The photochemical fractionation of oxygen isotopes in Titan's atmosphere

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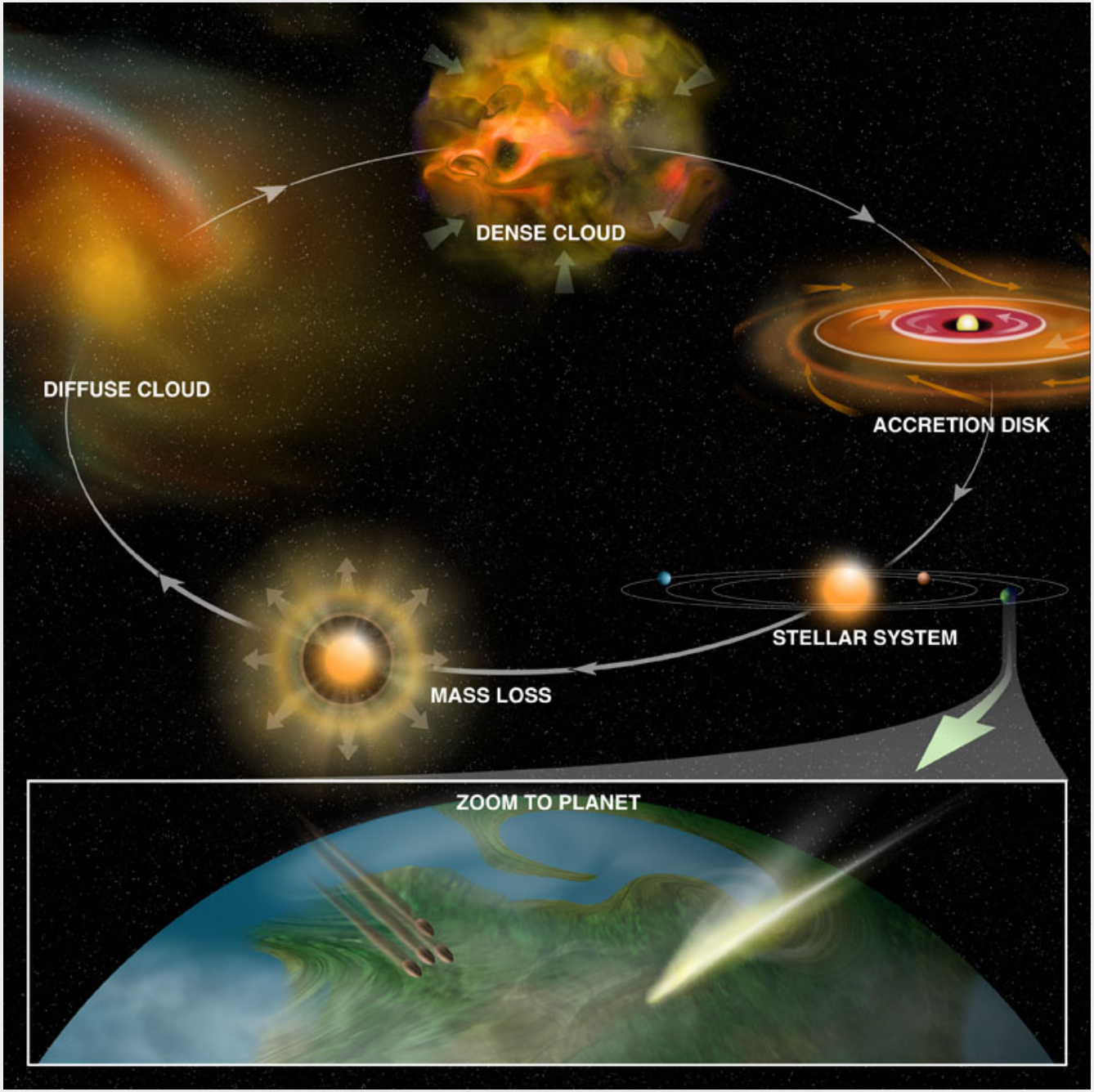

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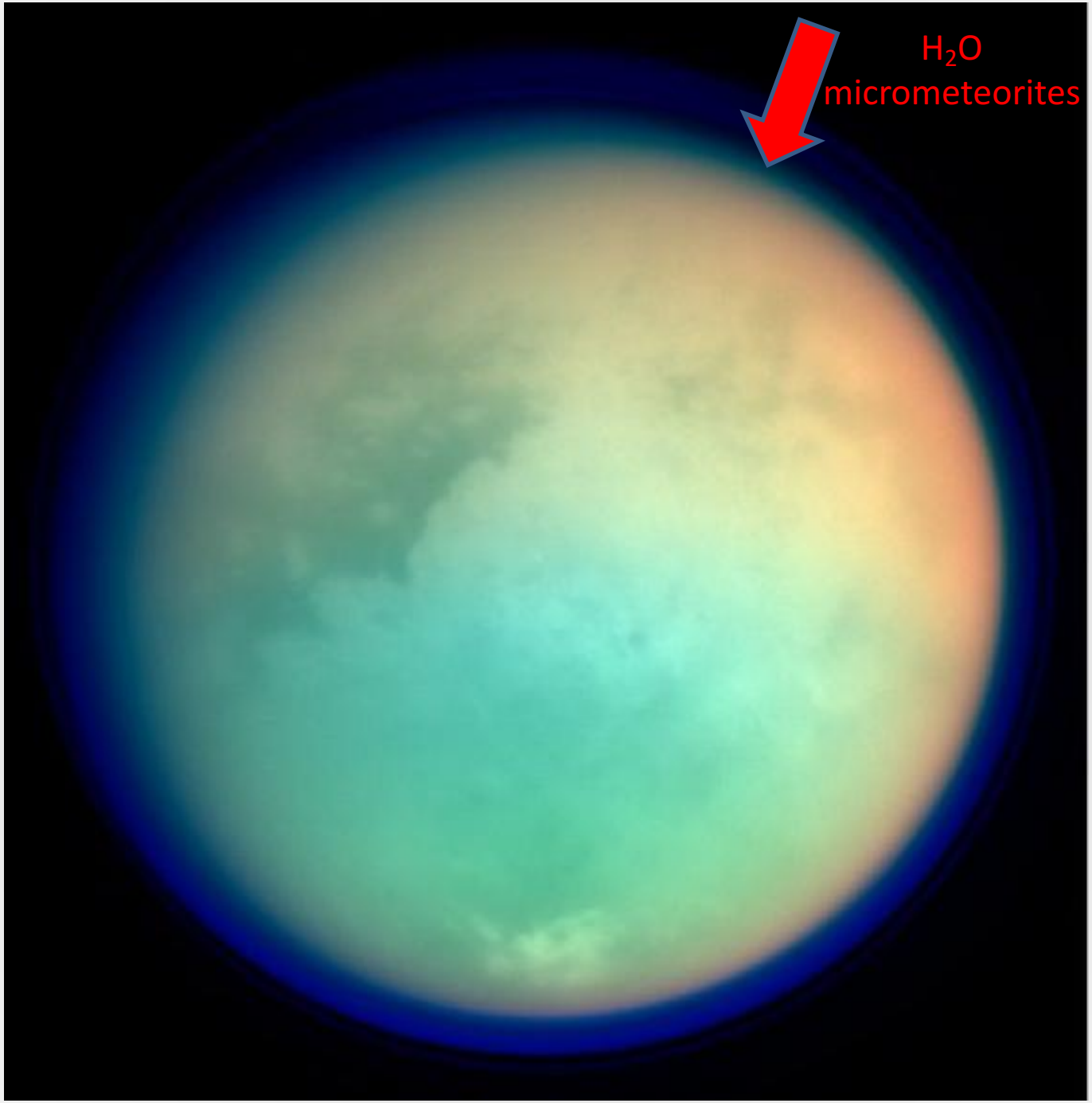

