

A New ALMA View of the HD 53143 Debris Disk


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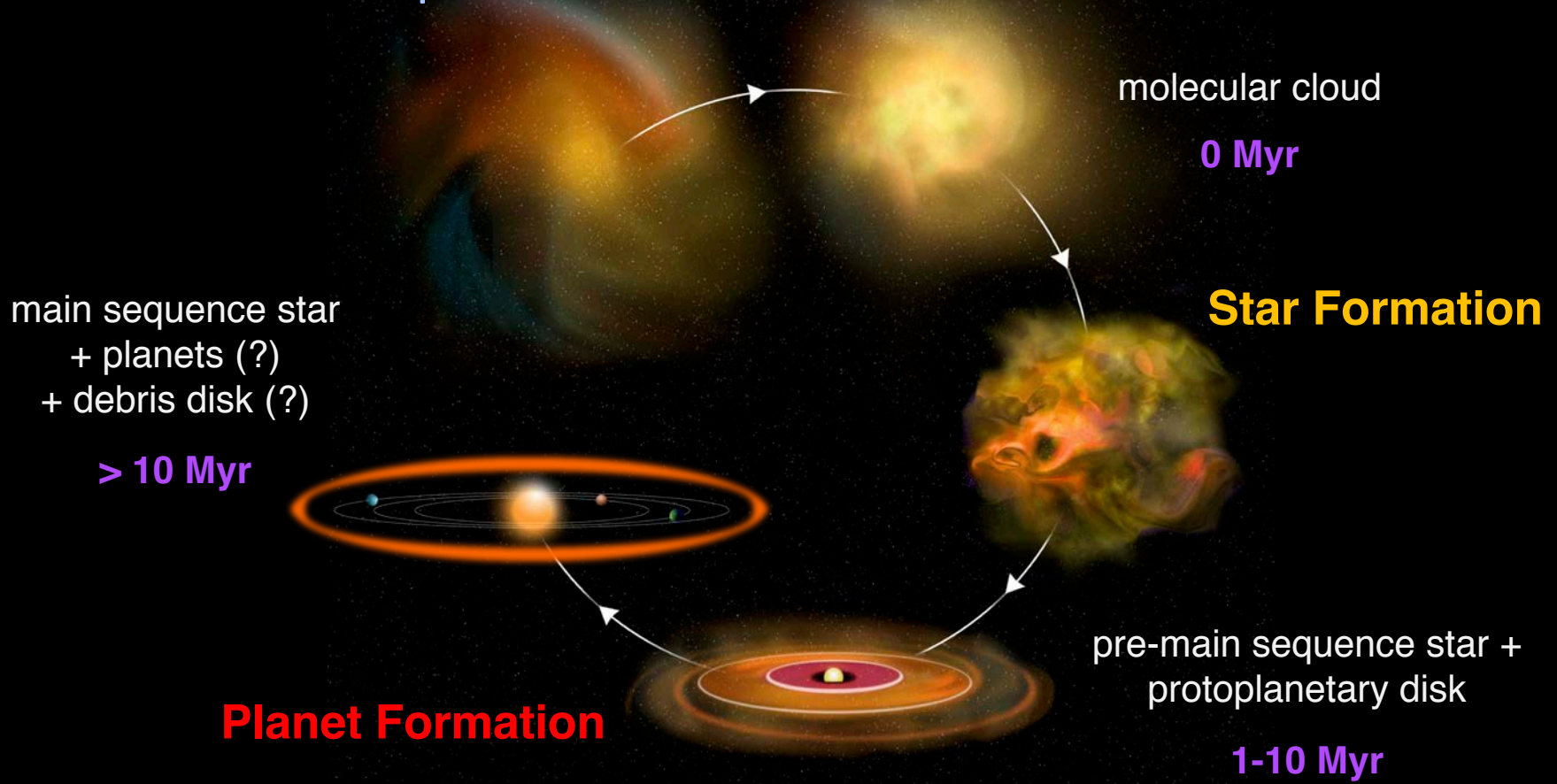


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How do stars and planets form?



The Atacama Large Millimeter/submillimeter Array (ALMA) has revolutionized our understanding of planet formation.



Introducing the HD 53143 Debris Disk

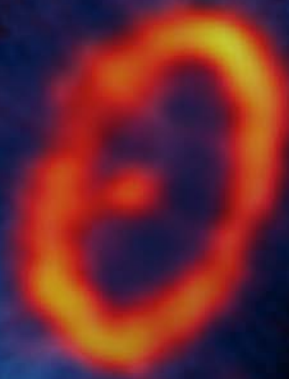
HD 53143 was first imaged by *Hubble*.

