Pathways 2015

Extrasolar Cosmochemistry

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In collaboration with
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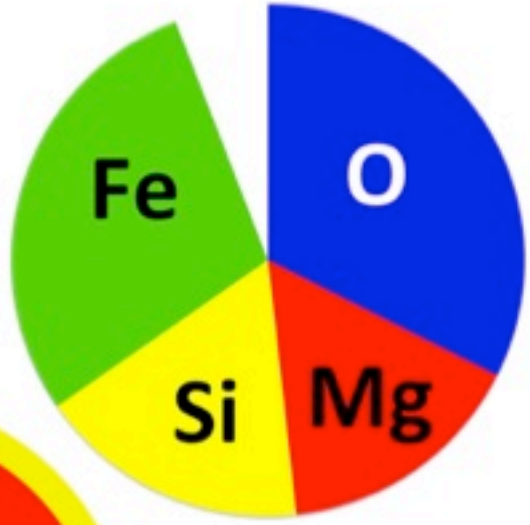
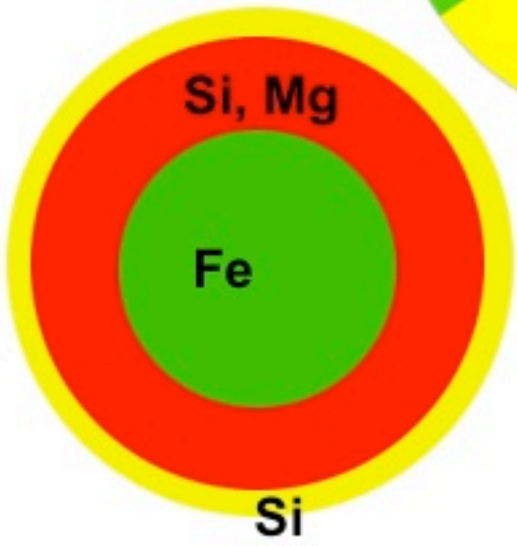
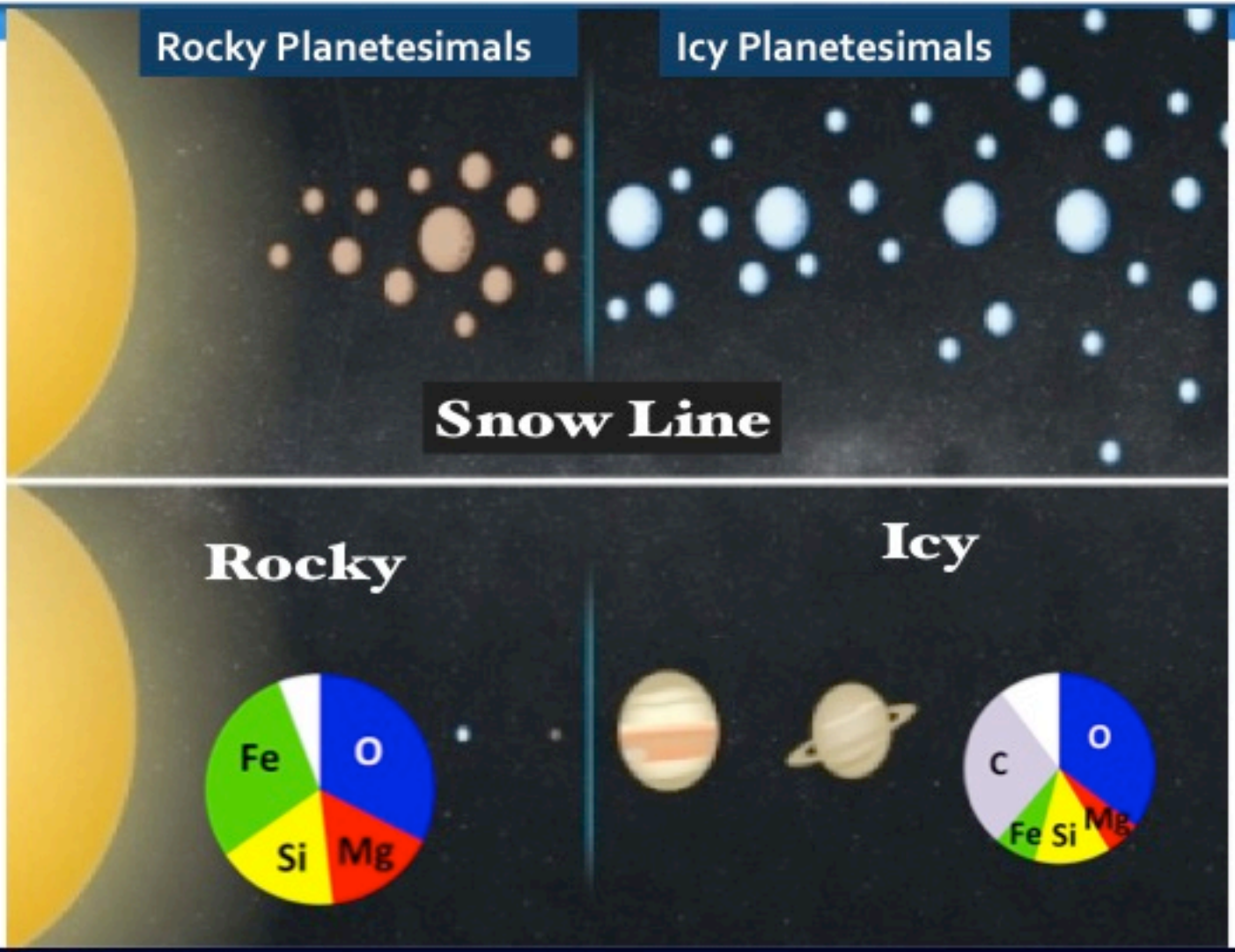
Earth: A Cosmochemical Perspective

