MARS

Carbon rain

Icarus **309**, 125–133 (2018)

UV radiation and cosmic rays can travel almost undisturbed through the Martian atmosphere and photodissociate organics within days at the very surface and on the order of Myr at a depth of tens of centimetres. Yet, the Curiosity rover has unambiguously identified carbon-based compounds. As endogenous carbon deposits cannot last long, where does this carbon come from? Kateryna Frantseva and collaborators explore the possibility of an external delivery in geologically recent times by meteorites, comets or interplanetary dust.

The authors use dynamical *N*-body simulations to study the impact statistics of test particles under the gravitational influence of the Sun and the eight Solar System planets in a 10 Myr time interval. The orbital characteristics of such particles are based on those of more than 600,000 asteroids and a synthetic population of 5,000 comets (computed from the known orbital properties of almost 900 comets). The two populations are studied separately. The authors find that both bring less carbon than the inferred contribution of interplanetary dust particles, with comets much less efficient than asteroids (on the order of 70–300 tonnes, 50 tonnes and 10 tonnes of organics per year from dust, asteroids and comets, respectively). However, the carbon dust shower is more or less spatially homogeneous, whereas contributions from comets and asteroids would dominate around impacts. This local effect must be taken into account, especially around craters, when interpreting in situ measurements.

Luca Maltagliati

Published online: 17 May 2018
https://doi.org/10.1038/s41550-018-0492-2