

## Dust in the Kuiper Belt: How an Alien Might See Our Solar System

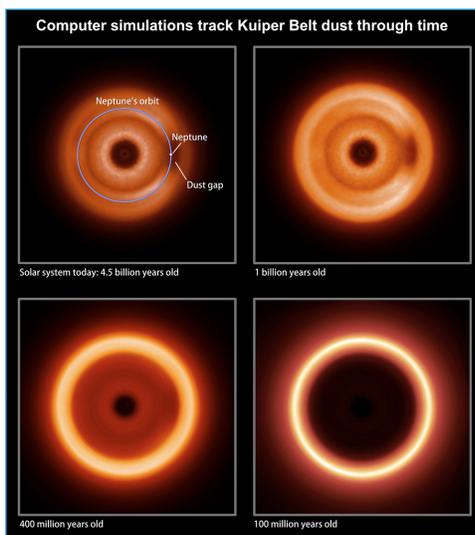
### Science Mission Directorate

We have modeled the appearance of the Kuiper Belt, the ring of planetesimals and dust beyond the orbit of Neptune, using the NASA Center for Climate Simulation's Discover cluster. Our models will help us understand disk images from NASA's space telescopes, and dust data from NASA's New Horizons mission. For example, the first direct image of an extrasolar planet, made with the Hubble Space Telescope, shows the planet interacting with a ring of dust, just as Neptune sculpts the Kuiper Belt.

Previous models of Kuiper Belt dust ignored collisions among dust grains. Using our own “collisional grooming algorithm,” we performed the first 3D, multi-grain-size simulations incorporating grain collisions.

In this simulation, we were able to: track at least 10 times as many particles as previous researchers; model the gravitational perturbations from Jupiter, Saturn, Uranus, and Neptune; and operate on about 16 gigabytes of data simultaneously to model the grain-grain collisions.

We simulated the pattern Neptune makes in the disk and studied how it evolved over time. We imagine that an alien observer could recognize the existence of Neptune—even if the planet were not visible—because of the pattern it makes in the solar system's dust. Our simulation also indicates that our solar system may once



have resembled the narrow rings observed around Fomalhaut and other stars.

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Computer models produced these infrared snapshots of Kuiper Belt dust as seen by a distant observer. By including the effects of grain collisions for the first time, the models show how the appearance of the solar system at infrared wavelengths might have changed over its history. *Marc Kuchner, Christopher Stark, NASA/Goddard*