+ Dominated by Fe, O, Si, Mg
+ Very little volatiles (C, N, S), very little water
+ Differentiated
+ Plate tectonics
+ Habitable

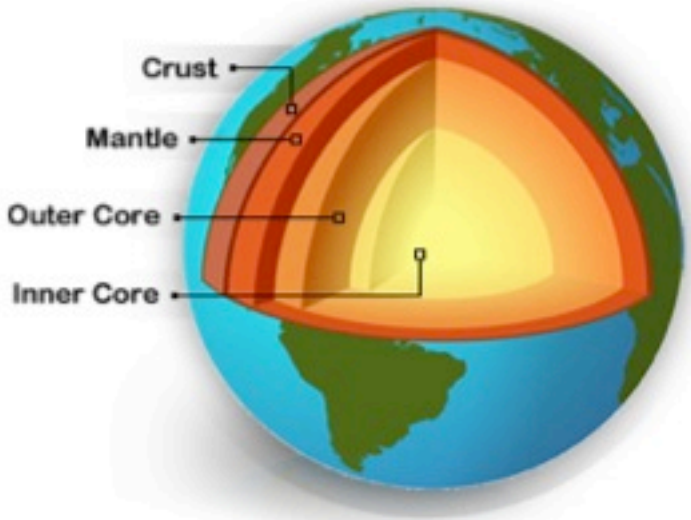




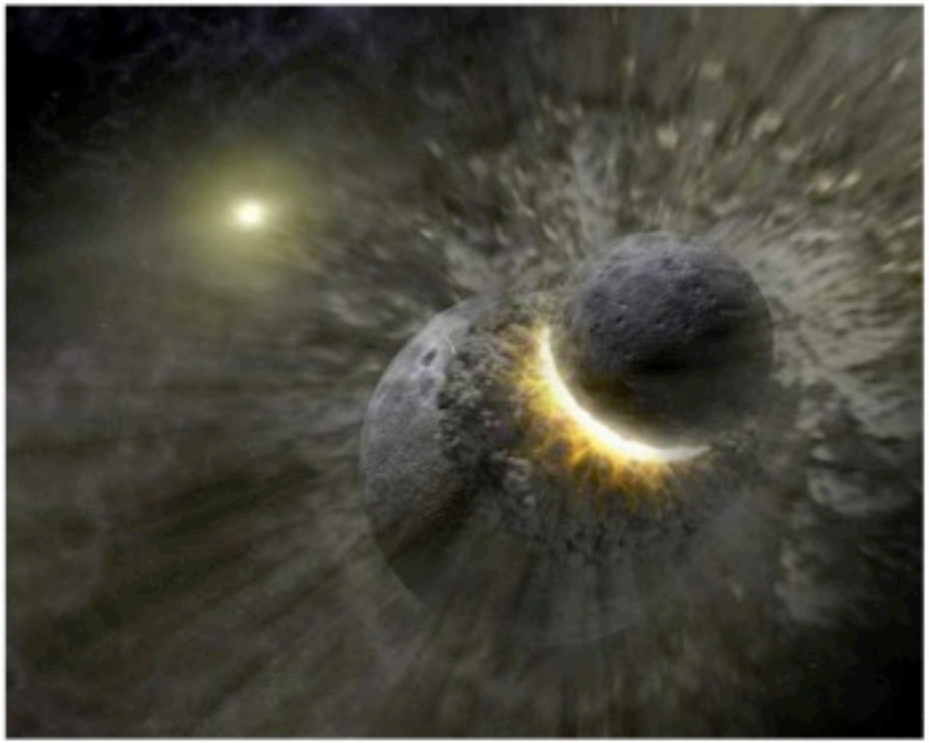
Solar System: A Cosmochemical Perspective



Solar System: A Cosmochemical Perspective



Earth



A possible scenario for Mercury

Meteorites

CI Chondrite (Ivuna)

