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Itokawa: a case for ballistic segregation[1] TROY SHINBROT, Rutgers University, TAPAN SABAWULA, Okinawa Institute for Science and Technology, THEO SIU, MIGUEL VIVAR LAZO, Rutgers University, PINAKI CHAKRABORTY, Okinawa Institute for Science and Technology — Recent photographs of the asteroid Itokawa have revealed strong separation between regions populated almost entirely by small pebbles and other regions consisting only of larger boulders. This size separation has been attributed to the Brazil Nut Effect (BNE), however we point out here that the BNE depends on conditions such as isotropic gravity, parallel sidewalls and periodic vertical shaking that are wholly absent on asteroids. On the other hand, surface areas of boulders and pebbles appear to be comparable on Itokawa, and in this situation it follows that the asteroid must have suffered many orders of magnitude more collisions with pebbles than with boulders. We observe that a pebble will tend to bounce off of a boulder but will sink into a sea of similar pebbles, and so we predict that seas of pebbles must grow on such asteroids. We carry out experiments and simulations to evaluate this and related predictions, and we demonstrate that this new mechanism of segregation based on simple counting of grains can produce the strong separation of sizes reported.

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