Now, ALMA has given us a clearer view!

(1) This is the first time that we have fully resolved this system.

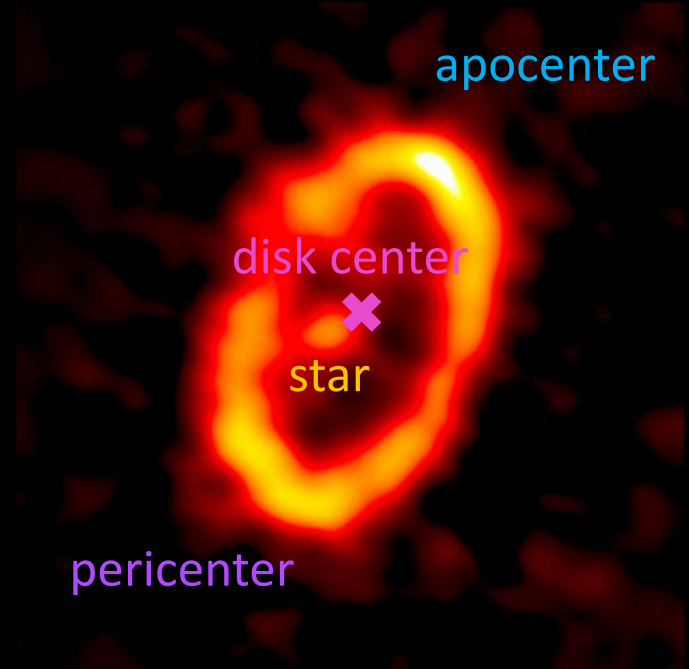
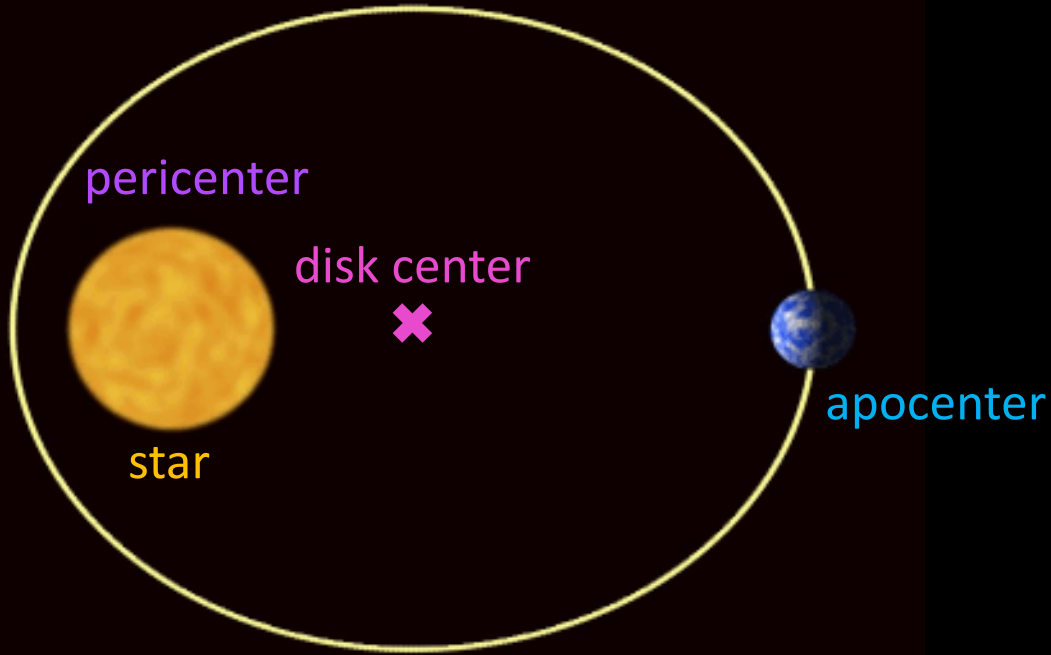
(2) Its unique structure indicates that unseen planets are sculpting the disk.

(3) Since this is a young analogue of the solar system, it gives us a glimpse into the formation of our planetary system.