Iron Meteorite

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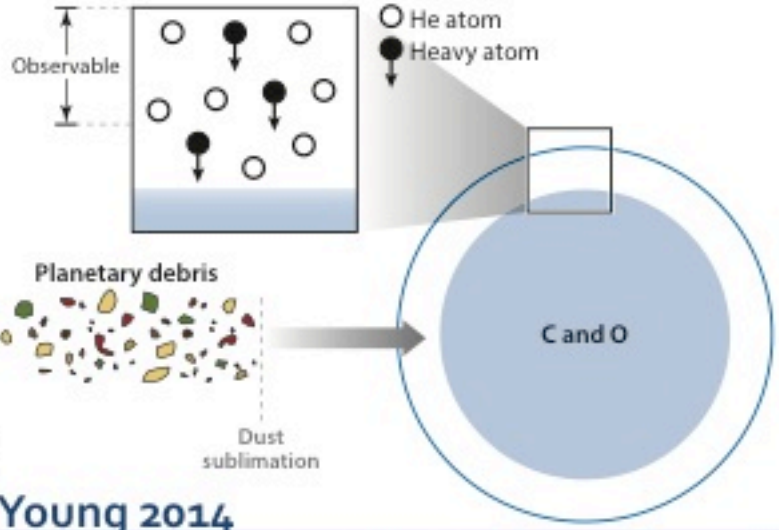
Extrasolar Cosmochemistry

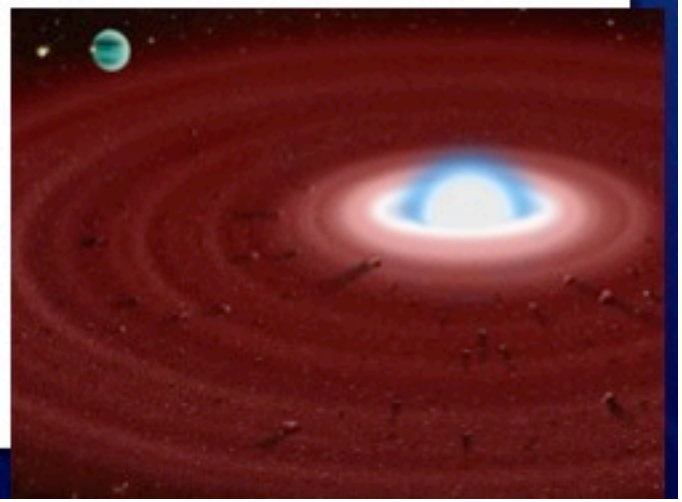
-- from spectroscopic observation of polluted white dwarfs

Evidence for WD-Asteroid Accretion

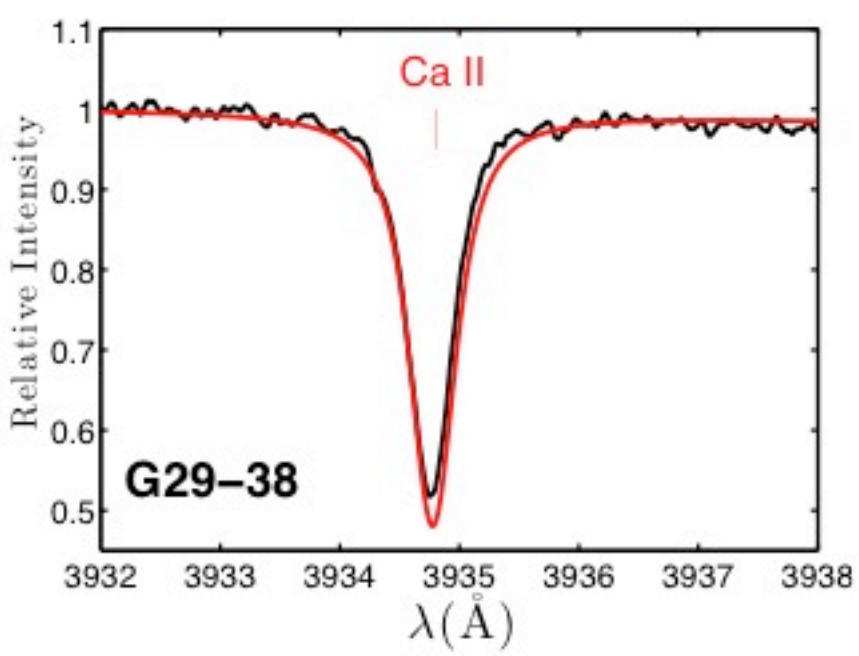
+ ~75% WDs are "clean"
+ Discovery of WD dust disk and gas disk
+ Supported by dynamical simulations

