THE TRANSPORT PROPERTIES OF NON-VOLATILE RANDOM POROUS MEDIA: POROSITY RANGE AND MEAN FREE PATH DISTRIBUTION. H. Schmidt[1], Y. V. Skorov[1], J. Blum[1], H. U. Keller[1], [1]Institute for Geophysics and Extraterrestrial Physics, Technical University of Braunschweig, Mendelssohn-Str. 3, D-38106 Braunschweig, Germany

Introduction: The investigation of the transport properties of non-volatile random porous media plays an important role in modern cometary physics. In situ space observations provide strong arguments that cometary nuclei are covered by porous nonvolatile material. It means that the effective sublimation rate or, in other words, the net mass flux from a cometary nucleus is determined by the transport processes in these upper layers. Today the micro- and meso-scale (up to meters?) physical properties of the nucleus and, hence, of the inert upper layer are largely unknown; however, recent infrared measurements of Comet 9P/Tempel 1 have shown that the thermal inertia of the upper surface layer is extremely low [1]. This can only be fulfilled when the heat conductivity is small and hence the material is porous.

The Exploration: The exploration of the contact thermal conductivity of porous dusty aggregates was performed by a combination of laboratory experiments and numerical simulations [2]. Later it was shown [3] that the radiative heat transport becomes important if the temperature of the dust layer is high enough. The theoretical models developed in the cited papers depend on the packing structure of the material and its transport characteristics. Hereafter we present results obtained for a wide set of random porous media generated numerically. We investigate properties of the layers generated by the random ballistic deposition (RBD) method and the random gravitational deposition (RGD) method. Using the RBD spheres are dropped in a volume where they stick to that position, which is either the ground or another sphere. In case of the random gravitational deposition the spheres roll down to a stable position with contact to at least three other spheres. The porosity of a RBD-medium is about 85% and the porosity of a RGD medium is about 40%. In both cases a monodisperse medium as well as different variants of polydisperse media are explored. For polydisperse media we test some bi-disperse distributions followed by a Gaussian distribution and a power law distribution. Using computer simulations we evaluate the average porosity and distribution of the mean free path for all considered examples. These results allow us to improve the description of the heat transport in random porous media.

References: [1] Groussin et al. (2007) Icarus, *187*, 16-25 [2] Krause M. et al. (2011) Icarus, *214*, 286-296 [3] Gundlach B. and Blum J. (2012), Submitted to Icarus, arXiv:1111.0535v2