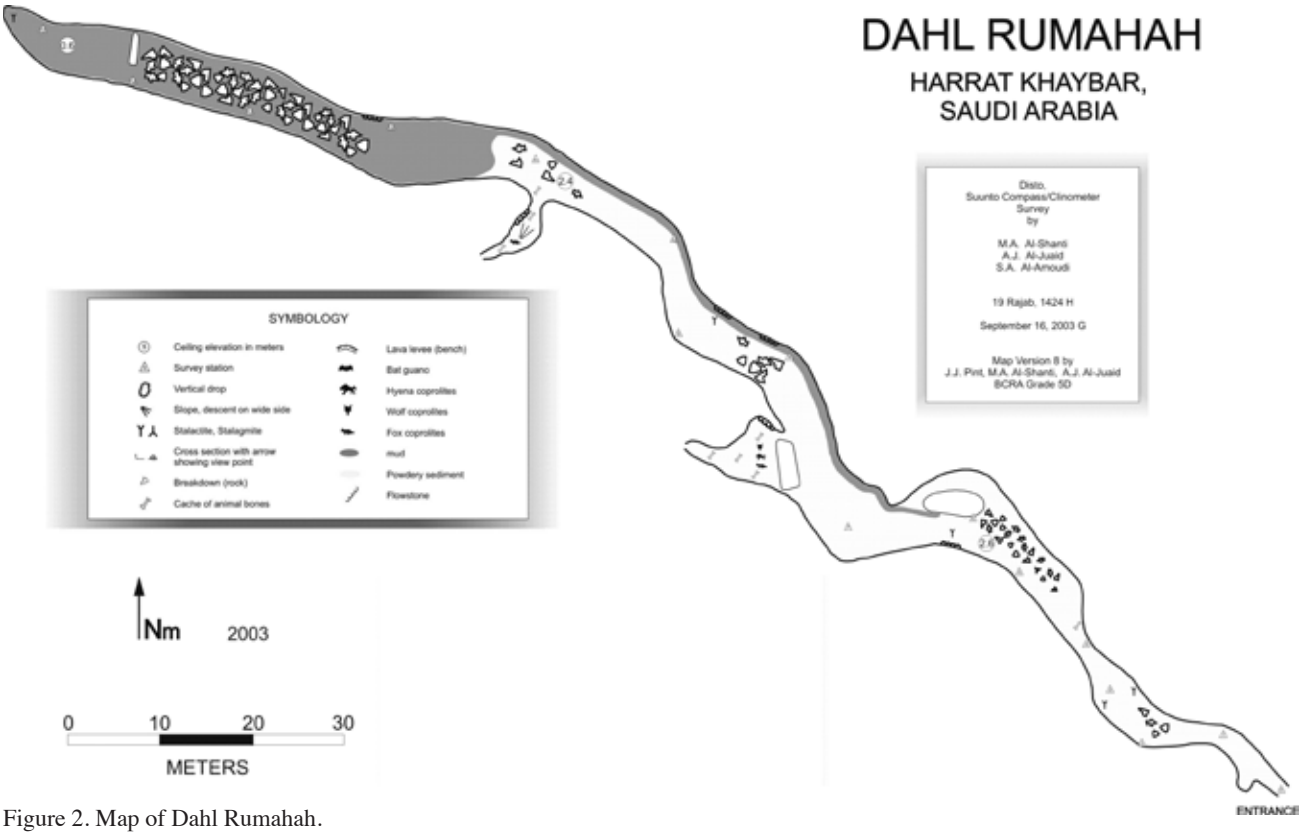

Figure 2. Map of Dahl Rumahah.

