Geophysical Research Abstracts
Vol. 17, EGU2015-14884, 2015
EGU General Assembly 2015

Mapping Mars' northern plains: origins, evolution and response to climate change - an overview of the grid mapping method.

Jason Ramsdale (1), Matthew Balme (1,2), Susan Conway (1), and the ISSI Team

(1) Dept. Physical Sciences, Open University, Walton Hall, Milton Keynes, MK7 6AA (jason.ramsdale@open.ac.uk), (2) Planetary Science Institute, Suite 106, 1700 East Fort Lowell, Tuscon, AZ, USA.

An International Space Science Institute (ISSI) team project has been convened to study the northern plains of Mars. The northern plains are younger and at lower elevation than the majority of the martian surface and are thought to be the remnants of an ancient ocean. Understanding the surface geology and geomorphology of the Northern Plains is complex, because the surface has been subtly modified many times, making traditional unit-boundaries hard to define. Our ISSI team project aims to answer the following questions:

1) "What is the distribution of ice-related landforms in the northern plains, and can it be related to distinct latitude bands or different geological or geomorphological units?"

2) "What is the relationship between the latitude dependent mantle (LDM; a draping unit believed to comprise of ice and dust thought to be deposited under periods of high axial obliquity) and (i) landforms indicative of ground ice, and (ii) other geological units in the northern plains?"

3) "What are the distributions and associations of recent landforms indicative of thaw of ice or snow?"

With increasing coverage of high-resolution images of the surface of we are able to identify increasing numbers and varieties of small-scale landforms on Mars. Many such landforms are too small to represent on regional maps, yet determining their presence or absence across large areas can form the observational basis for developing hypotheses on the nature and history of an area. The combination of improved spatial resolution with near-continuous coverage increases the time required to analyse the data. This becomes problematic when attempting regional or global-scale studies of metre-scale landforms. Here, we describe an approach to mapping small features across large areas.

Rather than traditional mapping with points, lines and polygons, we used a grid "tick box" approach to locate specific landforms. The mapping strips were divided into 15×150 grid of squares, each approximately 20×20 km, for each study area. Orbital images at 6-15m/pix were then viewed systematically for each grid square and the presence or absence of each of the basic suite of landforms recorded. The landforms were recorded as being either "present", "dominant", "possible", or "absent" in each grid square. The result is a series of coarse-resolution "rasters" showing the distribution of the different types of landforms across the strip.

We have found this approach to be efficient, scalable and appropriate for teams of people mapping remotely. It is easily scalable because, carrying the "absent" values forward to finer grids from the larger grids would mean only areas with positive values for that landform would need to be examined to increase the resolution for the whole strip. As each sub-grid only requires the presence or absence of a landform ascertaining, it therefore removes an individual's decision as to where to draw boundaries, making the method efficient and repeatable.