

Library of Self-consistent Simulated Exoplanet Atmospheres

BDEXOCON, 22nd Oct. 2019

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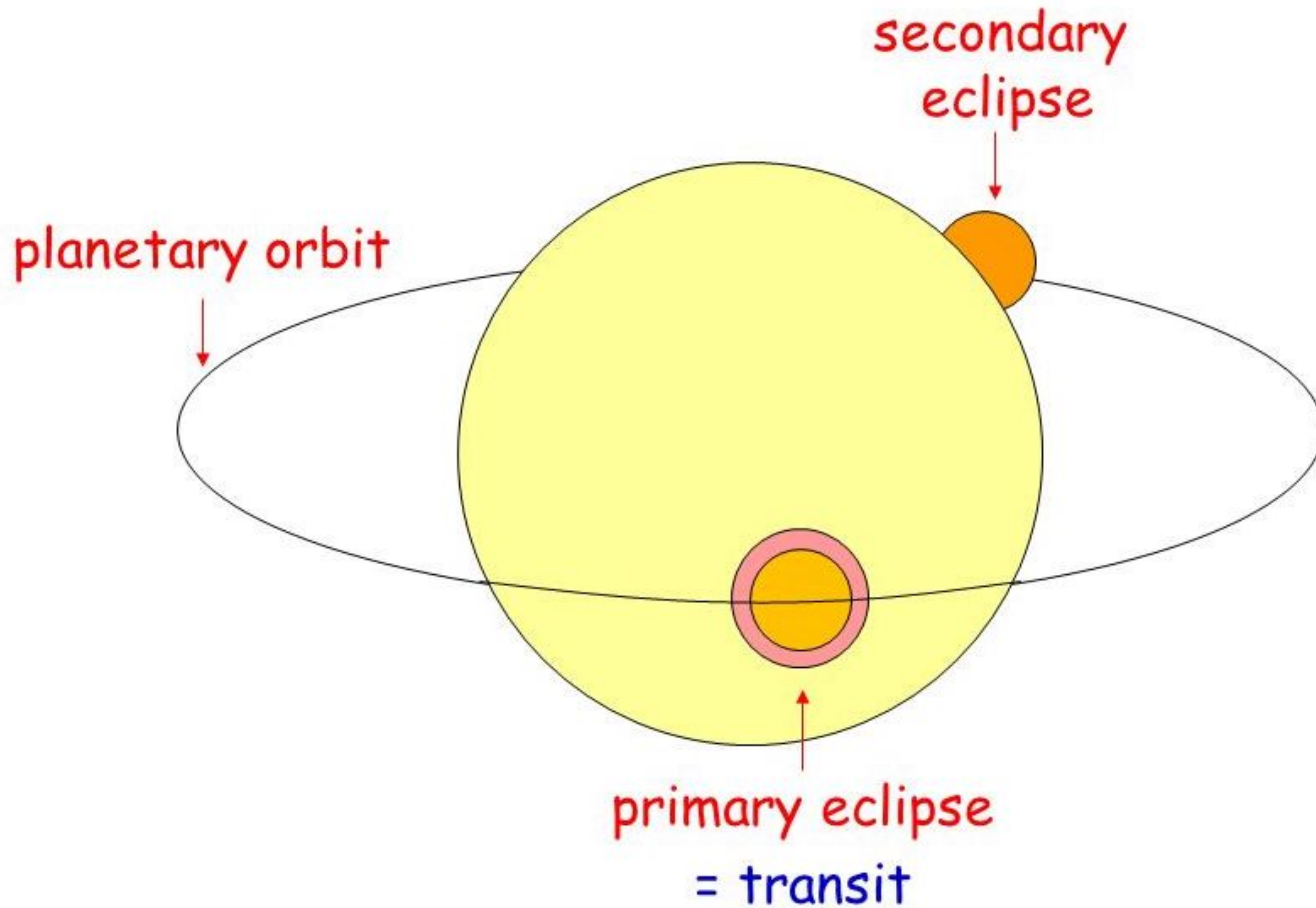
Nathan Mayne, Ben Drummond, David Sing, Eric Hebrard, Nikole Lewis, Pascal Tremblin, Mark Phillips, Tom Evans, Hannah Wakeford



extremeInstability.com

Pressure-Temperature using Radiosonde





Planet Specific Atmospheric Library

Which Model?

