WESTERN OCEANUS PROCELLARUM AS SEEN BY C1XS ON CHANDRAYAAN-1

S. Z. Weider[1,2], B.J. Kellett[2], B. Swinyard[2], I.A. Crawford[1], K. H. Joy[1,3,4] & C1XS Team*. [1]Centre for Planetary Sciences at UCL/Birkbeck, London, UK. [2]Space Science & Technology Department, Rutherford Appleton Laboratory, Oxon, UK. [3]Center for Lunar Science and Exploration, LPI, USRA, Houston, TX, USA. [4]The NASA Lunar Science Institute. *Listed at the end. E-mail: s.weider@ucl.ac.uk.

Introduction: C1XS (Chandrayaan-1 X-ray Spectrometer) was a compact XRF (X-ray fluorescence) spectrometer that flew onboard the Indian Space Research Organisation (ISRO) Chandrayaan-1 lunar mission between October 2008 and August 2009. Its design exploited heritage from the D-CIXS instrument on SMART-1 [1-2], but it was a much more capable, scientific instrument [3-5]. The instrument was intended to measure the abundances of major rock-forming elements (e.g. Mg, Al, Si, Ca, Ti and Fe) in the lunar regolith at both high spectral (~110 eV) and spatial (50 km footprint) resolutions during C-class (10^{-6} to 10^{-5} Wm^{-2}) and above solar X-ray flare events.

Dataset: Due to the low levels of solar activity during the mission and the shortened mission lifetime, the scientific yield from C1XS was lower than had been anticipated. However, due to the excellent design and the exceptional capabilities of the instrument, scientifically interesting and important data were obtained during less-energetic flare events than the original design requirements had specified. One such dataset was obtained during a B-class (10^{-7} to 10^{-6} Wm^{-2}) solar flare on 10th February 2009, with a ground track (~8° to 73° N; ~70° W) in the western portion of Oceanus Procellarum, the largest of the lunar maria. The three low energy characteristic X-ray lines of magnesium, aluminium and silicon in the resulting spectra were detected and easily resolved. Their relative line intensities show variation along the ground track and we will relate this to variations in the relative abundances of these elements in the uppermost lunar surface. We will compare our results with existing information from other remote sensing datasets (e.g. Clementine and Lunar Prospector) and from the returned sample collection. Oceanus Procellarum is known to be made up of numerous, compositionally distinct lava flows [e.g. 6] and Clementine multispectral reflectance data indicate that this C1XS ground track covers an area consisting mostly of high-titanium mare basalts, with an area of highlands terrane at the very north. There is also significant internal variation within the basaltic region, as revealed by Lunar Prospector data (e.g. changes in the relative abundances of magnesium, aluminium and silicon).

Although the C1XS dataset is limited in its size and extent, it can help constrain important geological parameters such as magnesium number (Mg#) and the refractory element budget of the lunar surface.

The C1XS Team: M. Grande, A. Cook, J.A. Carter B.J. Maddison, B.J. Kellett, C.J. Howe, B.M. Swinyard, P. Sreekumar, A. Shrivastava, S. Narendranath, J. Huovelin, L. Alha, I.A. Crawford, K.H. Joy, S.Z. Weider, C.L. Duston, O. Gasnaut, S. Maurice, D. Smith, D. Rothery, M. Anand, A. Holland, J. Gow, S.S. Russell, J.N. Goswami, N. Bhandari, D. Lawrence, V. Fernandes, T. Okada, C. Erd, D. Koschny, C. Pieters, M. Wieczorek.

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