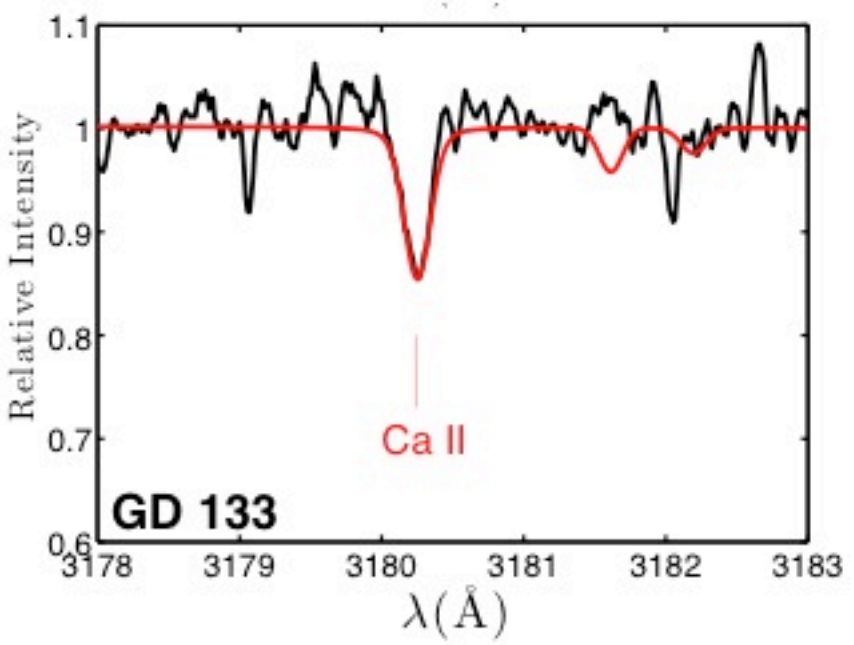


Jura & Young 2014



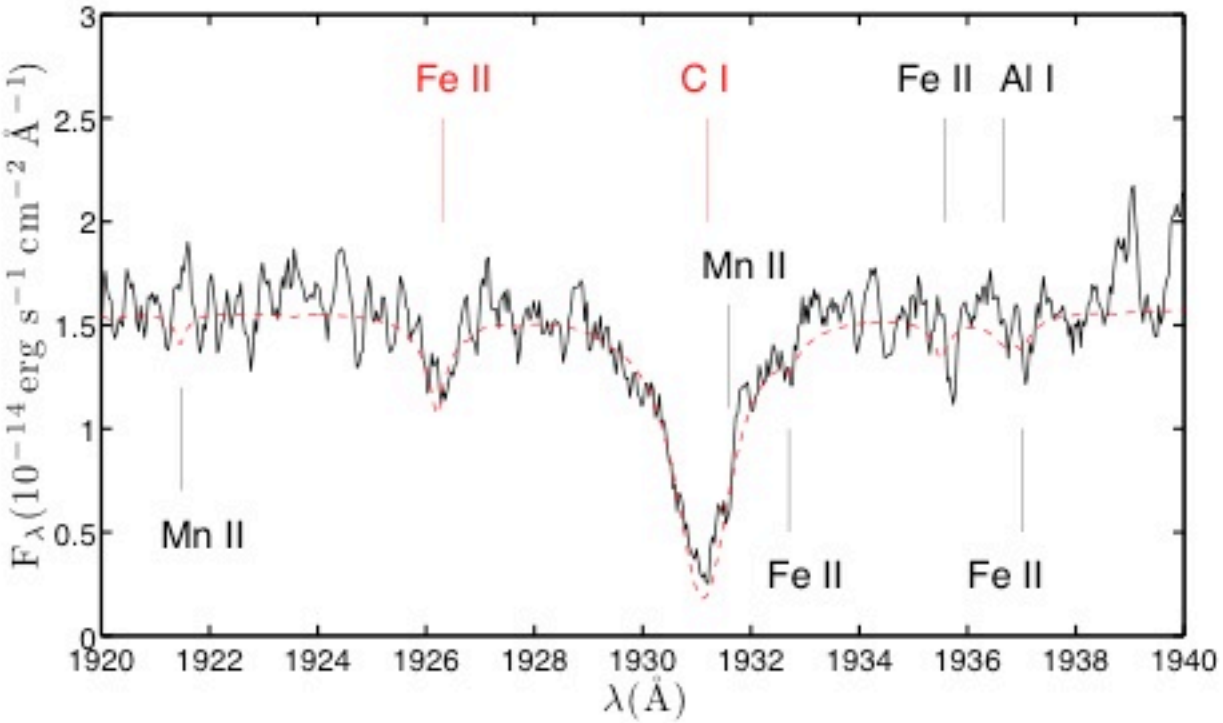