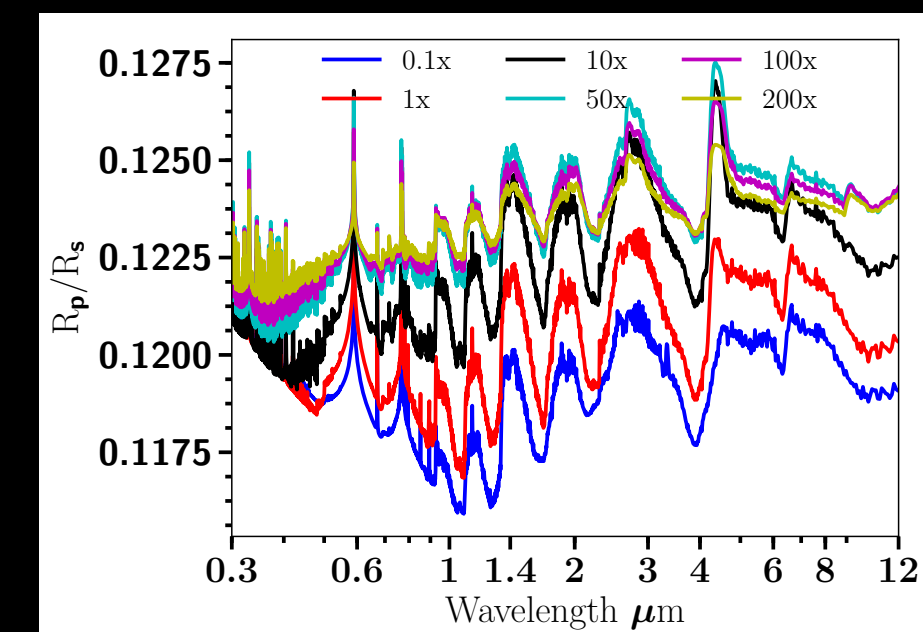
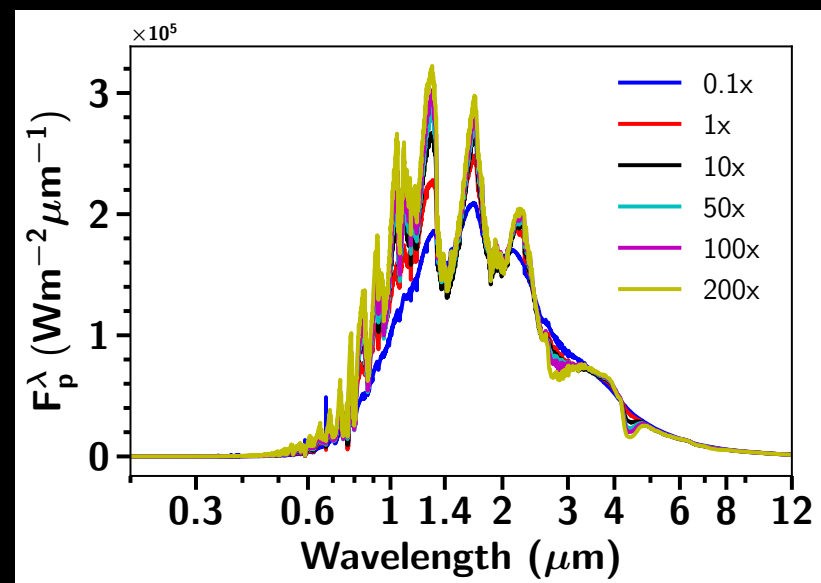
- * **1D Radiative Convective Equilibrium model ATMO**
(Tremblin 2015, Amundsen 2014, Drummond 2016, Goyal 2017)

What does grid contain?

- * **89 Observationally Significant hot Jupiter and warm Neptune exoplanets**
- * **Radiative Convective Equilibrium P-T profiles**
- * **Equilibrium Chemical Abundances with ionic species**
- * **Transmission and Emission spectra, Contribution Functions**
(Goyal et al. in prep)