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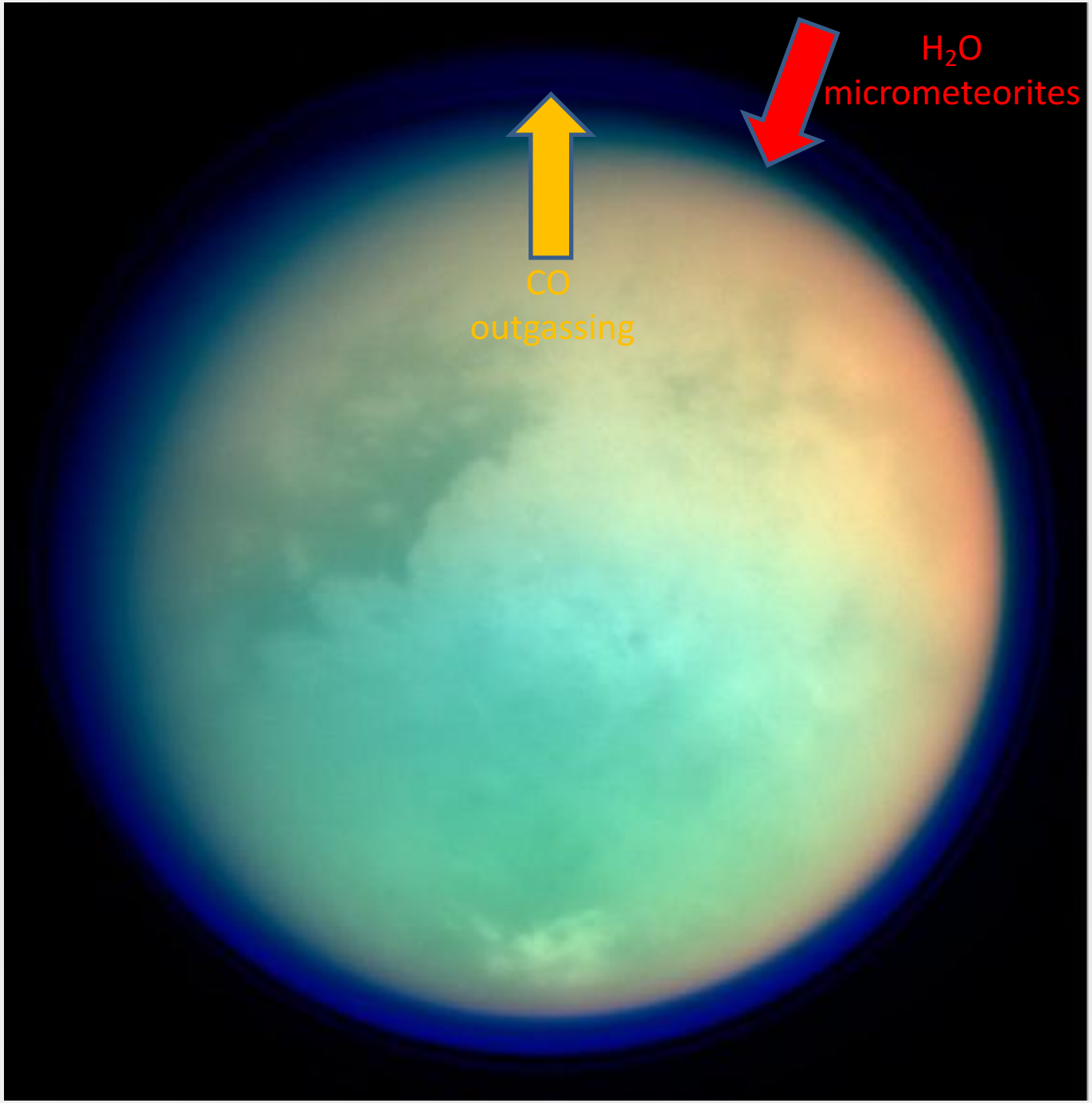