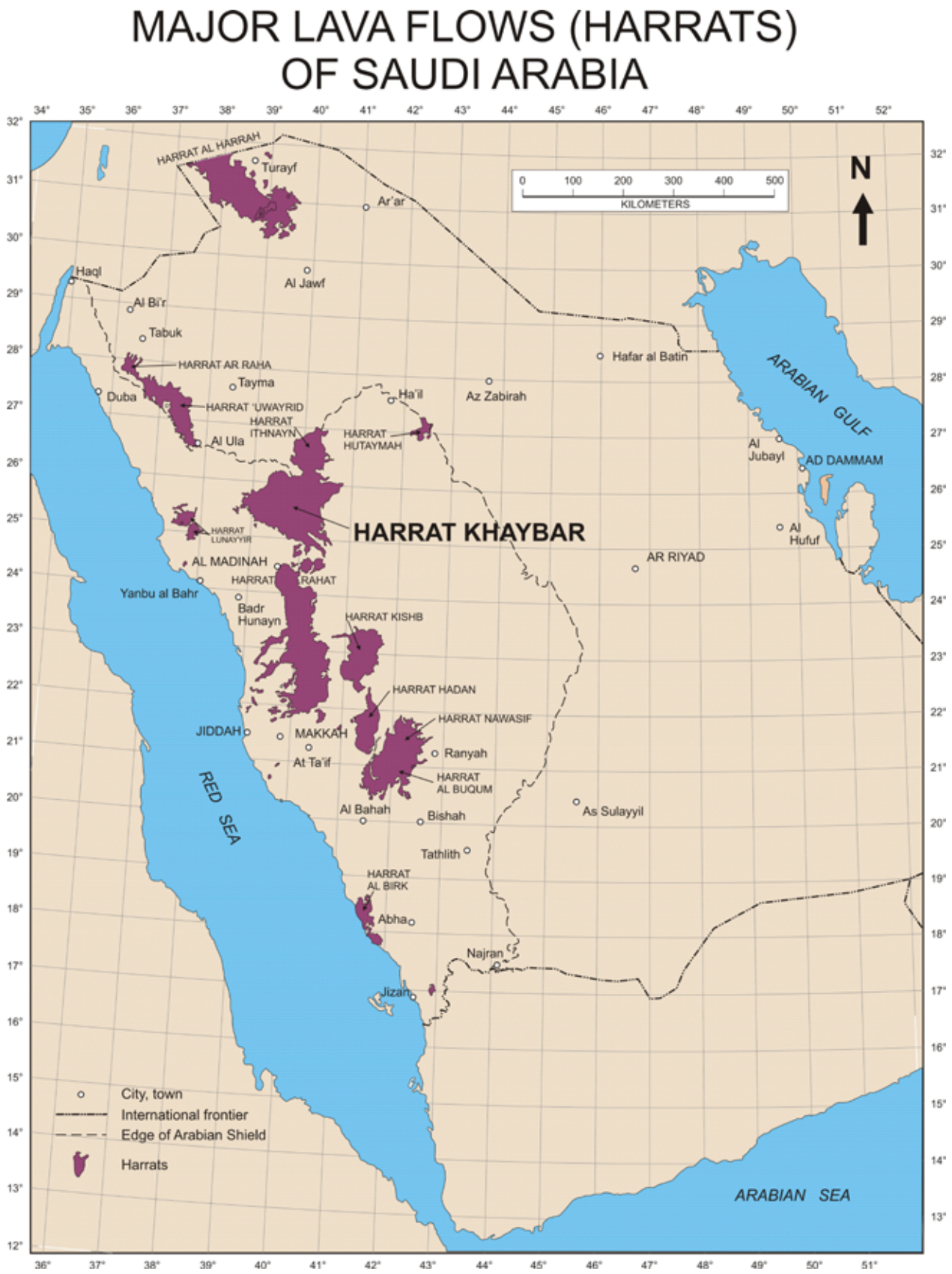

Figure 1. Location of Harrat Khaybar lava field in Saudi Arabia.

covered the floor of the southeast part of the cave while mud floored the northwest portion and occurred along part of the eastern wall. Water droplets and cave slime cover the ceiling at the far northwestern end of the cave. A natural bridge 1.5 m thick crosses the passage near its western end. Calcite-rich percolation water leaked through ceiling cracks, producing white stalactites, curtains and flowstone. There is a large area of bones, including hedgehog and porcupine quills, mixed with desiccated hyena, wolf and fox coprolites. The highest radon level noted in Saudi caves was found in Rumahah: 119 Pci/l. The cave's temperature was measured at 25°. Within a period of four hours the relative humidity rose from 68% to 74% at one point in the cave.

The radon level found in this cave seems high for a lava tube. It is possible that radon gas is entering the cave through cracks in the floor. The complete skeleton of an unknown animal is found in this cave, cemented to the floor by calcitic speleothems. There is evidence (including construction of a water-retaining wall) that this cave has long been used as a water reservoir.

Figure 3. Collapse entrance to Dahl Um Quradi in Harrat Khaybar.

Figure 4. Entrance to an unnamed lava tube in the Jebel Qidr flow. Photo by Uwe Hoffman.