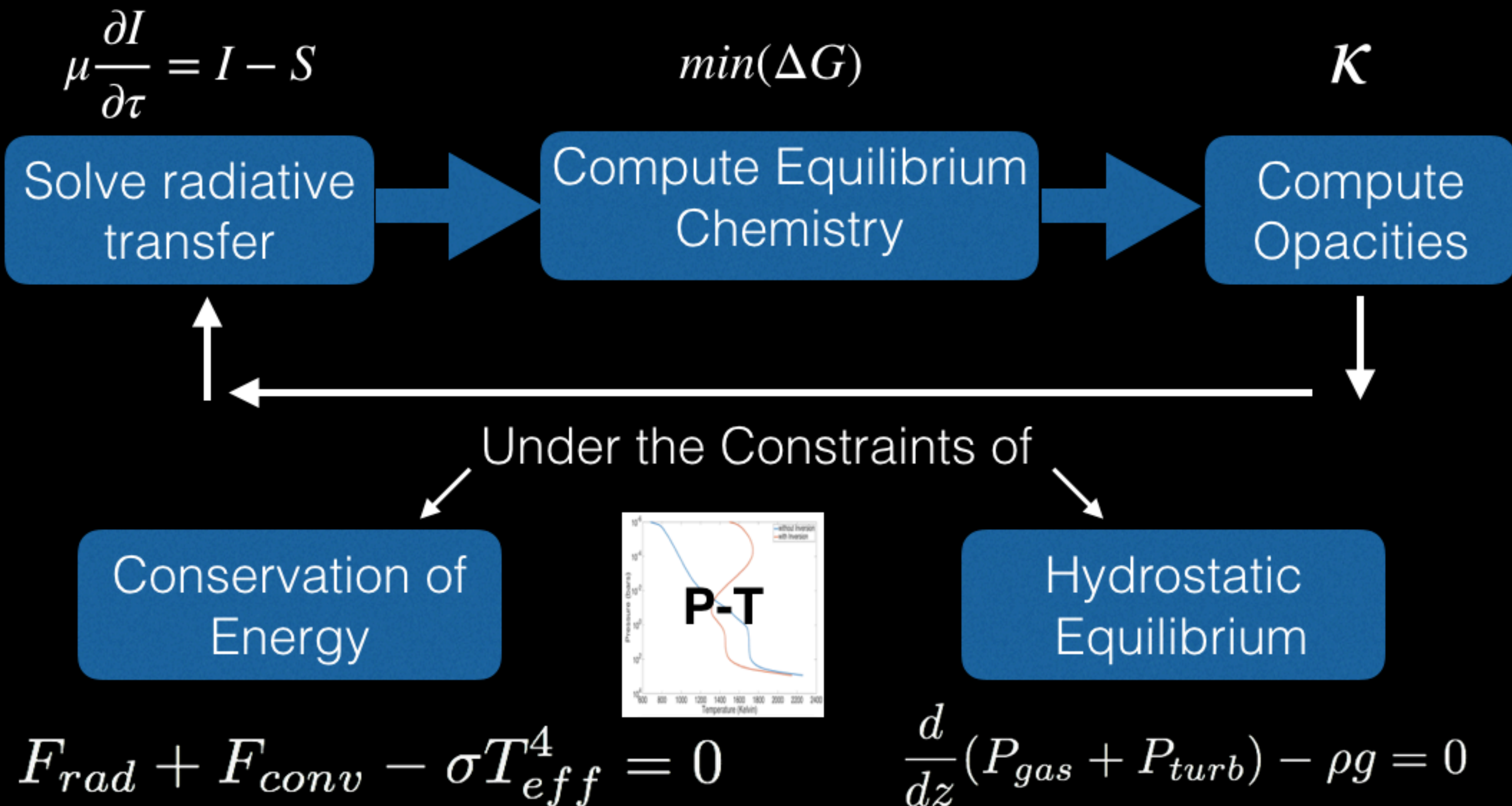
What are main grid variables for each planet?