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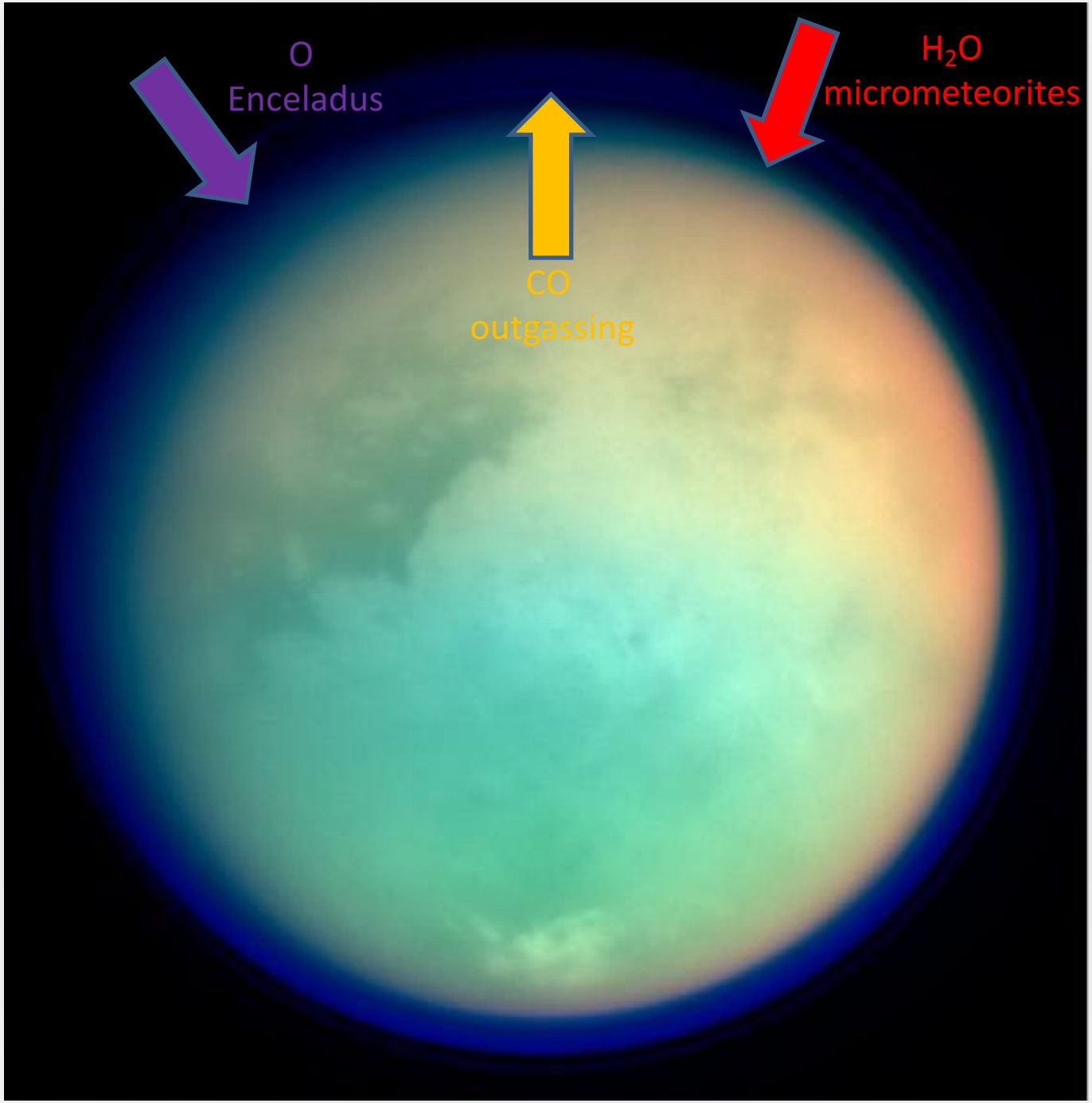

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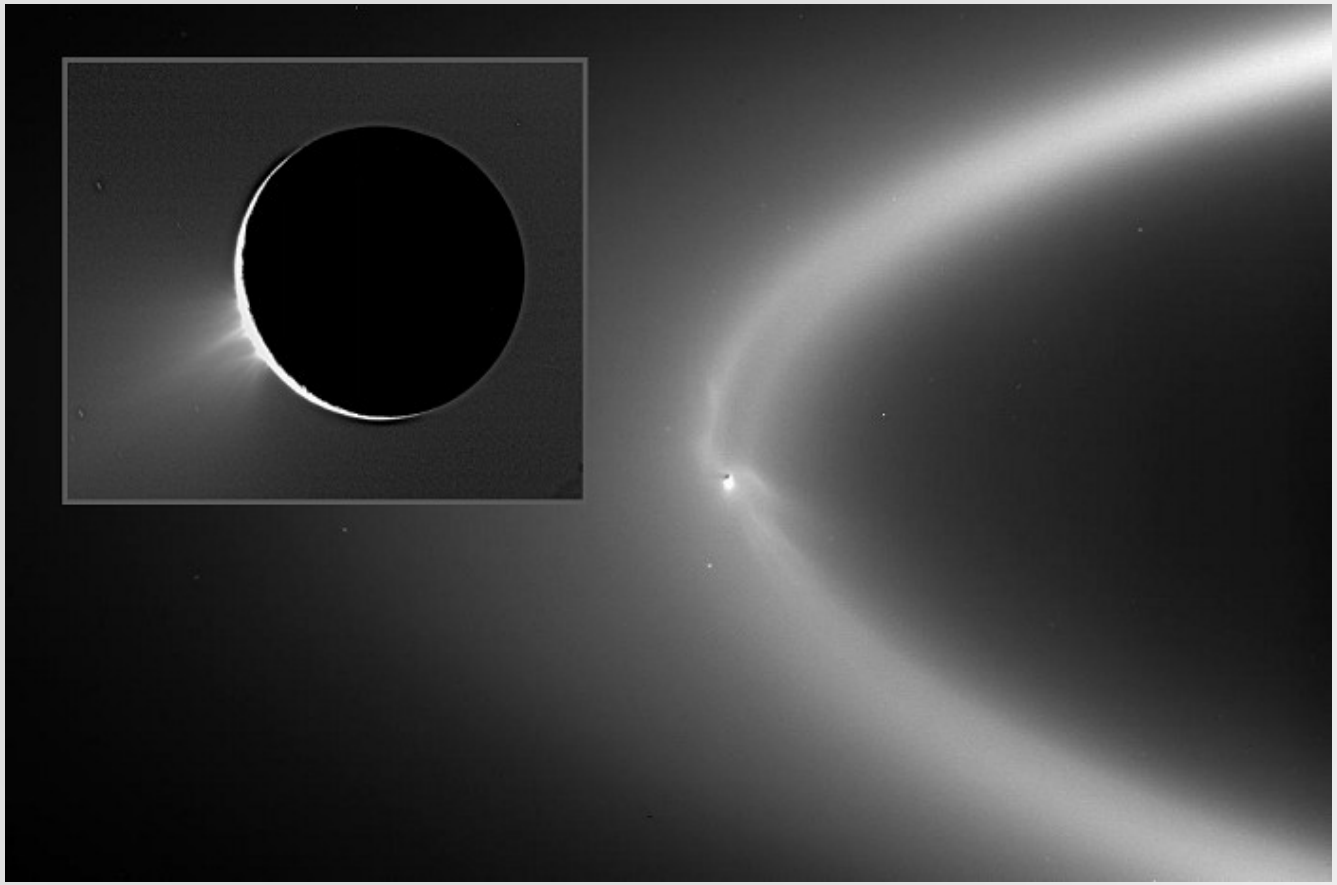

