WATER AND HEAT: NEW CONSTRAINTS ON THE PARENT BODY EVOLUTION OF CV CHONDRITES.

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Introduction: The mineralogical diversity [e.g., 1, 2] of CV chondrites reflects a complex combination of various processes in both nebular and asteroidal settings [e.g., 1]. There is an abundant literature on CVs, but mostly on individual falls. In the present work, we combined several analytical techniques (Raman and Infrared spectroscopy, ThermoGravimetric Analysis, optical microscopy, and magnetic measurements) on a series of 26 CV chondrites (18 Antarctic and 8 non-Antarctic) to bring new constraints on their post-accretion history.

Methods: We previously characterized the metamorphic history of our series of samples based on the structural order of the polyaromatic carbonaceous matter, as assessed by Raman spectroscopy [3]. We now tackle the aqueous alteration of the samples through *(i)* the characterization of the hydrous mineralogy of the matrices by IR spectroscopy under low pressure (P ~10^{-6} mbar) and at different step temperatures (100°C, 200°C and 300°C), and *(ii)* the quantification of water content and identification of the mineralogy of the water-bearing phases by TGA on bulk chondrites. The petrological oxidation state of each Antarctic CV (reduced *vs.* oxidized) was determined based on relative abundances of metal and magnetite by optical microscopy [4] and on magnetic properties.

Results and discussion: The considered series of CV chondrites span the entire metamorphic range with petrologic types from 3.1 to >3.7 [3] and exhibit variable degrees of hydration. In particular, the combination of IR and TGA results, taking into account the metamorphic grade and petrographic classification of each sample shows that: *(i)* The hydrous mineralogy of CV chondrites is dominated by a mixture of phyllosilicates and oxy-hydroxides. *(ii)* The relative abundances of phyllosilicates and oxy-hydroxides appear to be distinct between CV_{Red} and CV_{Ox}, consistent with [e.g., 5]. *(iii)* The present hydration of the samples is mostly controlled by their metamorphic history. *(iv)* The presence of hydrated secondary minerals and absence of metal oxidation in CV_{Red} shows that the oxidation of metal is not controlled by the aqueous alteration process. This is in agreement with [6] based on a thermodynamic approach, who advocate that Ca-Fe secondary phases in the matrices of CV_{Ox} and CV_{Red} formed in the same reduced conditions near the iron-magnetite buffer at low silica activity. Ongoing determination of modal abundances (matrix *vs.* high-temperature components) and petrologic characteristics (e.g., chondrule diameters) will bring additional constraints of the CV parent body(ies).

References: [1] Krot A.N. et al. (1995) *Meteoritics* 39: 748-775; [2] Howard K. (2010) *GCA* 74: 5084-5097; [3] Bonal L. et al. 2016 *GCA* 189: 312-337; [4] McSween H. 1977 *GCA* 41: 1777-1790; [5] Lee M. et al 1996 *MAPS* 31: 477-483; [6] Ganino C. and Libourel G. (2017) *Nature communications* 8: 261-271.