4 Recirculation factors
6 Metallicity
6 C/O ratios

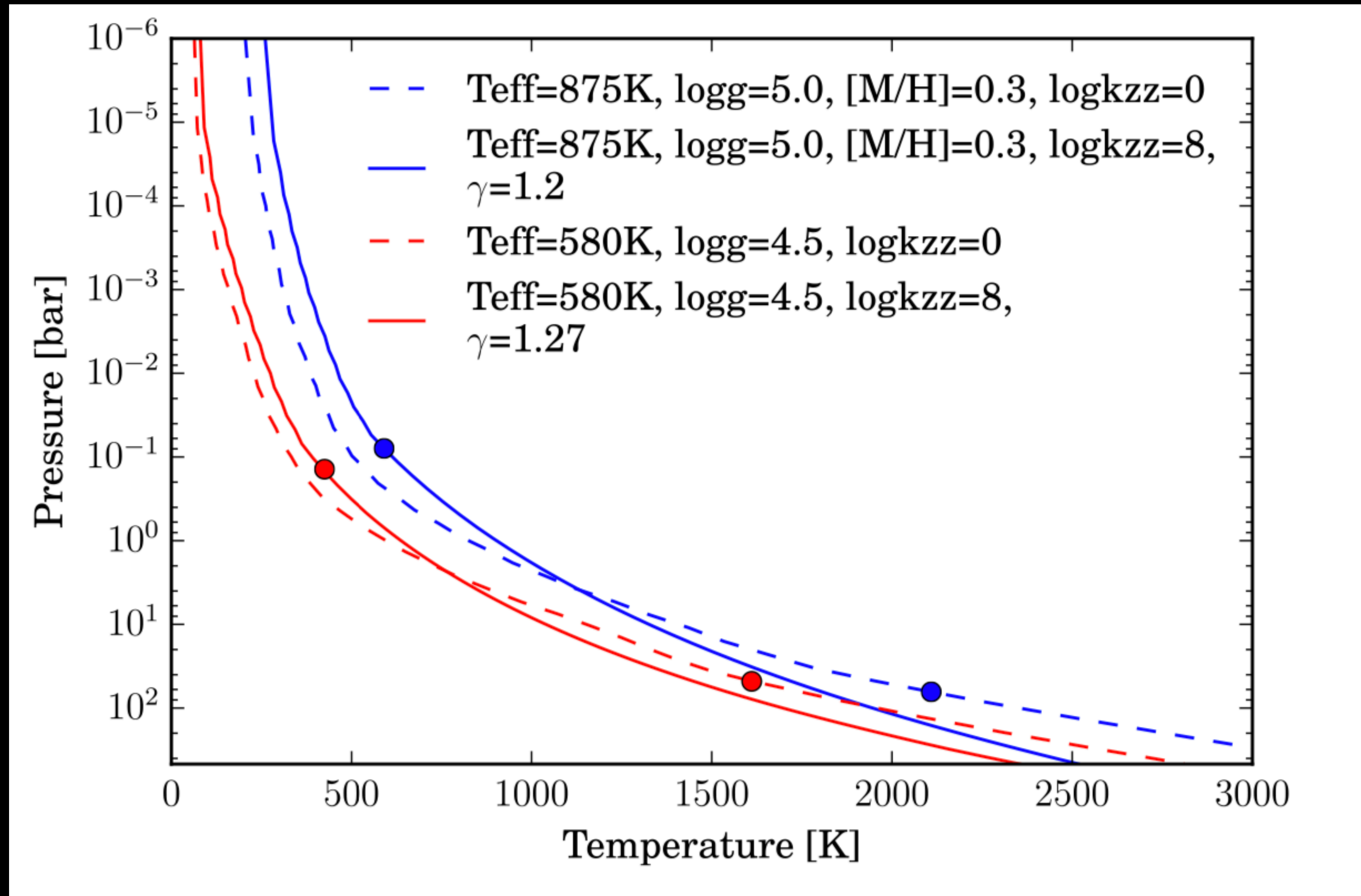


* **If you need models for any planet let us know!!**

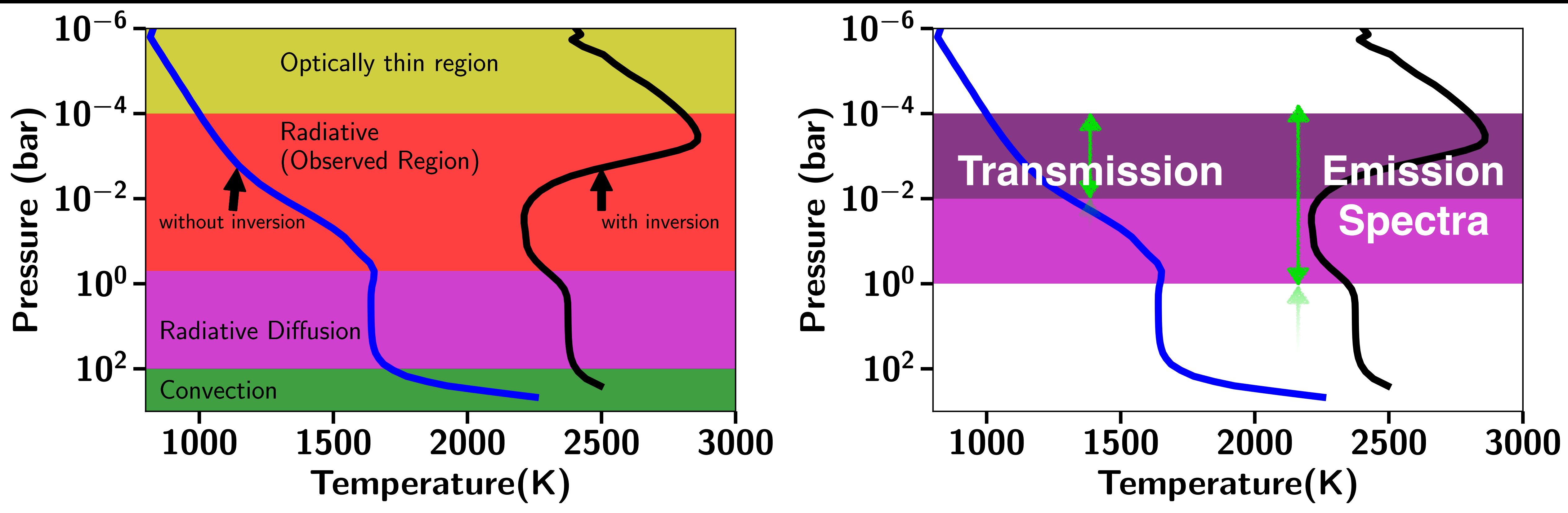
Solving Radiative Transfer Consistently with Equilibrium Chemistry