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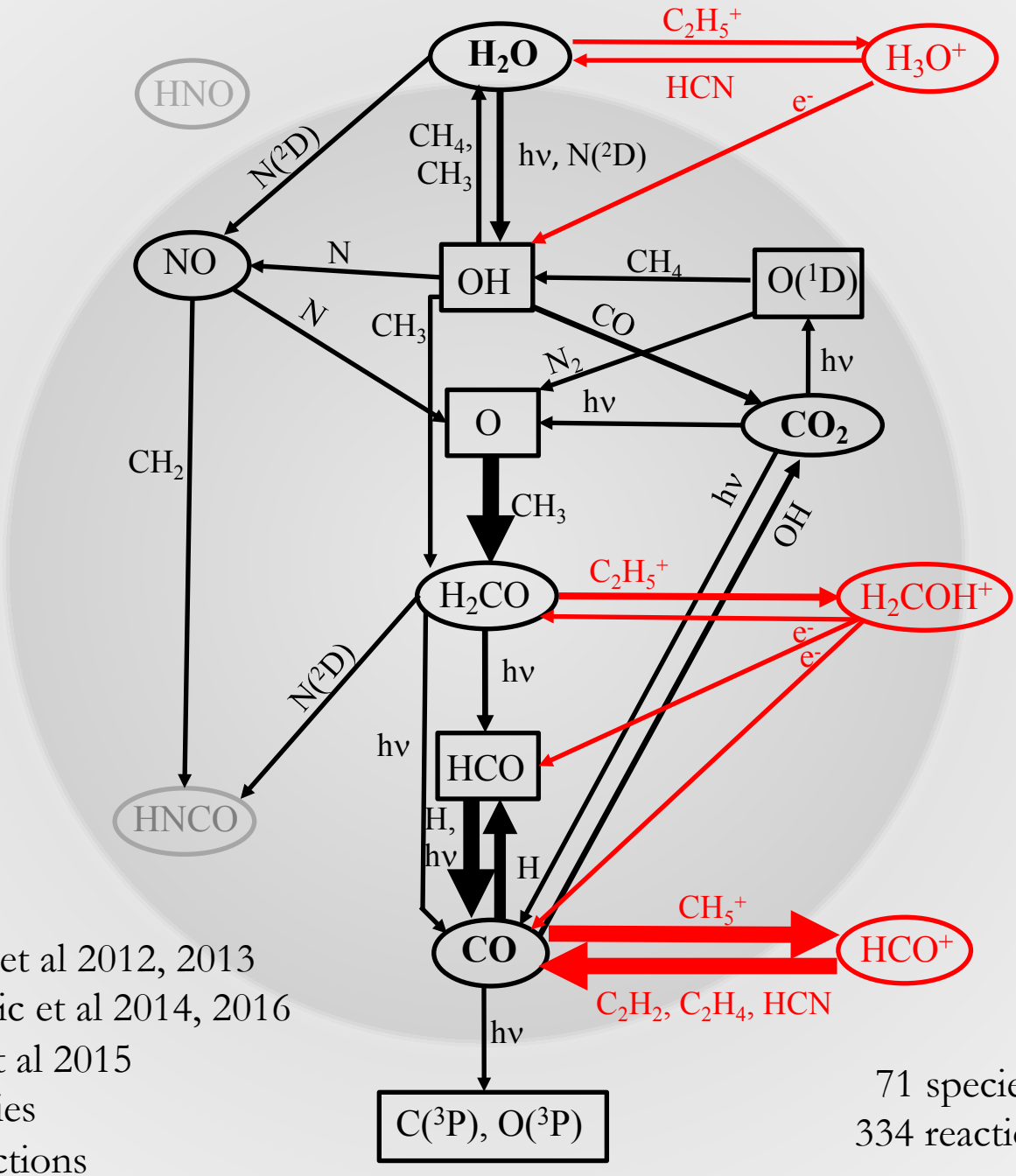

Hébrard et al 2012, 2013
Dobrijevic et al 2014, 2016
Loison et al 2015
150 species
1000 reactions

71 species
334 reactions

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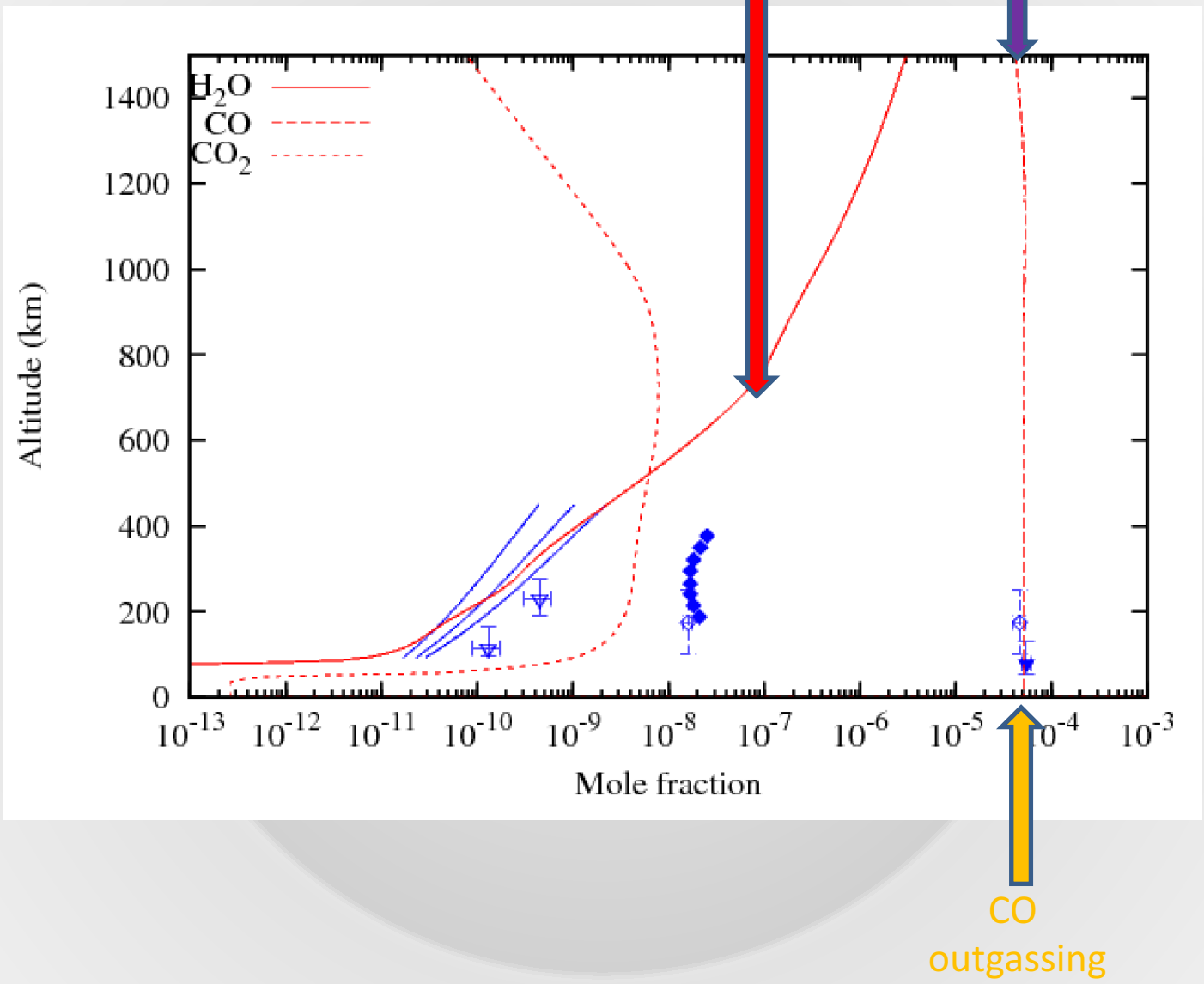

