THE INSOLUBLE ORGANIC MATTER OF THE PARIS CM CHONDRITE.

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Paris is considered as one of the least altered CM carbonaceous chondrite (CM 2.7/2.8) [1] and shows only incipient aqueous alteration and thermal metamorphism [2]. Paris therefore provides a unique opportunity to study one of the most pristine organic matter and to compare it to more altered samples, to assess the specific role of parent body processes on its evolution. The analysis of soluble organic matter in Paris already revealed signs of lower aqueous alteration degree compared to other chondrites [3]. We focused our work on the insoluble organic matter (IOM) which was then compared to the IOM of Murchison (CM2.5).

We isolated the IOM by HF-HCl chemistry and measured its molecular and isotopic compositions. The bulk C, H and N-isotope compositions of Paris IOM fall among the heaviest CM chondrites. NanoSIMS images of H and N-isotopes reveal numerous hot spots. D-rich hot spots in Paris span the same range as in Murchison, however 15N-rich hot spots are significantly heavier (mean value at 550‰, max at 1000‰), albeit lighter than in Bells [4]. The Raman signature points to a highly disordered structure, slightly heated and similar to type 1 and 2 chondrites [5]. XANES (X-ray Absorption Near Edge Structure) and NMR (nuclear magnetic resonance) and Infrared analysis show an aliphatic/aromatic carbon ratio larger in Paris than Murchison. Pyrolysis releases similar compounds than Murchison or Orgueil, but with some differences in the relative abundances. Overall, our multi-technique characterization reveals that Paris is intermediate between CR2 and CM2 IOMs.

Our analyses supports the pristine nature of the Paris meteorite with respects to other CMs. It is most likely the best CM sample available to infer the nature of the OM accreted on the CM parent body. However, it appears that aqueous alteration has modified the aromatic/aliphatic ratio of the IOM and strengthens the importance of alteration in shaping the organics ultimately recovered, as suggested before by [6, 7] for other chondrite groups. The higher 15N/14N ratio for hot spots may reveal that the CM organic precursor could have been similar to CR chondrites.