Water abundance in the Tagish Lake meteorite from TGA and IR spectroscopy: Evaluation of aqueous alteration

C Gilmour[a], CDK Herd[a], EA Cloutis[b], M Cuddy[b], and P Mann[b]

[a] *Earth and Atmospheric Sciences, University of Alberta, AB, Canada*
[b] *Department of Geography, University of Winnipeg, MB, Canada*

The Tagish Lake meteorite is an unique, organic-rich, ungrouped type 2 carbonaceous chondrite breccia that fell onto the frozen surface of Tagish Lake, BC in January 2000. Three notable Tagish Lake specimens (5b, 11h, and 11i) have been reported to show petrological variations that correspond to different degrees of aqueous alteration in the order of 5b < 11h << 11i. As aqueous alteration processes alter mafic silicates to hydrous silicates (phyllosilicates), the amount of water in a given altered meteorite is indicative of the degree of alteration. For specimens 5b, 11h, and 11i, it is unknown whether their phyllosilicate water abundances correspond to their reported alteration sequence. By addressing this unknown, this study can also determine which alteration phases (i.e., saponite vs. serpentine) are the main reservoirs for water in Tagish Lake.

Aqueous alteration studies on other carbonaceous chondrites have revealed that the degree of alteration among samples can be determined based on a direct correlation between the abundance of water in phyllosilicates and the ratio of phyllosilicates to mafic silicates. These two attributes can be quantified in Tagish Lake by thermogravimetric analysis (TGA) and transmission infrared (IR) spectroscopy, respectively. If the phyllosilicate water abundances and phyllosilicate/mafic silicate ratios for specimens 5b, 11h, and 11i correspond to their reported degrees of alteration, then two new specimens (4 and 10a) can be introduced into the alteration sequence. Preliminary results reveal that there is variability among the TGA and IR spectroscopy results, indicating that the scale of lithological variation in Tagish Lake may not be properly represented by the scale of sampling, or that alteration on the Tagish Lake parent body proceeded in a different manner than is currently understood.

Corresponding author: cgilmour@ualberta.ca