Method: High-Resolution Spectroscopy





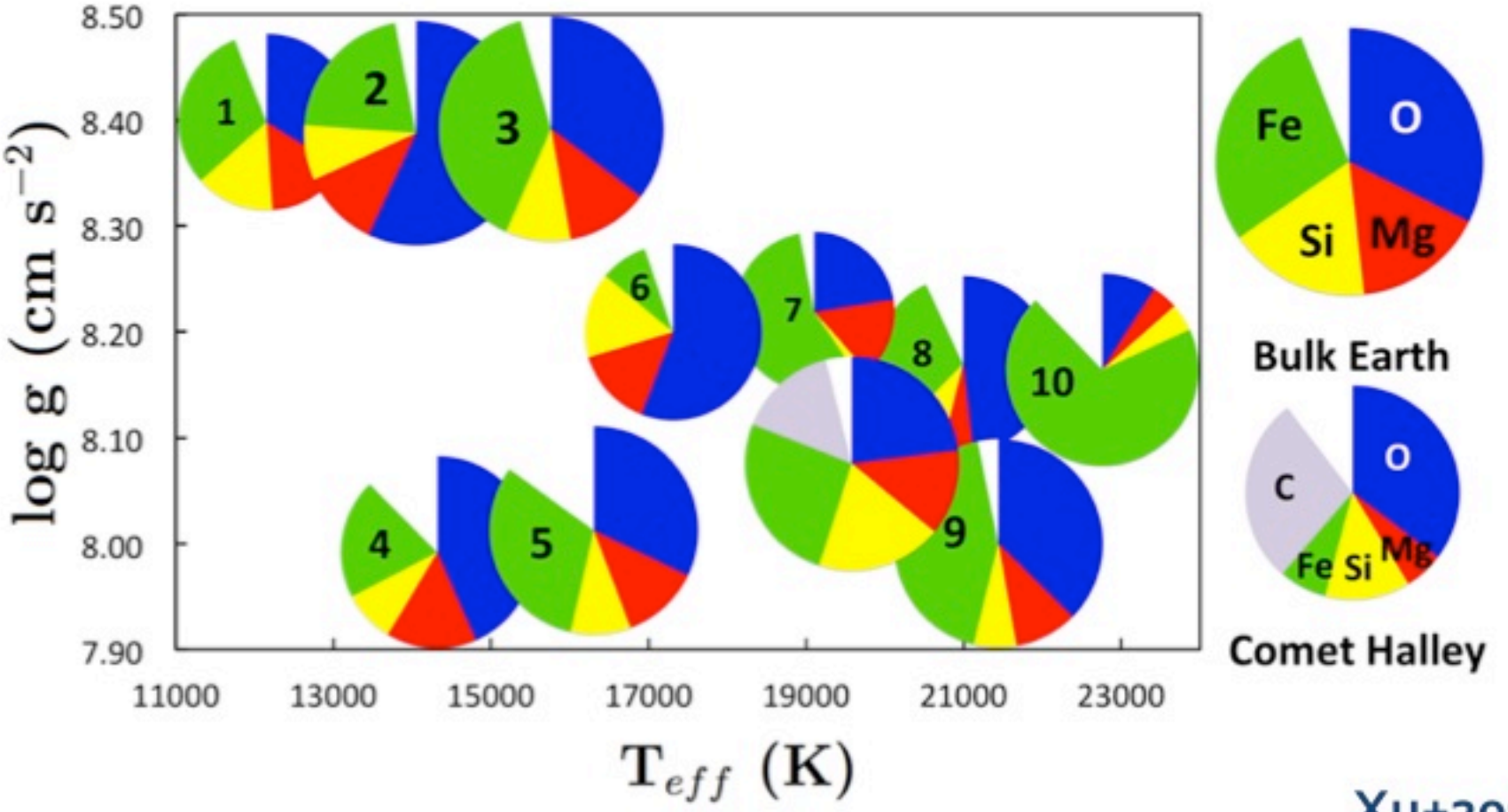
Xu+2014

Method: High-Resolution Spectroscopy