Um Quradi Cave

In February of 2003, an attempt was made to survey Dahl Um Quradi, a lava tube located in southern Harrat Khaybar. Just outside the cave entrance, a member of the team was seriously injured and had to be rescued by helicopter, resulting in the cancellation of the survey. However, it was noted that the cave has a walk-in entrance measuring 2 x 3 m and a vertical (collapse) entrance 4 m in diameter and ca. 5 m deep (Fig. 3). This lava tube may be 100-200 m long. Information from several sources suggests that there are other lava tubes in the area, but data is not available at this time. (Pint 2006)

Collapses on Jebel Qidr

Sometime in the late 1990's, German explorer Uwe Hoffman visited the basaltic stratovolcano Jebel Qidr, located near the center of Harrat Khaybar. At the foot of the volcano, he observed and photographed collapses which appear to be in lava tubes, one of which is shown in Fig. 4. In 2004, J. Pint, S. Pint and A. Gregory traveled to Jebel Qidr with the hope of entering these caves. Lack of time did not permit visits to these caves, but the apparent entrances to several other lava tubes on the flanks of Jebel Qidr were observed and photographed by A. Gregory (Fig. 5). According to Roobol et al. (2002), this volcano may have last erupted in 1800 A.D., suggesting that lava caves in this flow may be among the youngest and most pristine in Saudi Arabia.

Proximity to archeological sites and ancient trails

The National Geographic Society's Genographic Project is based on evidence that all modern human beings are descendants of people who left Africa 50,000 to 70,000 years ago. These emigrants apparently followed two basic routes: one around the northern tip of the Red Sea and the other via the Bab Al Mandab at the southern end of the Red Sea. Those who followed the latter route and then traveled north on foot would quickly have found that the interior of the Arabian Peninsula was as harsh and unfriendly in the past as it is today, as has recently been proven by the attempted dating of stalagmites taken from limestone caves in the interior of

Figure 5. Apparent entrance to a lava tube on the high flanks of Jebel Qidr. Photo by Arthur Gregory.

Saudi Arabia. The U/Th dating method indicated no stalagmite growth for at least the last 400,000 years, implying that the interior of the Arabian Peninsula has been arid for at least this long a period (Fleitmann et al., 2004).

The most practical route north from what is now Yemen, would have been along the shore of the Red Sea itself or slightly inland, where people would have been forced to make their way between or alongside the vast lava fields which cover 89,000 square kilometers of the Arabian Shield.

Following the edge of the lava fields would have provided one very practical advantage: access to water. Most lava fields are very efficient collectors of rain water, which frequently drains from the lava fields at their edges. The ancient settlement of Khaybar, in fact, is located at the western edge of Harrat Khaybar precisely because water is abundant. Here, in fact, are found the ruins of Sed Kasaybah or Kasaybah Dam which is thought to be at least 1000 years old.

Some of the lava caves in Harrat Khaybar are natural water catchments. One of these is Dahl Rumahah, whose entrance, even in recent years, was disguised by local peoples because of its usefulness as a reservoir. If ancient peoples sought these caves in their search for water, it is possible that they then took advantage of them for shelter from the elements, for caching food supplies, or for hiding valuables. A typical year-round cave temperature of 25° C would have offered relief from the unbearable heat of the area in the summer and escape from the cold winds and frigid temperatures of winter. Today, artifacts may lie buried in the sediment which typically covers the original floors of Saudi lava tubes. Powdery sediment covering the floor of one such lava tube, Hibashi Cave in Harrat Nawasif-Buqum was found to be up to 1.5 m deep and up to 5.8±0.5 ka old, measured by Optically Stimulated Luminescence (Pint et al., 2005).

To date, 50% of the lava tubes studied in Saudi Arabia have exhibited evident signs of man-made constructions outside or inside the cave entrances. Flat, aerodynamically shaped throwing sticks—possibly Neolithic—have been found in lava caves as well as large quantities of bones, horns and coprolites (Roobol et al., 2002, Pint et al., 2005).

Dahl Rumahah, the northernmost known lava cave in Harrat Khaybar, lies only 22 km south of a major Neolithic rock-art site with hundreds of petroglyphs. Much of the western edge of Harrat Khaybar lies alongside the old Nabatean Incense Trail connecting Yemen and Petra. Unfortunately, no archeological or paleontological studies have yet been carried out in any limestone or lava cave in Saudi Arabia.

Conclusions

1. Harrat Khaybar offers excellent possibilities for the discovery of many lava caves in its ancient and recent flows. This lava field may house some of the longest lava caves in the world.

2. Archeological and paleontological surveys of the caves in Harrat Khaybar should be undertaken because of their proximity to archeological sites and ancient migration and trade routes.

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