Brown-Dwarf P-T Profile

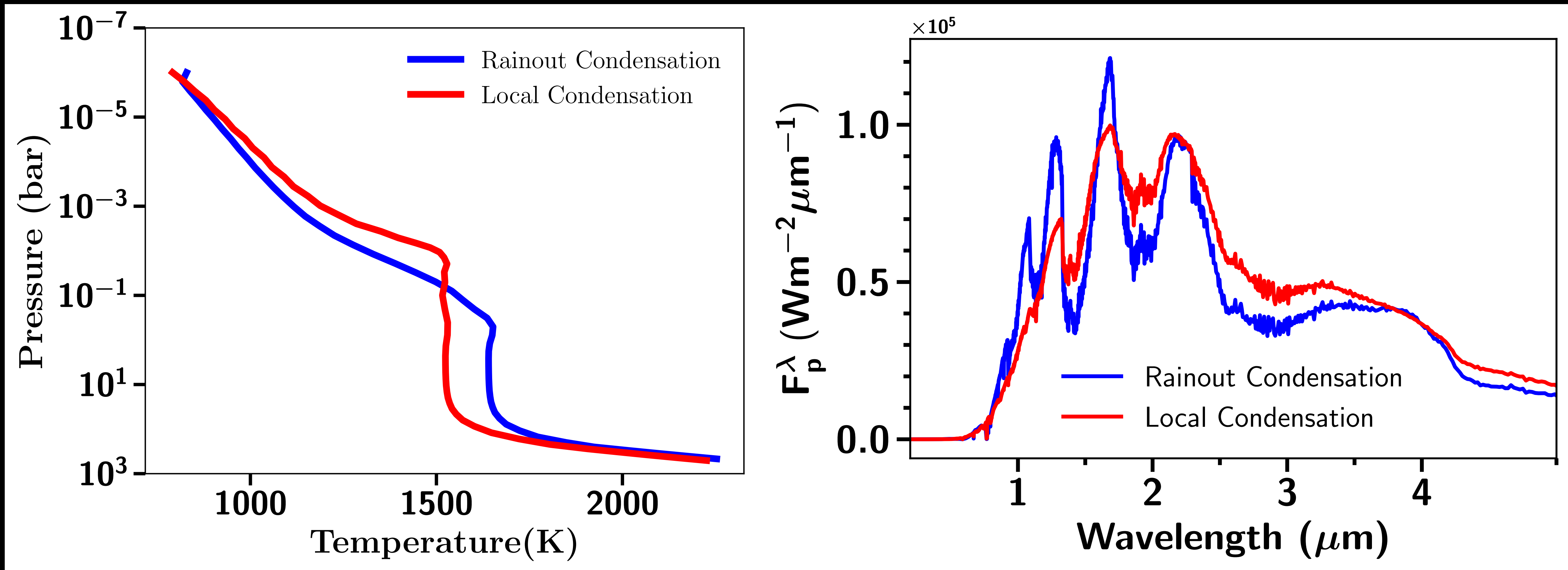


Hot Jupiter P-T profile

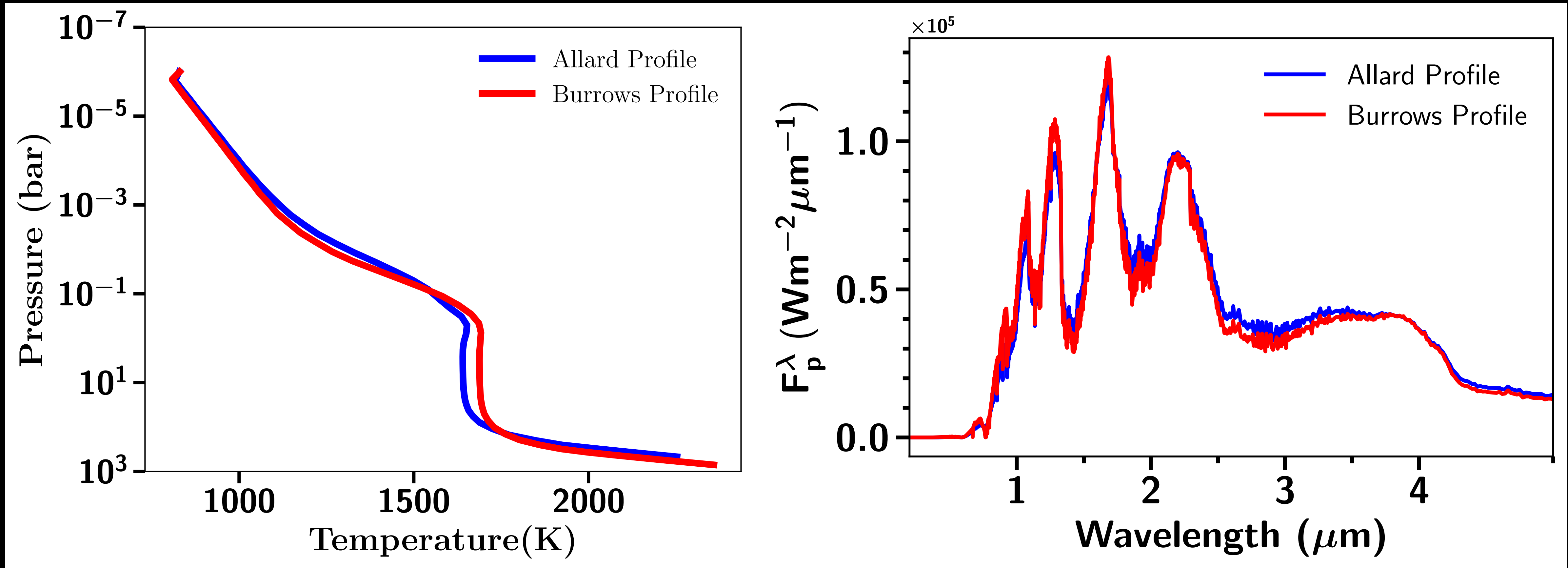


Goyal et al. in prep.