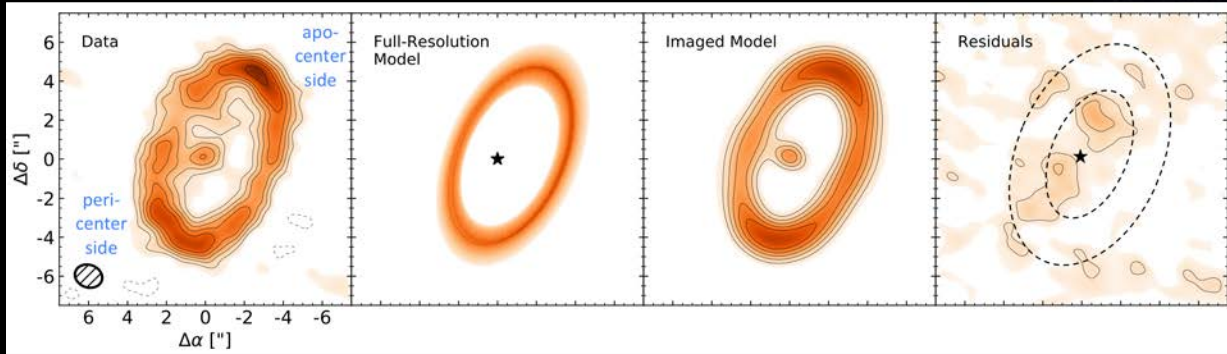


An Eccentric Disk

Disk is visibly eccentric (star offset from disk center) and exhibits apocenter glow (surface density enhancement at apocenter)

