Mars and Lunar Regolith Simulants – A New Terrestral Analogue Site

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Fogo Island is a good analogue for both the Moon and Mars due to its rocky, dusty and un-vegetated terrains. Volcanoes and volcanic landforms and processes can be studied such as vents; lava flows (both basaltic and differentiated); unconsolidated pyroclastic deposits; hydrothermal alteration; lava tubes and caves; dykes; channels and valleys; basaltic rift system and ridges; and astrobiology of volcanic environments. The red, oxidised, basaltic, tephra from Fogo has optical properties that resemble the established simulant of the bright regions of Mars. Geochemistry and mineralogic studies show a great similarity of the old pre-Caldera geological unit and the MGS1 Mars Global Simulant, evidenced by a relative depletion in mobile elements (e.g., Na, Ca, Mg) and an enrichment in non-mobile elements (e.g., Ti, Fe, Sc, Al), the decomposition of the most labile minerals (olivines), and the enrichment in secondary components (phyllosilicates and some Fe-oxides). The Historical geological units (recent eruptions) showed similarity with the JSC-1 Lunar simulant. As JSC-1 Lunar simulant, in the younger units of the Fogo Island sample, the basalts comprise an abundant volcanic-glazed landmass. In terms of composition, the mineral grains laid down in this groundmass are enriched in plagioclase and Fe-Mg minerals, which are more vulnerable to weathering than most of the silicates that constitute silica-rich rocks. Beyond geochemical and mineralogical characterization, the JSC-1 Lunar simulant was also characterized by determining seismic, magnetic and thermal properties, density with degrees of compaction, as well as some other parameters. To determine the thermal properties of JSC-1, a numerical model was developed with an inversion routine. The thermal conductivity obtained was 0.26W/mK, specific heat 701J/KgK and density 1352Kg/m^3. The seismic velocities determined in microgravity campaigns were lower than in 1g environment. These geophysical findings of the simulant will also be verified in Fogo Island materials as well as in the know Mars simulants.

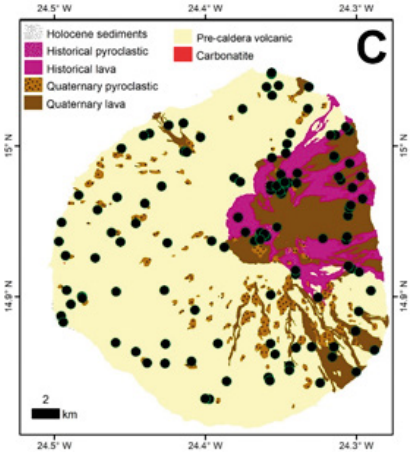

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FIGURE 1
Photo by Eduardo Ferreira da Silva.