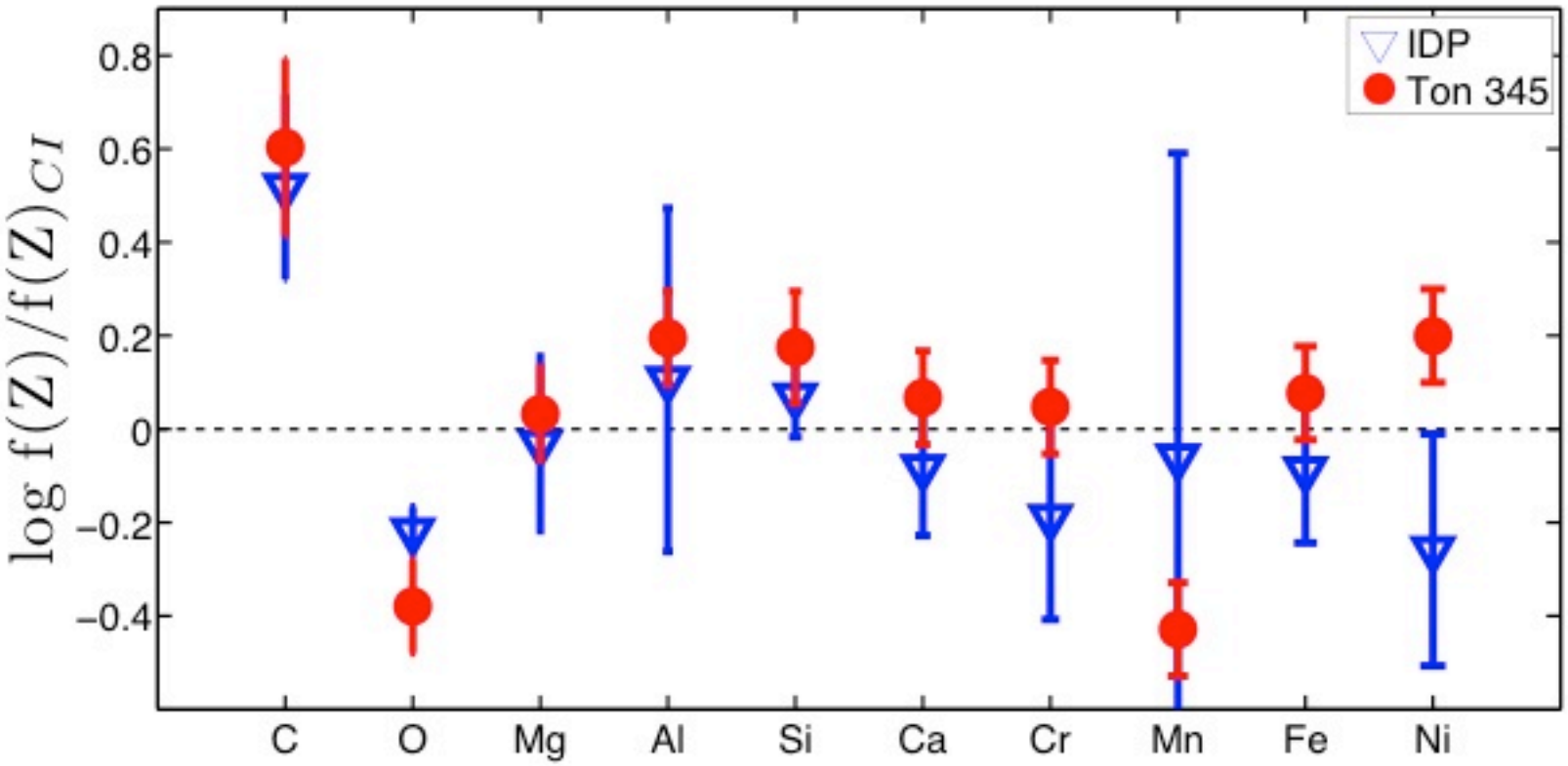
Xu+2013

The composition of extrasolar asteroids mostly resemble bulk Earth.



