2-D VS. 3-D GRAIN-SIZE ANALYSIS TECHNIQUES: A COMPARISON APPLIED TO METAL GRAINS IN GUJBA

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Introduction: The history of formation and subsequent processing of a geological material is reflected in its grain size distribution (GSD) [1]. 3-D GSDs can be estimated from 2-D sample sections by applying crystal size formulae to raw 2-D data and correcting to approximate the third dimension. This study investigates the accuracy of this method by comparing 2-D corrected GSD results of a slab of Gujba to real 3-D GSD results obtained from a computed tomography scan of the same meteorite.

Method: A 3cm thick polished slab of Gujba was BSE and element mapped using a LEO 1455. Particle analyses were run on over 1800 FeNi grains isolated from the image and corrected to approximate 3-D results with CSDSlice [1] and CSDCorrections [3] software. CSDSlice compares 2-D minor and major axes measurements of grains to return the best matching crystal. This crystal value is entered into CSDCorrections to correct grain data for the intersection probability effect and reduce errors from the cut section effect.

A separate 666g chunk of Gujba was CT scanned using a Venlo CT "Bladerunner" system and grain size data was collected from the 3-D reconstruction using image processing software SPIERS [4], ImageJ & VG Studio MAX (Figure 1).

Results and Discussion: During solidification or melting, rocks undergo changes in crystal shape, size and orientation which can be illustrated in CSD plots. The classic CSD diagram of Gujba from the corrected 2-D data set is similar to those found for clastic rocks [1]. Results of both 2-D and 3-D methods of GSD analysis, and implications for meteorite formation and evolution will be presented at the conference.

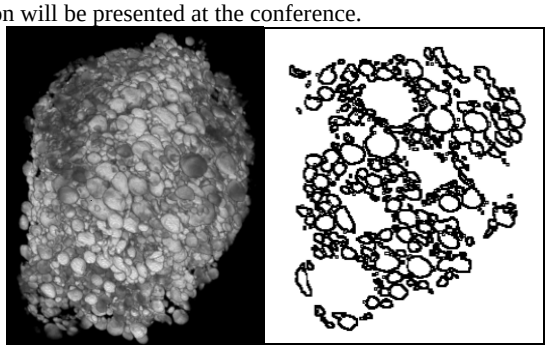

Figure 1: *Left*: 3-D reconstruction of the sample. *Right*: 2-D thresholded slice representation.

References: [1] B.D. Marsh. 1988. *Contributions to Mineralogy and Petrology*. 99:277-291 [2] D.J. Morgan & D.A. Jerram. 2005. *Journal of Volcanology and Geothermal Research*. 154:1-7 [3] M.D. Higgins. 2000. *American Mineralogist* 85:1105-1116 [4] M.D. Sutton et al. 2000. *Palaeontologia Electronica*. 4:1