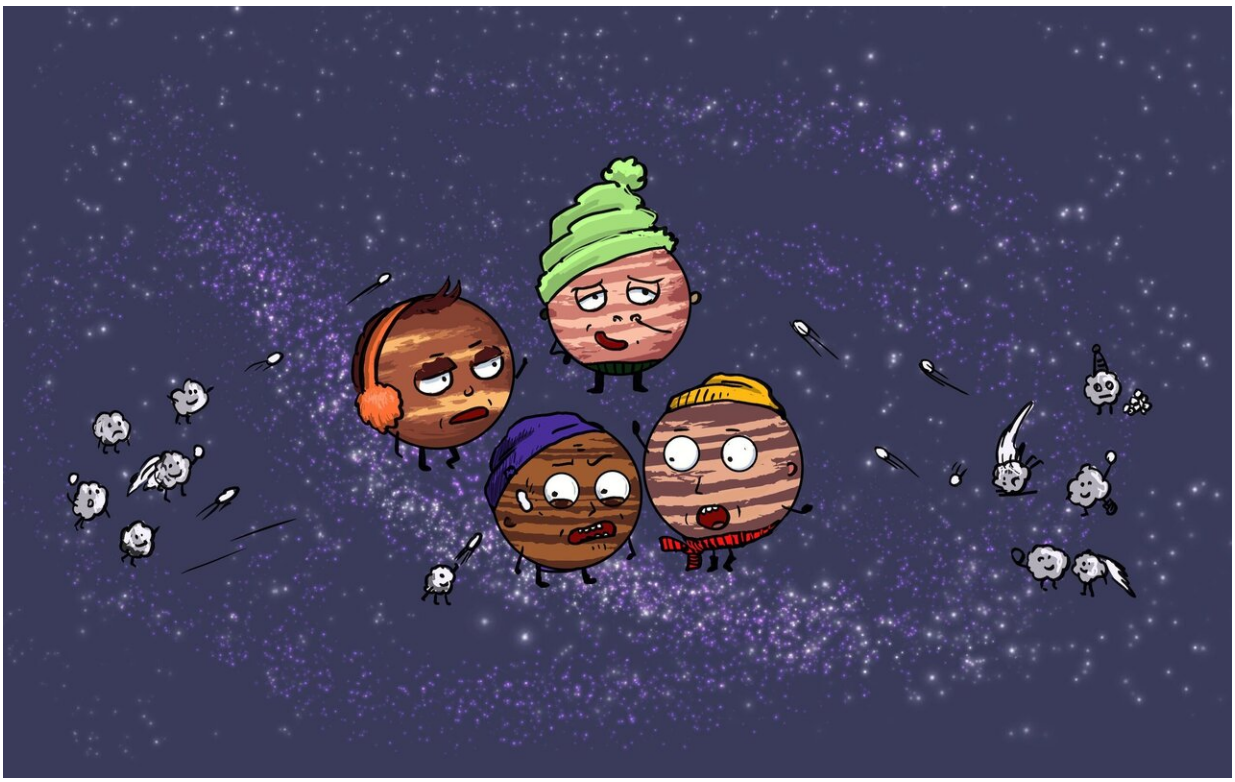
Astronomers predict bombardment from asteroids and comets in other planetary system

May 29 2020, by Erik Arends



Credit: Anastasia Kruchevska

The planetary system around star HR8799 is remarkably similar to our solar system. It has four gas giants in between two asteroid belts. A research team led by RuG and SRON used this similarity to model the

delivery of materials by asteroids, comets and other minor bodies within the system. Their simulation shows that the four gas planets receive material delivered by minor bodies, just as in our solar system.

Counting outward from the sun, our solar system consists of four rocky planets, an asteroid belt, four gas giants and another asteroid belt. The inner planets are rich in refractory materials such as metals and silicates, the outer planets are rich in volatiles such as water and methane. While forming, the inner planets had a hard time collecting a volatile atmosphere because the strong solar wind kept blowing the gas away. At the same time, the heat from the sun evaporated any ice clumps, so it was harder to retain water. In the outer regions, there was less solar heat and wind, so the eventual gas giants could collect water ice and also gather large atmospheres filled with volatiles.

Minor bodies, including asteroids, comets and dust, fine-tuned this outcome later on by delivering refractories from the inner belt and both volatiles and refractories from the outer belt. A team of astronomers led by Rijksuniversiteit Groningen and SRON Netherlands Institute for Space Research wondered if the same delivery system applies to planetary systems around other stars. They created a simulation for the system around HR8799. That is similar to our solar system with four gas giants plus an inner and outer belt, and possibly rocky planets inside the inner belt. Therefore the team could adopt some unknowns about HR8799 from our own solar system.

The simulation shows that just like in our solar system, the four gas planets receive material delivered by minor bodies. The team of scientists, consisting of Kateryna Frantseva (University of Groningen/SRON), Migo Mueller (NOVA/Leiden University/SRON), Petr Pokorný (NASA), Floris van der Tak (SRON/University of Groningen) and Inge Loes ten Kate (Utrecht University), predict a total delivery of both material types of around half a millionth of the planets'

masses. Future observations, for example by NASA's James Webb Space Telescope (launch in 2021), will be able to measure the amount of refractories in the volatile-rich gas giants.

Frantseva says, "If telescopes will detect the predicted amount of refractories, we say that these detected refractories can be explained by delivery from the belts as shown in our model. If they detect more refractories than predicted, we say that maybe the delivery process is more active that we thought, for example because HR8799 is much younger than the solar system. The HR8799 system may contain terrestrial planets. Volatile delivery from the asteroid belts may be of astrobiological relevance for those."

More information: K. Frantseva, M. Mueller, P. Pokorný, F. F.S. van der Tak, I. L. ten Kate, 'Enrichment of the HR 8799 planets by minor bodies and dust ', *Astronomy & Astrophysics* www.aanda.org/10.1051/0004-6361/201936783

Provided by SRON Netherlands Institute for Space Research

Citation: Astronomers predict bombardment from asteroids and comets in other planetary system (2020, May 29) retrieved 2 May 2024 from https://phys.org/news/2020-05-astronomers-bombardment-asteroids-comets-planetary.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.