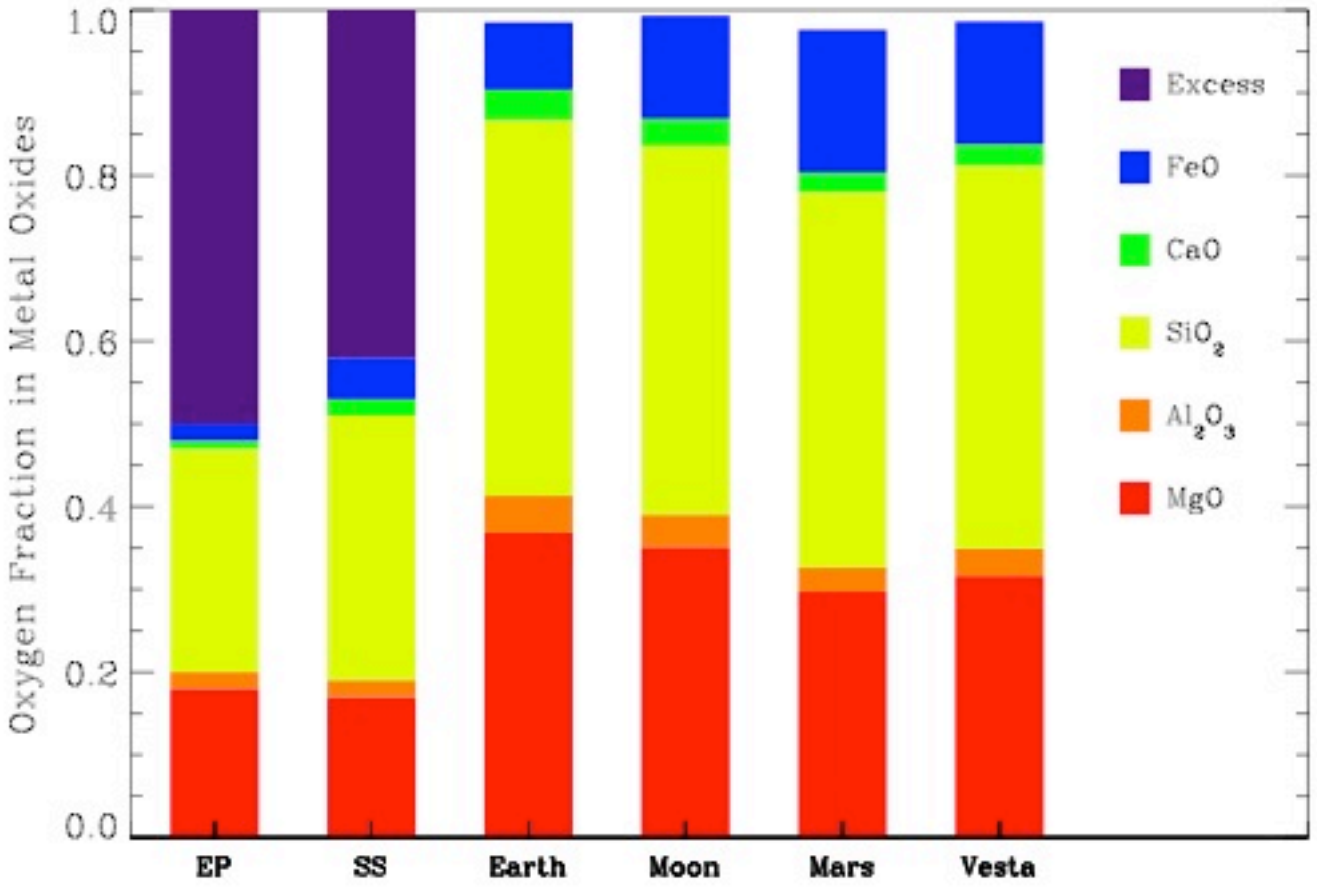
Xu+2014

Ton 345: Analog to Anhydrous IDP?



Jura+2015

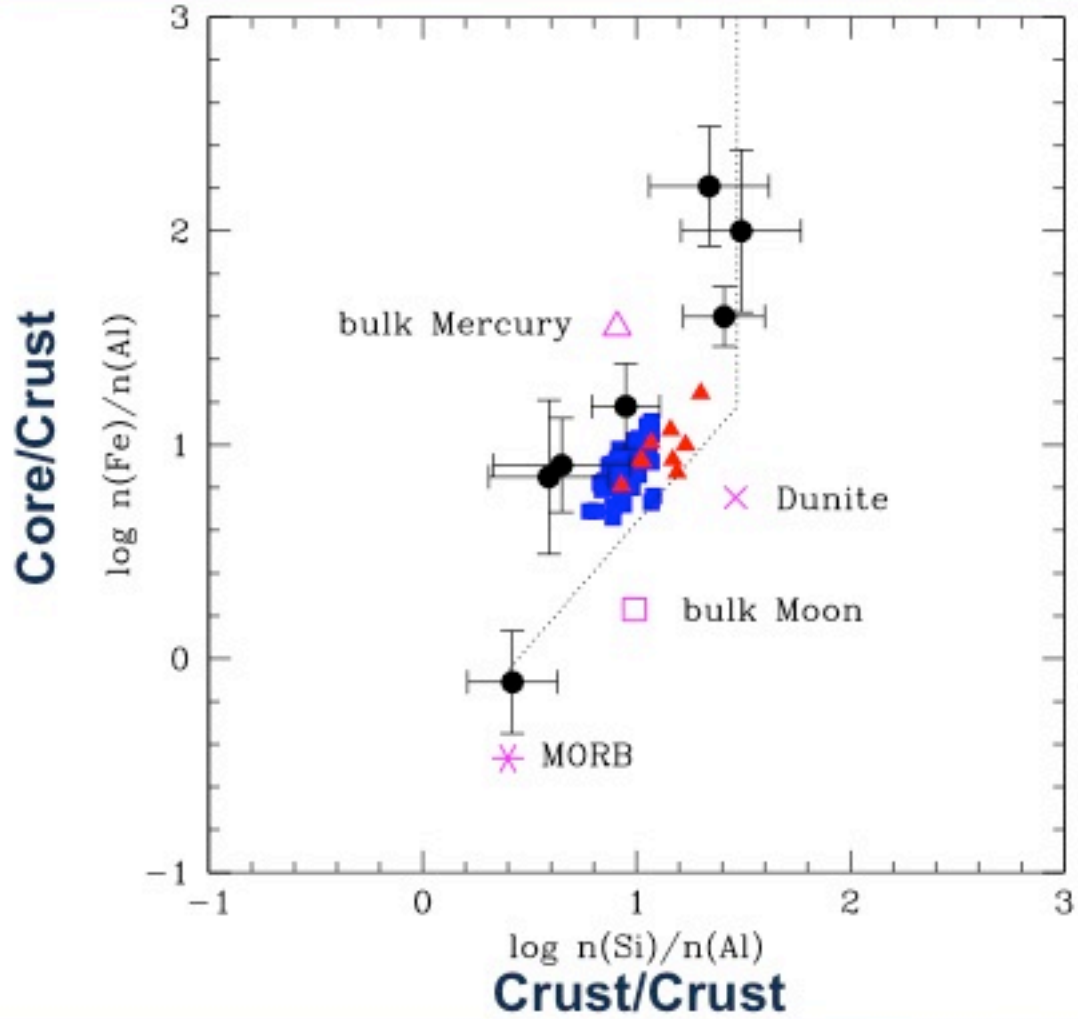
Evidence for H_2O-Rich Asteroid



See poster by J. Farihi!

