Magnetization of Carbonaceous Asteroids and the Origin of the CM Chondrites

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Testable prediction: Some C-type asteroids have detectable magnetic fields

1. The current origin story for CM chondrites

Carbonaceous Mighei-type (CM) chondrites are carbon-and-water-rich, undifferentiated meteorites that formed beyond Jupiter at 3-4 Myrs after CAIs while the solar nebular cloud of gas and dust was still present [1].

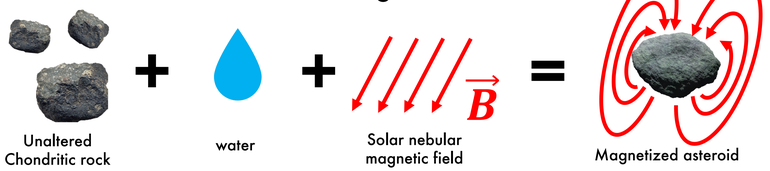
BUT WAIT!

CM chondrites are magnets!!!! [2]
(an unexpected observation)

Research question:
Does magnetization of CM chondrites fit with their formation story?
(Spoiler: yes!)

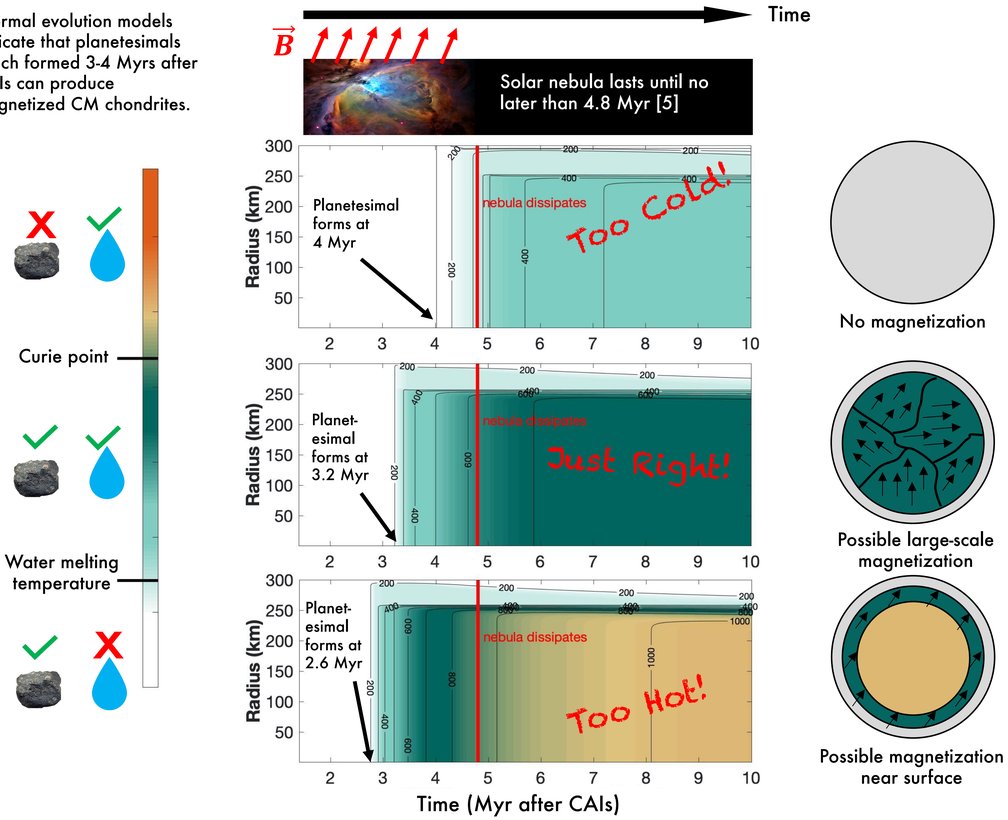
2. How do carbonaceous asteroids become magnetized?

Aqueous alteration within the solar nebular magnetic field could produce a chemical remanent magnetization [2,3,4].



3. When do these ingredients combine?

Thermal evolution models indicate that planetesimals which formed 3-4 Myrs after CAIs can produce magnetized CM chondrites.