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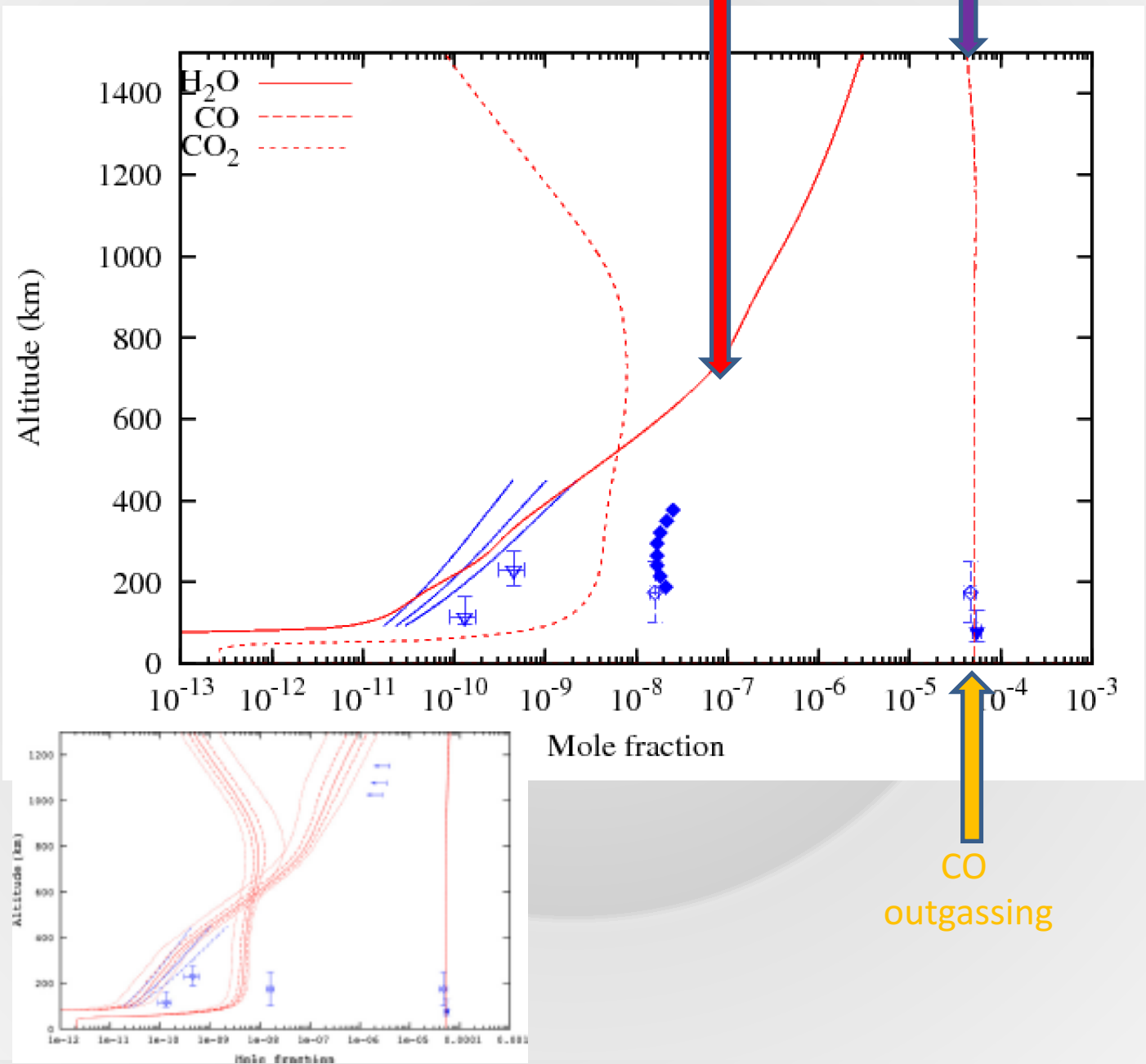

^{18}Observations

- $C^{16}O/C^{18}O = 486 \pm 22$ (Nixon et al 2016)

- $C^{16}O_2/C^{16}O^{18}O = 173 \pm 55$ (Nixon et al 2016)

($^{16}O/^{18}O$ ratio in CO_2 of 346 ± 110)

Cometary: $^{16}O/^{18}O \approx 500$

$$\mathbf{OH + CO \rightarrow H + CO_2}$$

$$k(OH+C^{18}O)=k(^{18}OH+CO)=\mathbf{0.985}*k(OH+CO)$$

(Chen 2005, Stevens 1980, Rockmann 1998, Feilberg 2005)