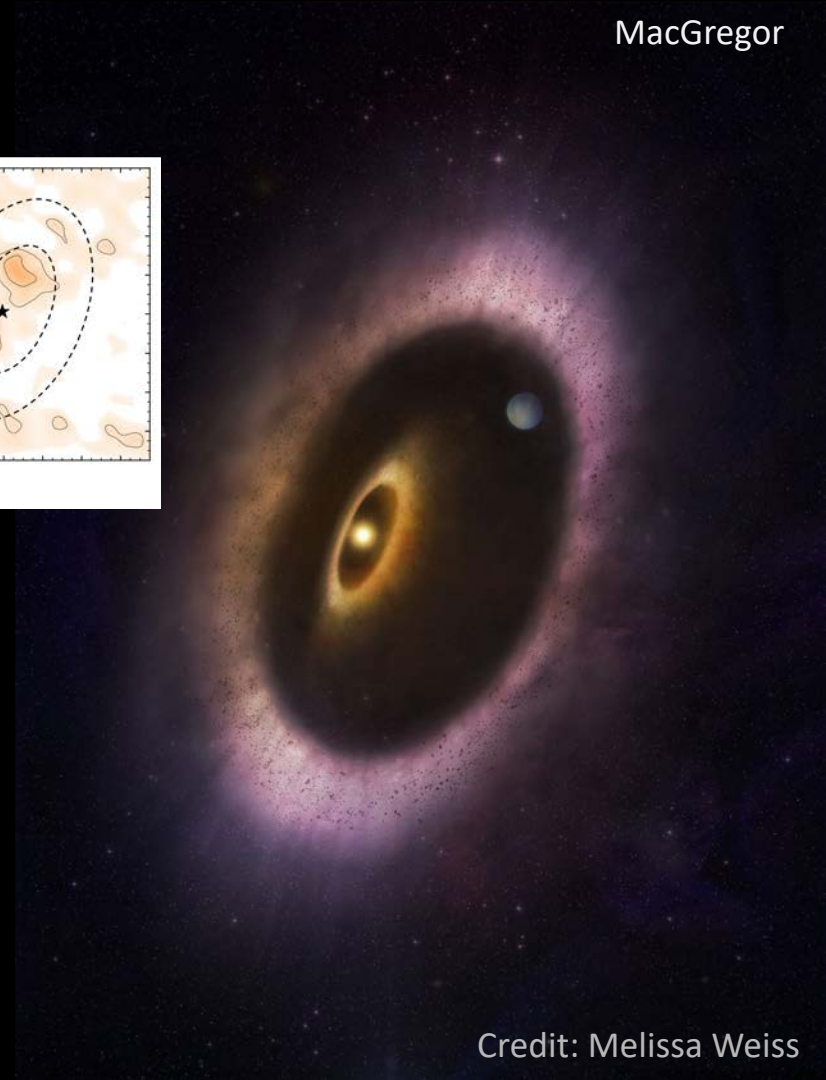


A Misaligned Inner Disk

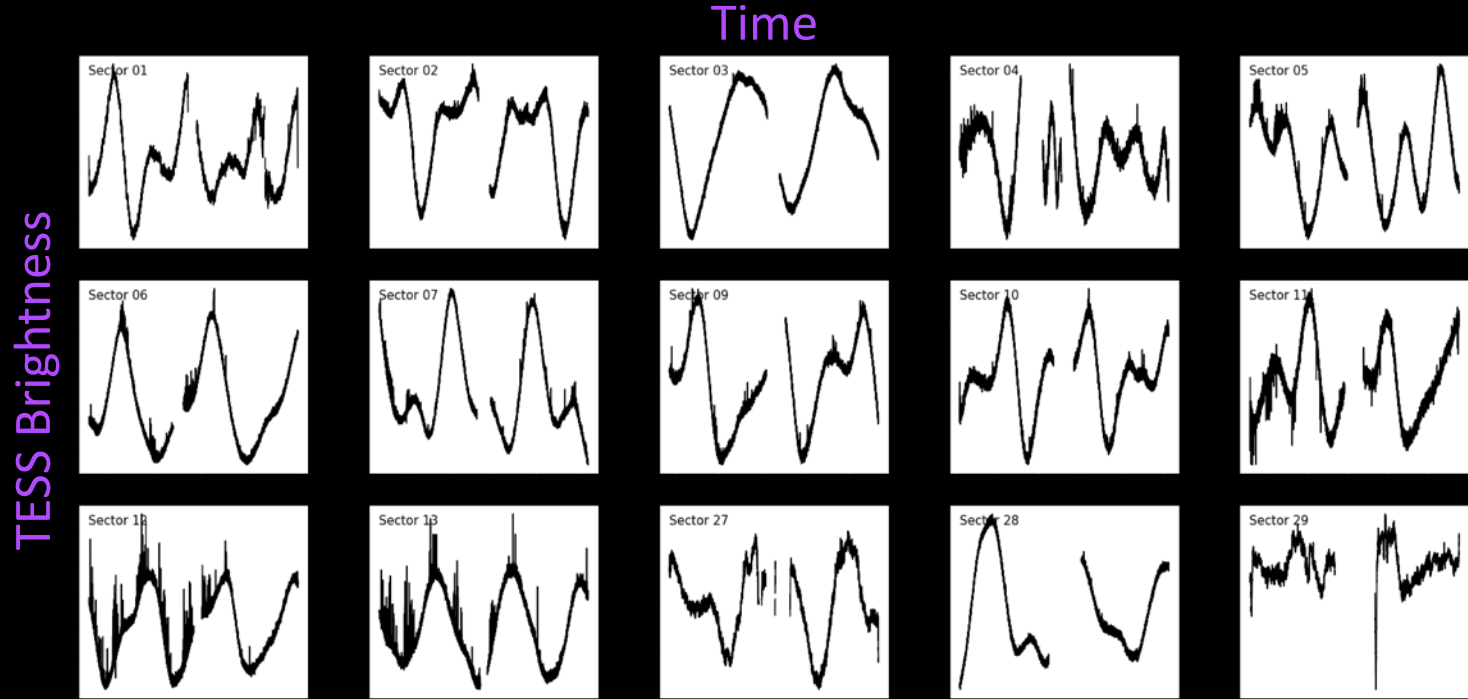


Our eccentric model does not fit the system perfectly.

This indicates that there is a second inner, misaligned disk.

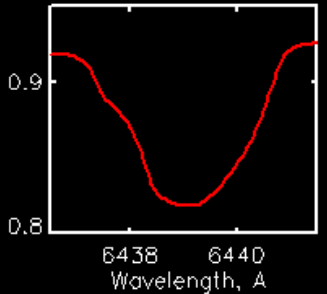
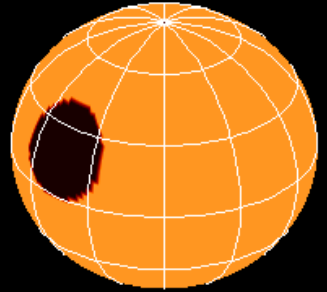


A Young Solar Analogue



As stars age, they spin more slowly

By measuring the rotation rate of the star we are able to precisely determine its age to be about 1 billion years.



Animation of spot modulation on GJ 581 from PSU

Take-Away Messages

- (1) Our new ALMA image reveals the HD 53143 debris disk in unprecedented detail.
- (2) This system has a unique structure (eccentric with a misaligned inner disk), which indicates that unseen planets are likely sculpting the disk.
- (3) HD 53143 is a young (1 billion year old) analogue of the solar system, so these observations gives us a glimpse into the formation of our own planetary system.

MacGregor et al. (2022) published in an upcoming edition of ApJL
arXiv: 2206.05856

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