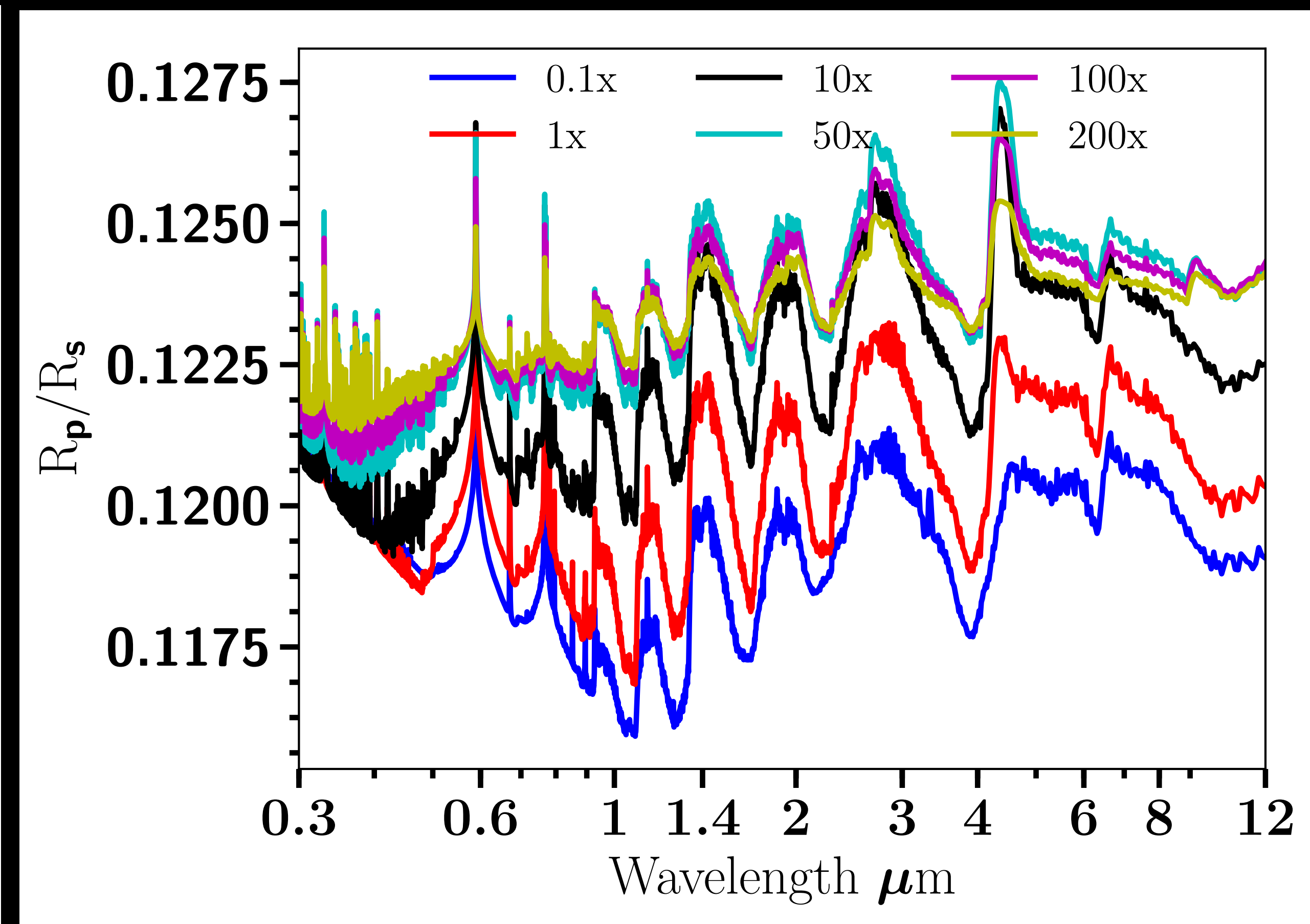
