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Light from shattered worlds

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Abstract

Collisions between massive, planetary scale, bodies 'giant impacts' are widely predicted to play a key role in the formation of planetary systems. This is particularly true in the terrestrial zone where giant impacts form the final phase in the construction of terrestrial planets [e.g. 3]. Such impacts are by no means limited to the inner regions however and can play an important role much further out in planetary systems as well [e.g. 1]. Giant impacts are violent, tumultuous, events, and in addition to building large planetary bodies also release copious quantities of debris [e.g. 4].

In [2] we demonstrated that for the case of the impact that formed our Moon, the debris produced should be readily detectable on timescales of tens-of-millions of years after the impact. This despite the canonical Moon-forming impact being a relatively low debris production event. As such it should generally be expected that giant impacts will produce long-lasting detectable debris, and this debris may be used to gain insights into the planetary system hosting it.

The debris disk produced by a giant impact has a strong initial asymmetry. While at orbital distances of $\sim$1 AU this only lasts for around 1000 years, in the outer parts of a planetary system this asymmetry may last 100 times as long, $\sim$0.1Myr, and with instruments like ALMA such a disk can be resolved. We discuss the morphologies and observables of giant impact debris disks, such as this distinctive asymmetry, and how they can be used to infer properties of the host planetary system. In addition we relate this to known debris disks, such as the well known disk of Beta Pictoris, which possesses an asymmetry.

References

[1] CANUP, R. M. On a Giant Impact Origin of Charon, Nix, and Hydra. *Astron. J. 141* (Feb. 2011), 35.

[2] JACKSON, A. P., AND WYATT, M. C. Debris from terrestrial planet formation: the Moon-forming collision. *Mon. Not. R. Astron. Soc. 425* (Sept. 2012), 657–679.

[3] KENYON, S. J., AND BROMLEY, B. C. Terrestrial Planet Formation. I. The Transition from Oligarchic Growth to Chaotic Growth. *Astron. J. 131* (Mar. 2006), 1837–1850.

[4] STEWART, S. T., AND LEINHARDT, Z. M. Collisions between Gravity-dominated Bodies. II. The Diversity of Impact Outcomes during the End Stage of Planet Formation. *Astrophys. J. 751* (May 2012), 32.