FROM ANTARTICA TO THE STARDUST AEROGEl.

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Introduction: We already argued in 1998 [1] that the unmelted chondritic dust recovered from the stratosphere and polar ices and snows (micrometeorites or MMs) that we and many other analyzed are cometary dust particles. We thus pointed out that cometary dust particles would be similar to MMs, being made of a material related to the CM-type hydrous-carbonaceous chondrites containing refractory phases, kerogen, and being depleted in unbroken chondrules. This "ordinary" dust was formed in the inner solar system and then forwarded to the outer solar system by huge surges of nebular gas [2]. It is timely to compare this "cometary" Antarctica dust to the dust of comet Wild 2 (W2-dust), which was captured in the aerogel of the Stardust mission.

A "big surprise": Initially, the name of this mission was selected to summarize the general consensus of 1999 when the mission was launched: comets would be made of interstellar ices and interstellar dust grains. We were impressed by the analytical results obtained by 183 scientists on a 0.2 µg of W2-dust [3]. What is less impressive is the way the data are interpreted and sold as a "big surprise" and/or the "most dramatic early finding" (i.e., relatively to the 1999 consensus). In fact, the W2-dust analyses [4, 5] confirm our earlier deductions because they establish strong similarities with MMs for: (i) the abundance of Ca-Al-rich inclusions and pre-solar grains: (ii) the H, C, N, and O isotopic compositions; (iii) the chemical composition of the refractory magnesian silicates and of Fe sulfides.

"Bulbs and carrots": These similarities imply that hydrous silicates must also be present in the W2-dust, and that they should be dominated by saponite, which is the major hydrous silicate of unmelted MMs. However, the Stardust team repeatedly emphasized that "hydrous silicates are missing" in the W2-dust. The fate of these missing silicates is just pictured in the bulb-shaped aerogel tracks reported many times (e.g., the cover page, in ref. 3). It documents the microscopic explosion of a dust particle containing saponite during its sharp deceleration in the aerogel. Only the most massive and refractory constituent particles can continue traveling to the termini of the tracks. Indeed, saponite contains both OH groups and very labile H_2O, which starts to be released at about 100°C. Consequently, it should be "instantaneously" released during the pulse heating of the particles and form an explosion bulb in the aerogel – with the result that saponite is now missing. In contrast, "dry" crystalline W2-particles produced the "carrot-shaped" tracks also observed in the aerogel. With these beautiful bulbs, the ultra-clean and cold snow of central Antarctica can be assimilated to a giant inexhaustible cometary dust collector.

References: [1] Maurette M. 1998. In (Ed. A.Brack) *The Molecular Origin of Life* (Cambridge University Press). pp. 147-186. [2] Shu F. et al. 1996. *Science* 271: 1545-1552. [3] Brownlee D. et al. 2006. *Science* 314: 1711-1716. [4] Matrajt G., *et al.* 2003. *Meteoritics Planet Sci.* 38: 1585-1600. [5] Engrand C., *et al.* 2007. Abstract #1668. 38th Lunar Planet. Sci. Conference. [6] Duprat J. et al. 2007. *Planet. Space Sci*. In press.