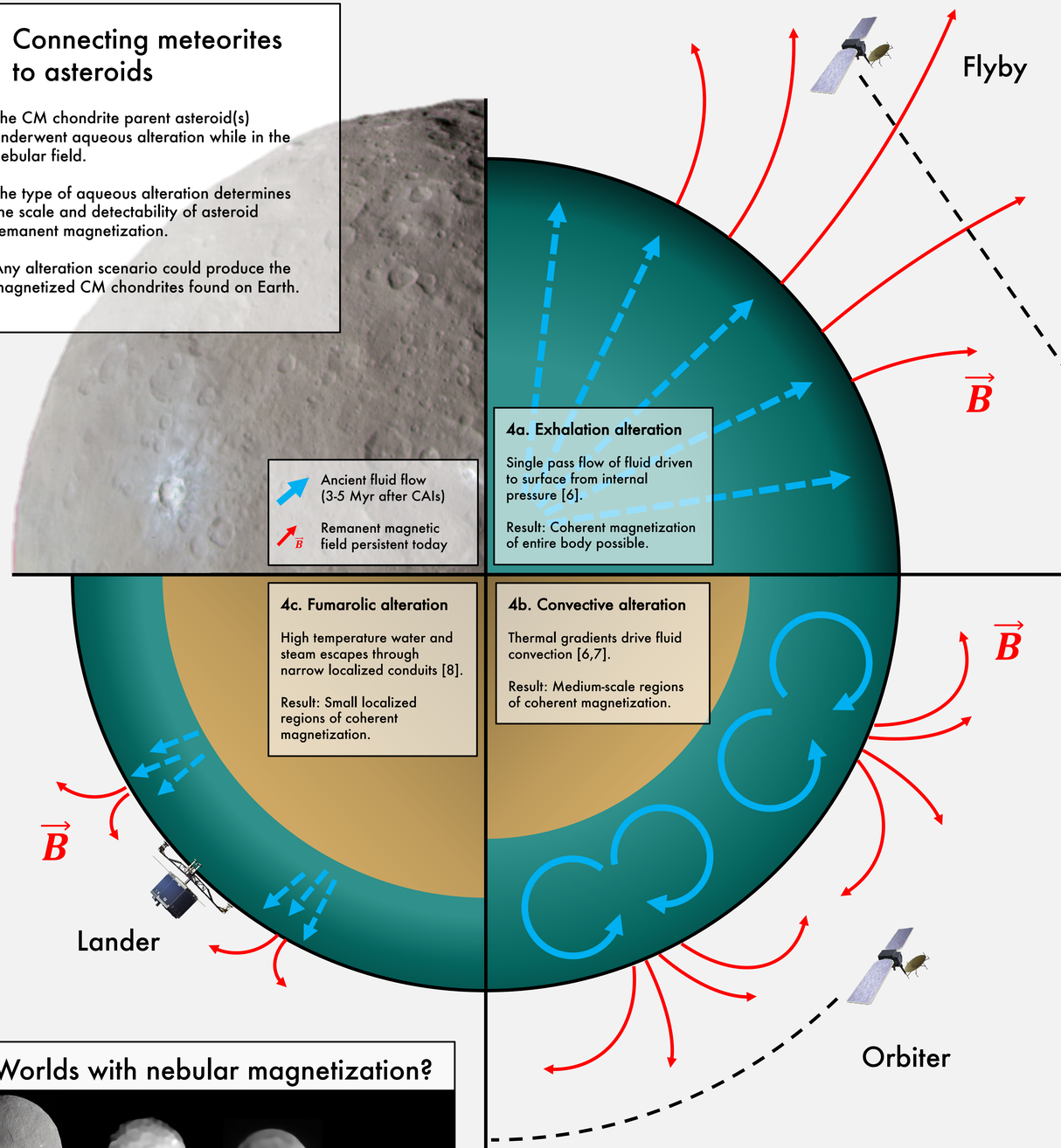


4. Connecting meteorites to asteroids

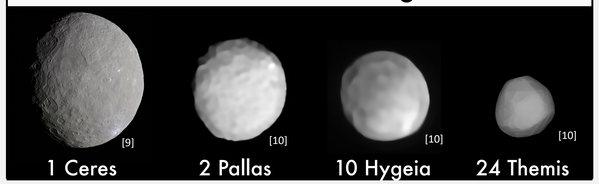
The CM chondrite parent asteroid(s) underwent aqueous alteration while in the nebular field.

The type of aqueous alteration determines the scale and detectability of asteroid remanent magnetization.

Any alteration scenario could produce the magnetized CM chondrites found on Earth.



5. Worlds with nebular magnetization?



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Acknowledgements:

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