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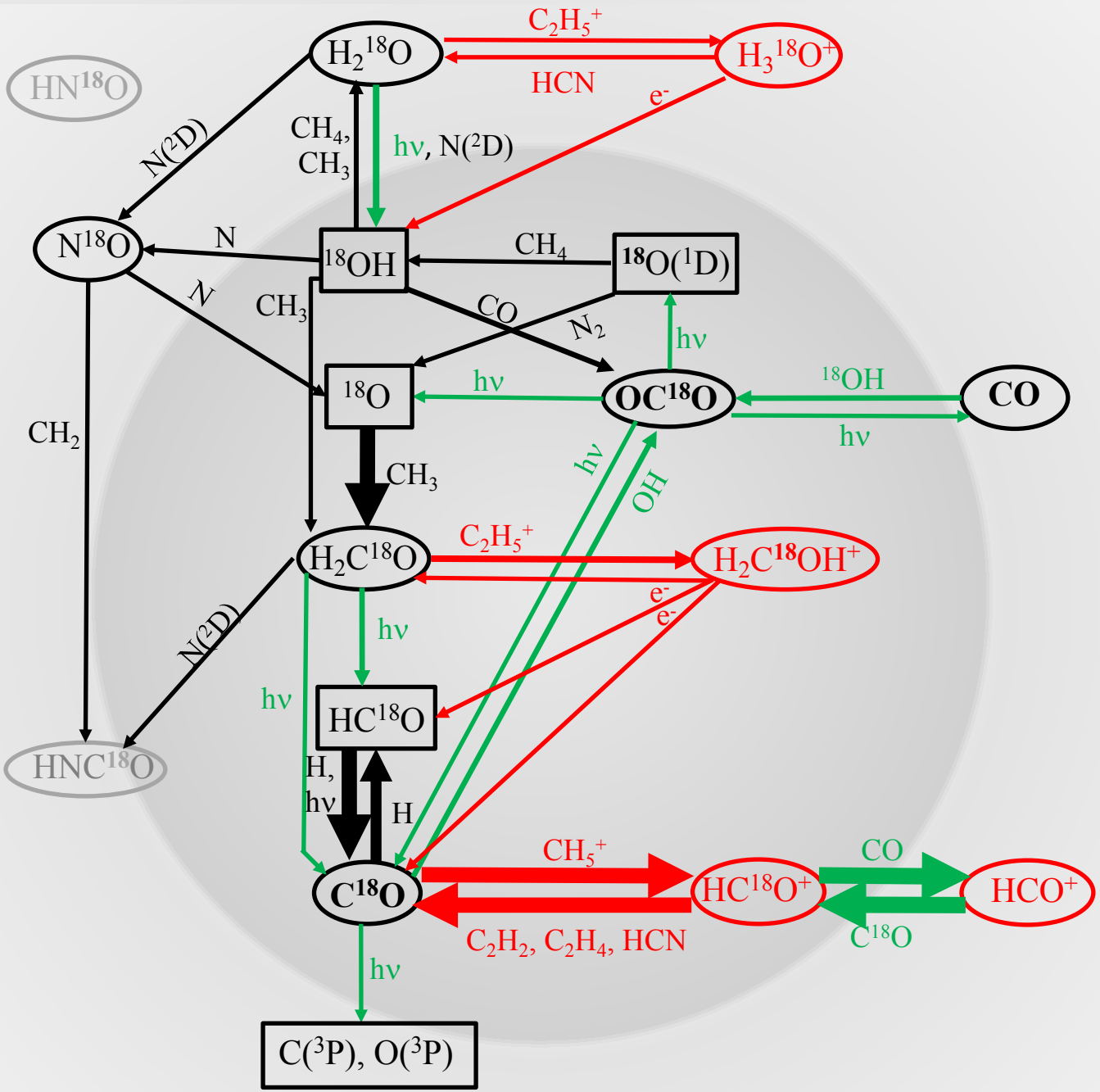

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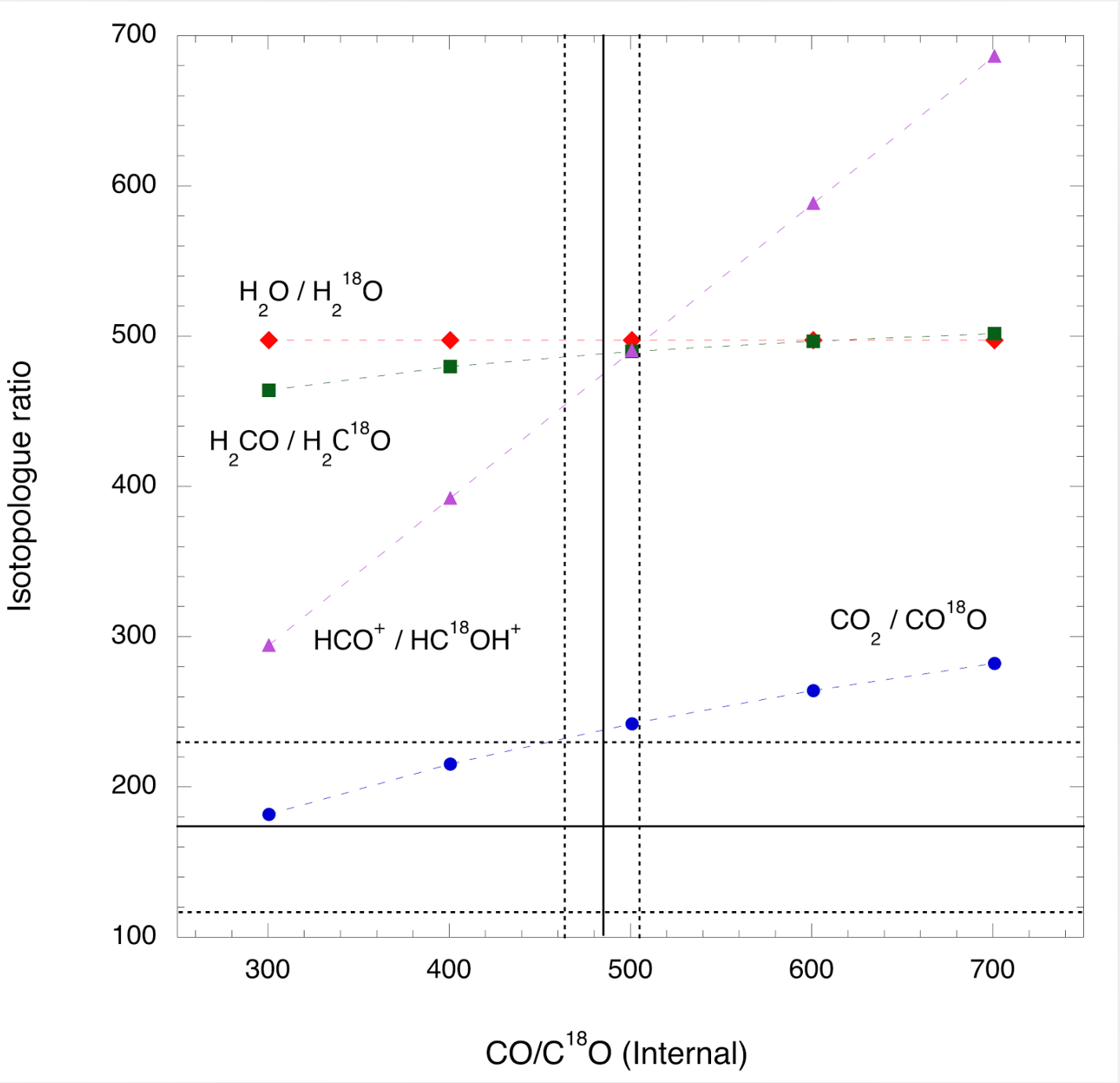