Farihi+2013

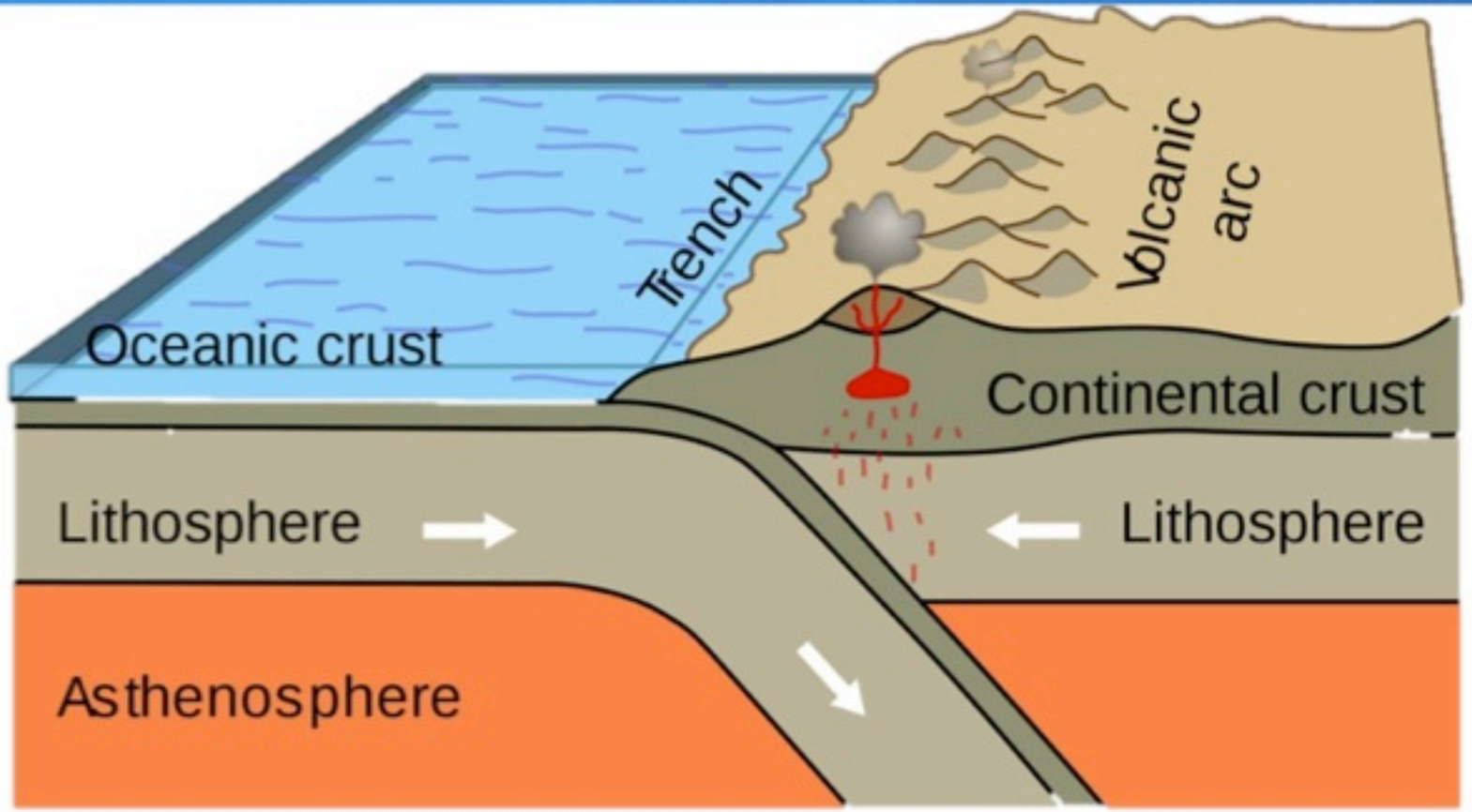
Evidence for Differentiation & Collisions



- WDs
- Chondrites
- Planet-Hosting Stars

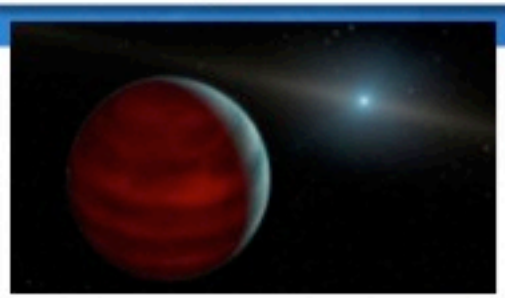
Jura+2013

Search for Signatures From Plate Tectonics



Continental crust is enhanced of *incompatible elements* (Ba, Sr…)

Summary: polluted WD is a powerful way to do extrasolar cosmochemistry



Dominant Elements	O, Fe, Mg, Si	O, Fe, Mg, Si
Volatiles (C, S, N, H_2O)	Very little	Mostly little
Differentiated	Yes	Widespread
Plate Tectonics	Yes	???
Habitable	Yes	???

Thank you!