

## MONOCARBOXYLIC ACIDS IN THE TAGISH LAKE METEORITE: INSIGHTS INTO THE ROLE OF PARENT BODY PROCESSING

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**Introduction:** The Tagish Lake meteorite is an ungrouped C2 chondrite with affinities to CI and CM chondrites [1]. Tagish Lake contains a high amount of organic carbon relative to other chondrites, most of which is insoluble in polar solvents [2]. A range of lithological variations beyond the carbonate-rich and carbonate-poor lithologies defined by [1] have been described by [3] and [4]. Our consortium has focused on organic matter in the pristine Tagish Lake meteorites, specifically samples 11v, 11i, 5b and 11h [3], representing individual meteorite specimens from within the suite. These samples display subtle variations in mineralogy and petrology [3], variations in the number and concentration of soluble organics [5, 6], including amino acids [7, 8] and large variations in insoluble organic matter (IOM) in terms of bulk H/C and  $\delta D$  ratios [9, 10]. The IOM is derived from a common precursor that has undergone an increasing degree of parent body alteration, in the order 5b  $\rightarrow$  11h  $\rightarrow$  11i  $\rightarrow$  11v [10]. Here we report compound-specific isotopic analysis of monocarboxylic acids (MCAs) in these same samples and examine the results in this context. Results have implications for the origin and modification of organics in meteorites, comets and IDPs.

**Samples and Methods:** MCAs were extracted and processed from ~0.7 g subsamples according to the method of [6]. SPME fibers were used to inject the extracted MCAs into an Agilent 6890 gas chromatograph coupled to a Thermo Deltaplus isotope ratio mass spectrometer (McMaster University).

**Results and Discussion:** While  $\delta D$  values of MCAs previously reported for sample 5b (e.g., formic  $\delta D = +247$  ‰, acetic/propanoic  $\delta D = +708$  ‰) indicate an extraterrestrial origin for these compounds [6], the  $\delta^{13}C$  values for the MCAs in these samples mostly overlap with terrestrial values. Significant variation in MCA  $\delta^{13}C$  values are observed, with the greatest variation in  $\delta^{13}C$  of acetic acid, ranging from  $-35$  ‰ (5b) to  $+8$  ‰ (11h). Only sample 11h shows a trend of decreasing  $\delta^{13}C$  with increasing carbon number, whereas results from the other samples are relatively constant ( $-20$  to  $-30$  ‰). Thus, 11h may be preserving a signature of kinetically controlled carbon addition in MCA synthesis [11], whereas the other samples record parent body isotopic exchange. Alternatively, sample 11h reflects preferential exchange of MCA carboxyl carbon with IOM or inorganic carbon [12]. Only the former hypothesis is consistent with results of amino acid analysis, which demonstrate that sample 11h is least affected by parent body alteration [8].

**References:** [1] Zolensky M.E. et al. 2002. *M&PS*, 37:737-761. [2] Grady M.M. et al. 2002. *M&PS*, 37:713-735. [3] Blinova A. and Herd C.D.K. 2010. *LPSC XLI*, #2140. [4] Izawa M.R.M. et al. In Press. *M&PS*. [5] Hilt R.W. and Herd C.D.K. 2008. *LPSC XXXIX*, #1737. [6] Hilt R.W. et al. 2009. *LPSC XL*, #1925. [7] Simkus D.N. et al. 2010. *GeoCanada*, Abstract. [8] Glavin D.P. et al. 2010. *This meeting*. [9] Herd C.D.K. and Alexander C.M.O'D. 2009. *M&PS*, 44:A88. [10] Alexander C.M.O'D. et al. 2010. *This meeting*. [11] Yuen G. et al. 1984. *Nature*, 307 :252-254. [12] Dias R.F. et al. 2002. *GCA*, 66 :2755-2769.