Grain-Size and -Shape Analysis of Basaltic Sands from Grand Falls, Arizona, USA: An Analogue for Aeolian Sediments on Mars

Ashley Platt, Matthew Innes and Daene Won

INTRODUCTION

The Grand Falls dunefield in northern Arizona, USA, is an active aeolian environment that borders the eastern edge of the San Francisco volcanic field (Fig. 1). The volcanic field consists of some 600 volcanics with basaltic access cones and lava flows (Meade et al., 2010). Although much of the surface of Mars (Hayward et al., 2010) has been studied as an analog for interpreting and understanding aeolian processes and linkages of basaltic lithology that is typical of much of the surface of Mars (Hayward et al., 2010). Further to this, the San Francisco volcanic field is an ideal candidate to use as an analogue for interpreting and understanding aeolian processes and linkages of basaltic lithology that is typical of much of the surface of Mars (Hayward et al., 2010). This setting is similar to that of an extensive as an astronaut training ground for the Apollo moon landings and NASA’s Desert Research and Technology Studies (Desert RATS) program (Hayward et al., 2010). 'Negligible attention has been made of the eruption dynamics, or how the particles evolve during aeolian transport. As for the sediments from Arizona, speculation can be made about previous and current aeolian environments where weathering and erosion of the source sediments for the Grand Falls sample. The data collected from this investigation will contribute to the developing body of knowledge about aeolian and geological processes on Mars and its landscape development.

BACKGROUND

Visual similarities of surface features between Grand Falls and Mars allow for the comparison and analysis of past and present environments on Mars. Through the analysis of crater and river images it has been found that similar dune formations and environmental factors exist on Mars, as found on Earth. In particular, the size and shape of dunes and basaltic sands on both surfaces are similar in many instances and indicate that the shape distribution of these sediment sizes allows for the indication of shape changes between the sizes. The moderately sorted analogue sample is an example of sands that roughly fit into two size grades. Due to finer sediment grades producing rounder grains and a multi-fraction, and suggests that the Grand Falls volcanic source, only some 5 km to the southwest, did not comprise larger granule, fine spherical, and rounded grains. This distribution of sediments within the granulometry of the analogue sample indicated that the majority of the sediments were between 0.5mm and 1.0mm. The shape distribution of these sediment sizes allows for the indication of shape changes between the sizes. The moderately sorted analogue sample is an example of sands that roughly fit into two size grades. Due to finer sediment grades producing rounder grains and a multi-fraction, and suggests that the Grand Falls volcanic source, only some 5 km to the southwest, did not comprise larger granule, fine spherical, and rounded grains.