

ASTEROIDS

Insights on the olivine mystery

Icarus **322**, 13–30 (2019)

There is a scarcity of olivine-dominated asteroids ('A-types' in the standard asteroid taxonomy) in the main belt: only 17 A-type asteroids have been discovered so far.

Olivine is a signature of mantle material and indicates that the parent body of the asteroid was fully differentiated, thus such a shortage holds important clues about the history of the asteroid belt. Francesca DeMeo and collaborators performed follow-up spectral observations of A-type candidates with NASA's Infrared Telescope Facility and the 6.5-m Magellan telescope in order to obtain a better characterization of olivine asteroids in the main belt.

DeMeo et al. identified 21 new A-type asteroids, more than doubling the A-type population. The scarcity of A-types is confirmed: they constitute only $0.16 \pm 0.03\%$ of the asteroid population of the belt, bringing the estimate of their total number to ~600. This shortage does not seem to be due to observational biases, as the ratio of A-types does not depend on the asteroid size. They are also distributed pretty evenly across the belt, indicating no single common origin like a small population of differentiated bodies formed locally. DeMeo et al. show that this result also holds for asteroid families, none of which exhibit a particular abundance in A-types that could indicate differentiation of their parent bodies.

Globally, these results support the hypothesis that mantle material was implanted in the belt from outside, possibly in the region of the terrestrial planets, whereas the asteroids remained largely undifferentiated.

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Published online: 30 January 2019

<https://doi.org/10.1038/s41550-019-0704-4>