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Mosaicked HRSC DTMs for Mars Geomorphological Analysis of Ares Vallis

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The Martian outflow channels are the largest known geomorphic features carved by running water in the Solar System. They form some of the most dramatic landscapes on the Martian surface being several kilometres deep and tens of kilometres wide. The outflow channels are believed to have been eroded during enormous episodes of catastrophic flooding, which are estimated to have far exceeded the scale of catastrophic floods on Earth. To understand the magnitude, number and timing of flood events, and the mechanisms responsible for their formation, numerous studies of the outflow channels have been carried out over the last few decades. However, these studies were hampered by the spatial resolution of topographic data available to study Martian landforms. Whilst extensive but low resolution Viking imagery, MOLA topography and high resolution, but spatially restricted, imagery taken from Mars Observer Camera-Narrow Angle (MOC-NA) and Thermal Emission Imaging System (THEMIS) have been available, the lack of high resolution topographic data with which to investigate meso-scale (1-100 km scale) landforms in detail has restricted the analysis and interpretation of the features on Martian surface.

Since the European Space Agency (ESA) Mars Express spacecraft entered an elliptical orbit around Mars on the 25th of December 2003, the High Resolution Stereo Camera (HRSC) placed onboard has been imaging the Martian surface. Due to HRSC's characteristics of high resolution and stereo imaging capability, the construction of Digital Terrain Model (DTM) of Mars surface topography with a grid spacing of 30-75 metres is feasible for most areas. By visualising the Martian terrain in a high resolution three-dimensional model, the evolution of the Martian surface and the geomorpho-

logic interpretation can be effectively and correctly implemented.

This study reports on the creation of high resolution DTMs of a large outflow channel in Ares Vallis, which is covered by a number of HRSC orbital images. To obtain a complete 3D terrain model of area of interest, DTMs of each orbit were firstly produced and noise due to stereo matching blunders removed. Consequently a single DTM was mosaicked to obtain complete coverage of the outflow channel in Ares Vallis. The details of the methods employed, as well as the benefit for geomorphologic analysis using the resultant DTM will be demonstrated.