**THE HYDROGEN ISOTOPIC COMPOSITION OF FOSSIL MICROMETEORITES: IMPLICATIONS FOR THE ORIGIN OF WATER ON EARTH.** M. Gounelle[1,2], C. Engrand[2], P.A. Bland[3], O. Alard[4], M.E. Zolensky[5], S.S. Russell[1], J. Duprat[2]. [1]Department of Mineralogy, The Natural History Museum, London SW7 5BD, UK. [2]CSNSM, Bâtiment 104, 91 405 Orsay Campus, France (gounelle@csnsm.in2p3.fr). [3]Department of Earth Science and Engineering, Exhibition Rd., Imperial College, London SW7 2AZ, UK. [4]Earth Sciences Department, The Open University, Milton Keynes MK7 6AA, UK. [5]ST, NASA Johnson Space Center, Houston, Texas 77058, USA.

**Introduction:** Although still debated, the origin of water on Earth is usually ascribed to a *late veneer* of hydrous primitive bodies [1]. The isotopic composition of water hydrogen (D/H ratio) in a diversity of primitive extraterrestrial materials can help to assess the nature of the late veneer agent. We present measurements of D/H ratios of hydrated silicates in carbonaceous chondritic microclasts (CCMs) recently identified within the achondrite howardites [2]. These CCMs have been interpreted to be fossil micrometeorites trapped in the howardite parent-body in early Solar System history [2].

**Results:** Measurements of D/H ratios of silicate water in the matrix of 6 CM2-like and 6 CR2-like CCMs were performed by Secondary Ion Mass Spectrometry following the procedure described in [3]. D/H ratios from CM2-like carbonaceous chondritic microclasts' matrix range from 117.6 x $10^{-6}$ to 171.0 x $10^{-6}$, with an average value of 132.7 x $10^{-6}$. D/H ratios from CR2-like carbonaceous chondritic microclasts' matrix range from 112.8 x $10^{-6}$ to 203.8 x $10^{-6}$, with an average value of 169.4 x $10^{-6}$. D/H ratios in CM2-like microclasts compare well to bulk CM2 carbonaceous chondrites [4]. D/H ratios in CR2-like microclasts are significantly lower than D/H measured in bulk CR2 chondrites [4]. This discrepancy probably arises from the fact that bulk measurement techniques on meteorites take into account D-enriched organics in addition to water. The average value of all the microclasts' population is D/H = 152.0 ± 4.8 x $10^{-6.}$

**Discussion:** The CCMs D/H average value compares favourably to the terrestrial value (149 ± 3 x $10^{-6}$). This match suggests that fossil micrometeorites could be a candidate for the late veneer agent that has endowed Earth with water. The calculated micrometeorite flux in the early solar system is adequate to account for the entire reservoir of terrestrial water. We will discuss the other constraints on the late veneer agent such as the Platinum Group Element content and the Osmium isotopic composition [5].

**References:** [1] F. Robert, *Science* **293**, 1056-1058 (2001). [2] M. Gounelle et al., *Geochim. Cosmochim. Acta* **67,** 507-527 (2003). [3] C. Engrand et al., *Meteoritics Planet. Sci.* **34**, 773-787 (1999). [4] J. F. Kerridge, *Geochim. Cosmochim. Acta* **49**, 1707-1714 (1985). [5] Drake and Righter *Nature* **416**, 39-44 (2002).