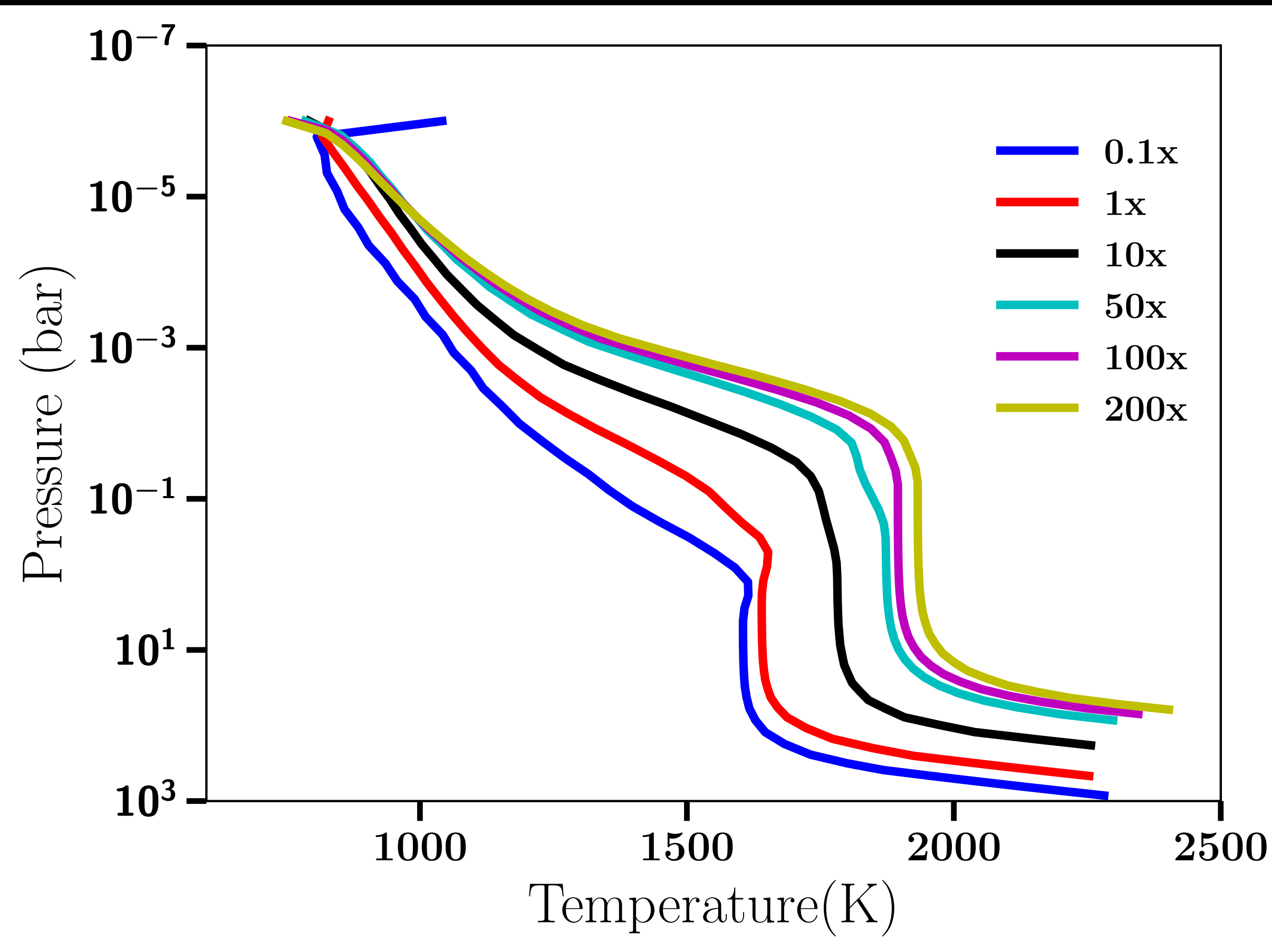
Rainout vs. Local Condensation



