DALLOL AS AN EARTH ANALOGUE TO MAAR-LIKE STRUCTURES IN MARS. F. Gómez*[1], N. Rodríguez[1], Jorge Pla-García[1], Cristina Escudero Parada[1], Daniel Viúdez-Moreiras[1], Antonio Molina[1]. [1]Centro de Astrobiología (INTA-CSIC). Carretera de Ajalvir km 4 Torrejón de Ardoz. Madrid 28850 Spain (*gomezgf@cab.inta-csic.es).

Introduction: The Danakil Depression is a rift valley between the Eritrean Plateau and Danakil Horst (3000 m and 600 m above sea level, respectively), to the west of the Red Sea, in northern Ethiopia. This up to 200 km wide graben-like valley is located in the northernmost part of the Afar Triangle, the center of the Afro-Arabian Rift System [1]. Continental crust in this area is very thin due to the formation of the oceanic crust in the junction of three oceanic ridges (the Gulf of Aden, the Red Sea, and the main Ethiopian rift [2] and due to tensional forces the area is highly active. Graben is formed due to parallel normal faults that displace the hanging wall downward and the footwall upward, while the center dips.

As the rift opens, the floor of the Danakil Depression subsides; and after millions of years of activity, the deepest part of the depression is about 120 meters below sea level, one of the lowest points on Earth. The Danakil depression is about 220x30 km. It is characterized by mud, salt plains, iron stains, and hot spring activity that produce a colorful but very unstable landscape in the Dallol craters. The depression basin has been flooded with seawater overtopping the divide between de basin and the Red Sea during its formation.

Subsidence in the area has occurred since the Oligocene and this rift segment hosts several NNW trending active volcanoes known as Erta Ale range as a consequence of this intense activity. Dallol (disintegration in the Afar language), to the Northwest, is one of the most recent expressions of this activity. There is fumarolic activity in the main dome outcrop, with clay-alteration and sublimation of sulfates.

Dallol hydrothermal system: The Dallol colorful landscapes originate as the active magma reservoir beneath the Salt Valley heats groundwater and vents at the surface to feed the surrounding highlands. This hot water moves up through the evaporite deposits, dissolving salts as halite, sulfur, calcite, sodalite, and hematite, with minor levels of silica. The supersaturated brine emerges through hot springs in the craters.

Maar-like Structures in Mars: The interaction between magma and subsurface volatiles (as water or ice) has been advocated to explain various unusual landforms of possible volcanic origin on Mars [3], [4], [5]. Maar structures superficially resemble to impact craters, especially secondary, but also periglacial features, pit craters, and volcanic rootless constructs [5]. However, they show some unique morphologic qualities. They display a low raised rim, and a shallow topographic depression with a floor below the level of the surrounding surface [6]. When they are associated with distinctive ejecta pattern, raised and show a very circular shape, they could be ruled out. However, many features has been identified as Maars since the 1960s, being common in monogenetic volcanic fields [6].

An area where the geomorphic evidence for such an interaction is particularly persuasive lies on the northwest edge of Elysium Planitia at 25–40°N, 130-145ºE, between the Viking 2 and InSight landing sites, close to Elysium Mons (~25°N,147ºE). Shallow basins that show evidence of water flow, lobate units that appear to be mudflows, and the drainage system that constitutes Galaxias Fossae (Hrad Vallis, Granicus Valles, and Hebrus Valles) all indicate that water reached the surface in proximity to relatively young lava flows [7].

Seasonal Water Vapor Transport on Hrad Valley: Running atmospheric models [8] we simulated the possible origin of the air in Hrad valley in order to evaluate potential astrobiological interest. Atmospheric transport is the driving mechanism in the absence of a local source of water. The global seasonal water sources are at the poles with the north being the most dominate.

Results: The column abundance of water vapor peaks around Ls 150º at Hrad Valley location as observed by TES and Viking MAWD. Some others interesting conclusion will be presented during the workshop as, if moist air makes it to Hrad Valley during Ls 150º, it should be a go-to site due to enhanced habitability implications.

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