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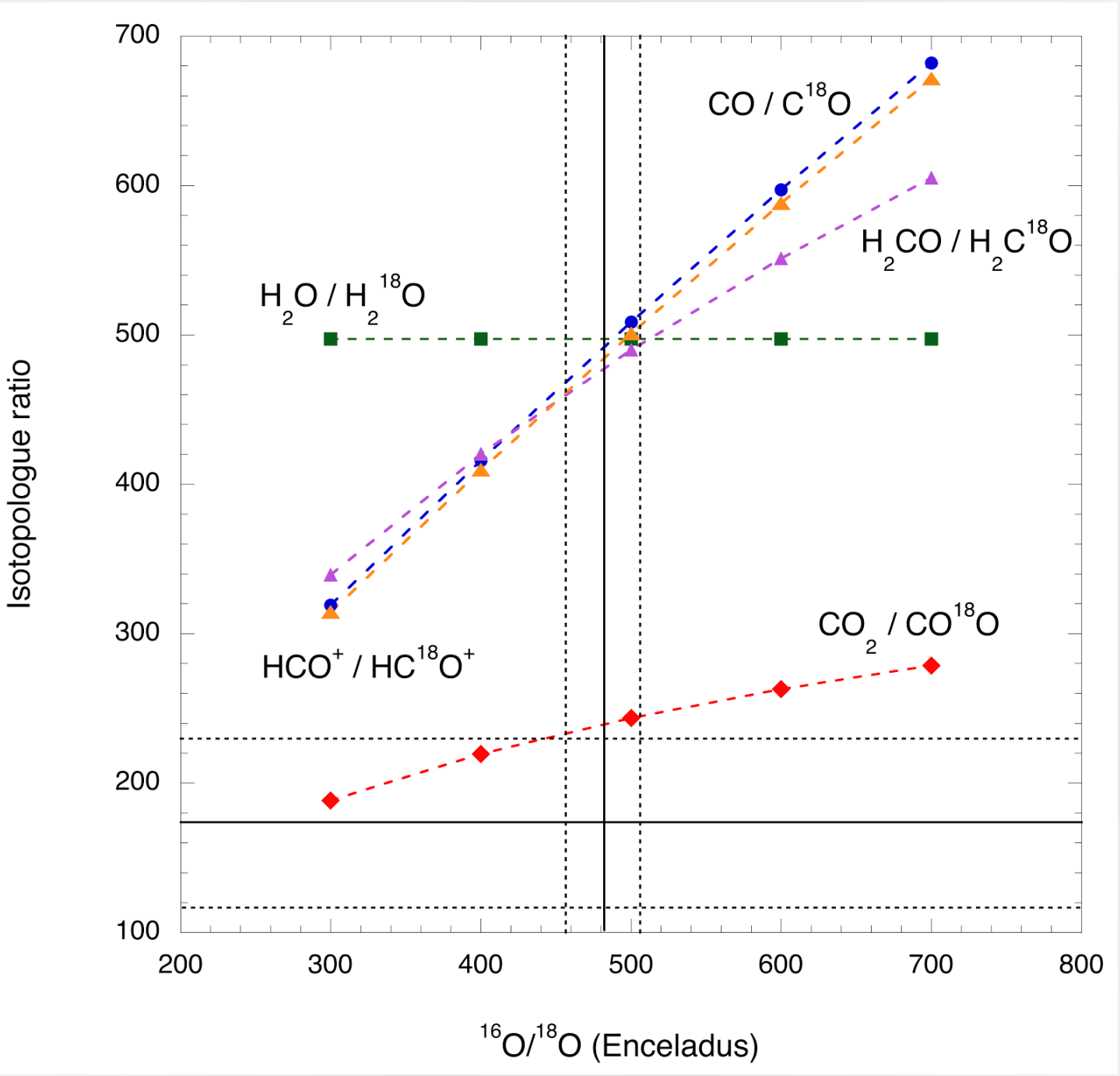

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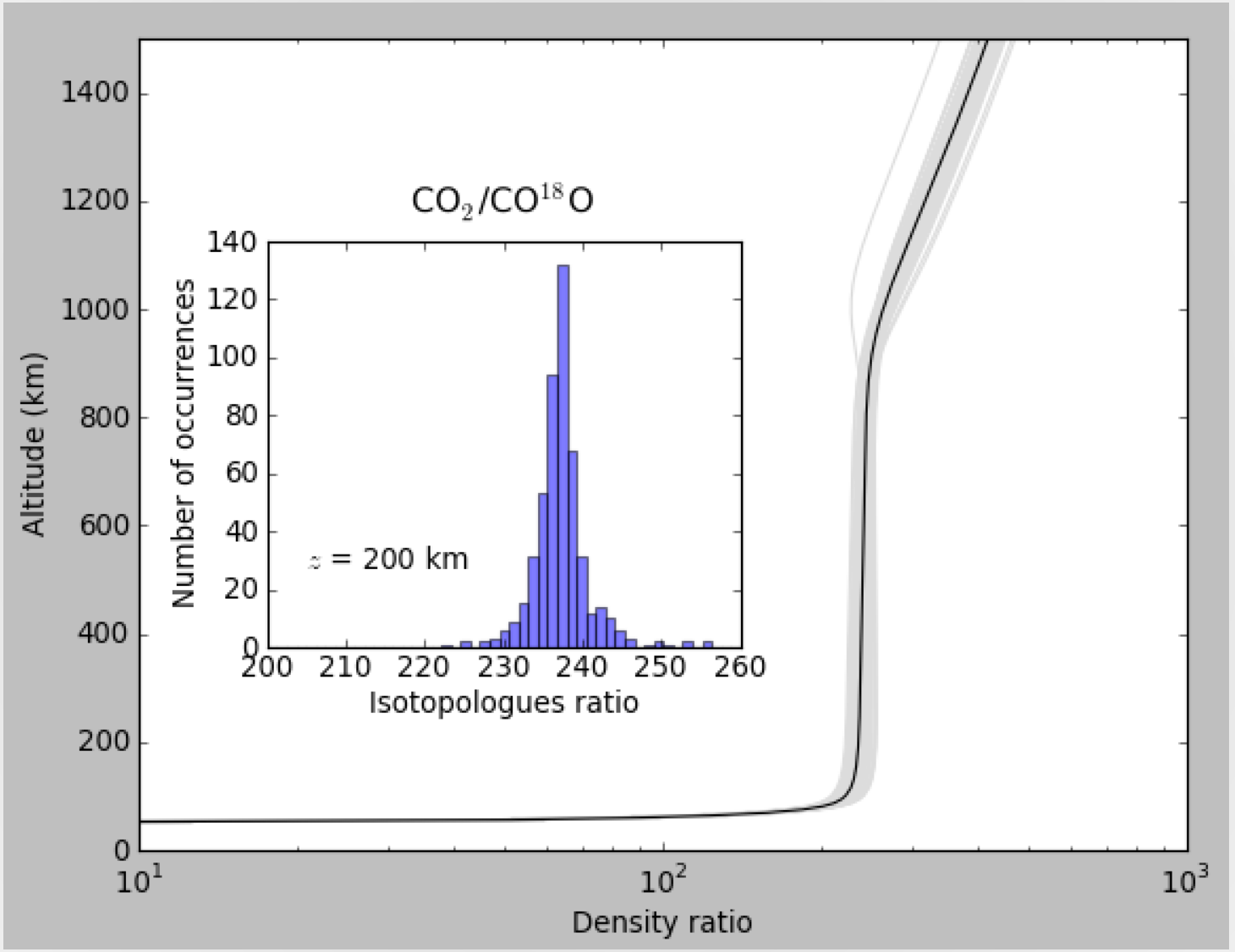

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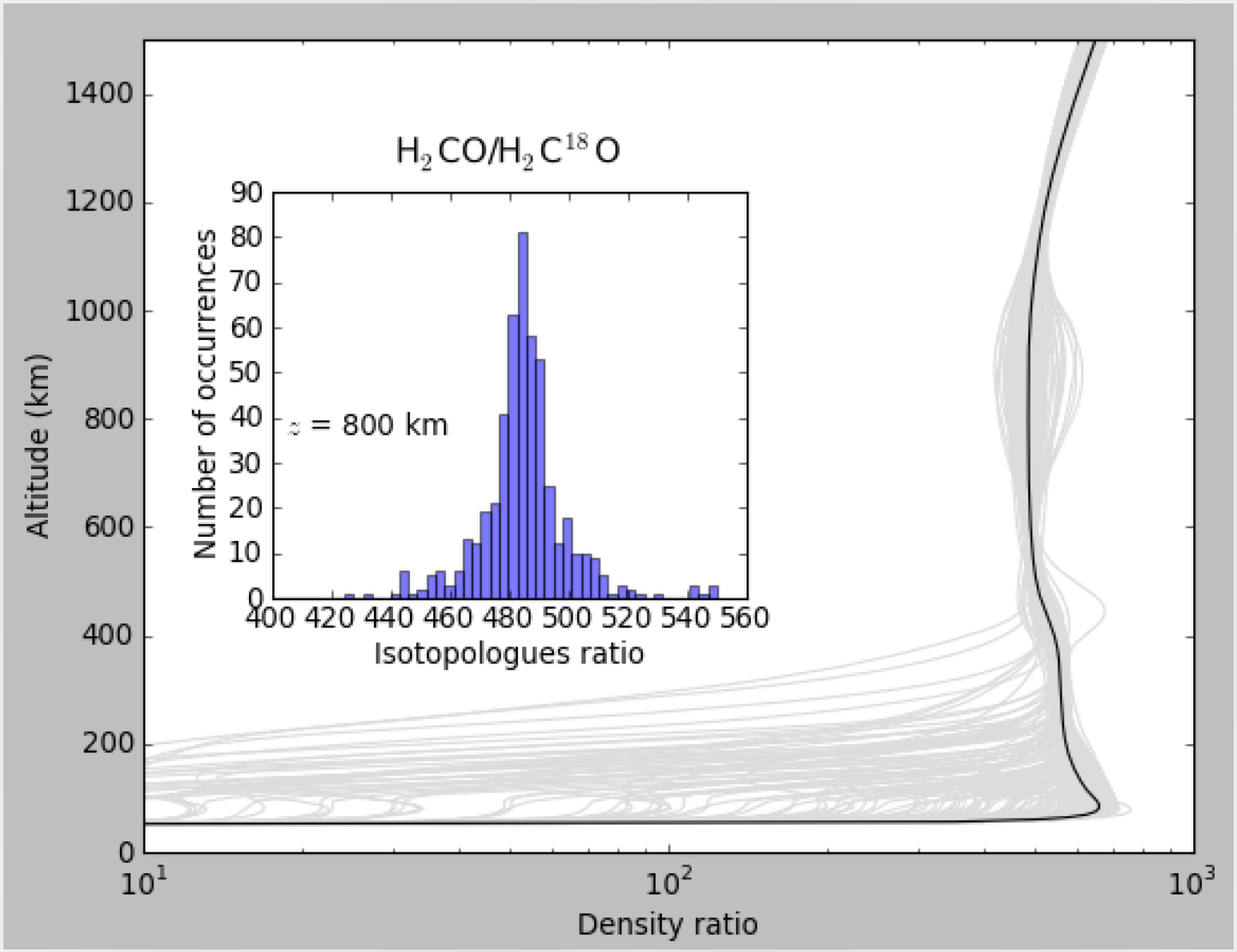

Conclusion:

- Low $^{16}O/^{18}O$ fractionation in Titan
- If CO internal: $C^{16}O_i/C^{18}O_i \approx 500$
- If CO external: $C^{16}O/C^{18}O \approx {}^{16}O/{}^{18}O$ Enceladeus
- $C^{16}O_2/C^{16}O^{18}O$: observation < modelisation
- $H_2C^{16}O/H_2C^{18}O$: highly dependant of the O origin