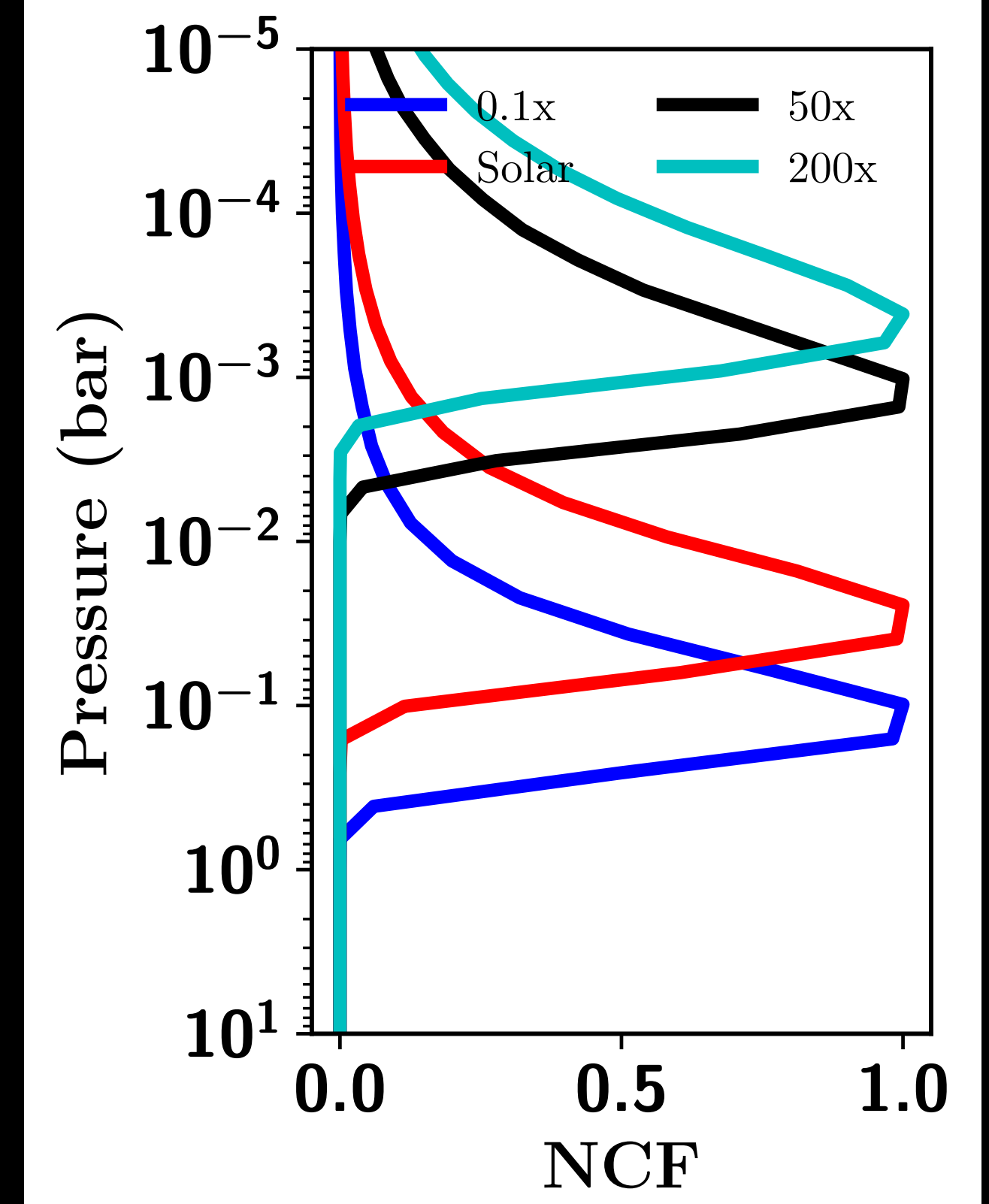
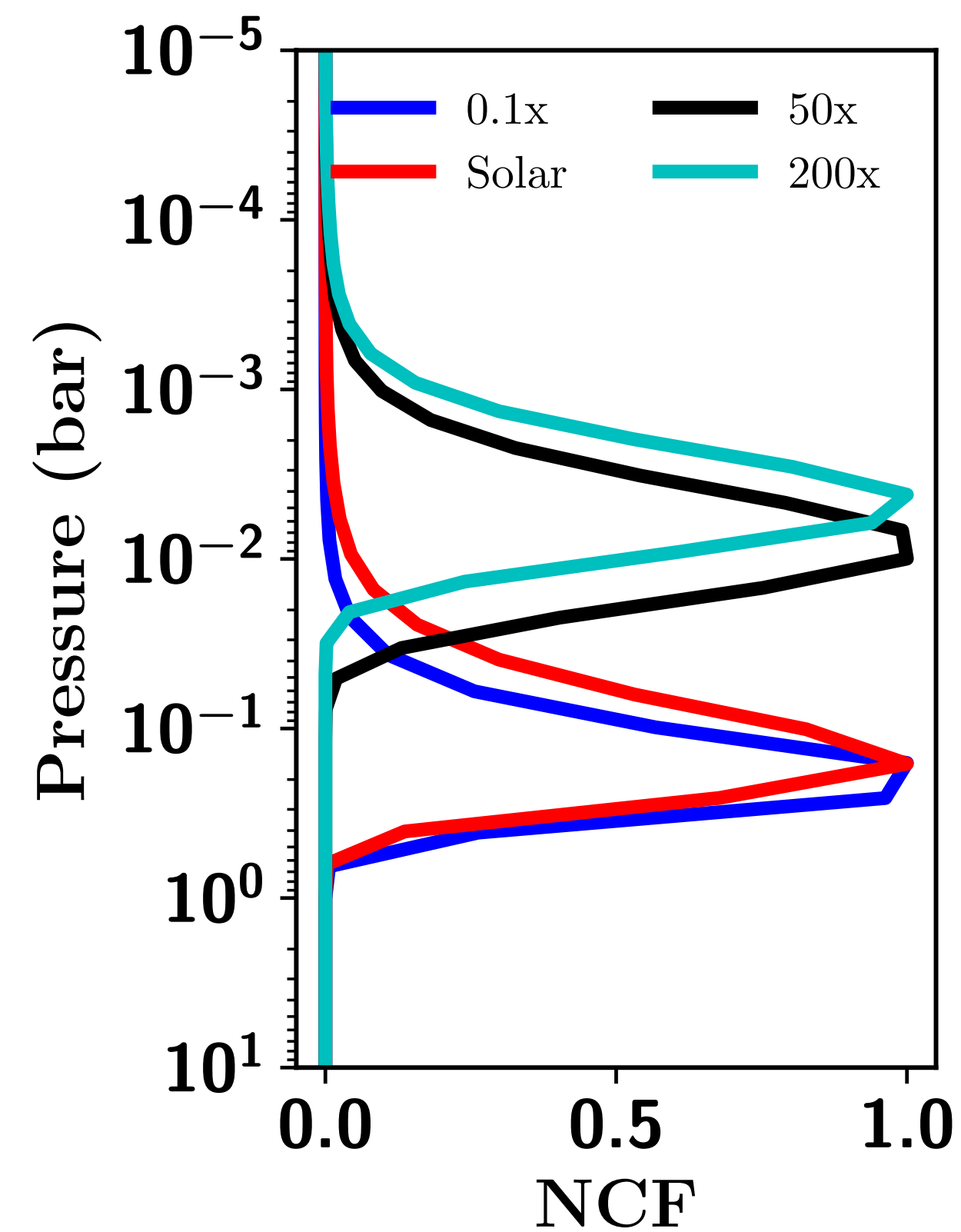
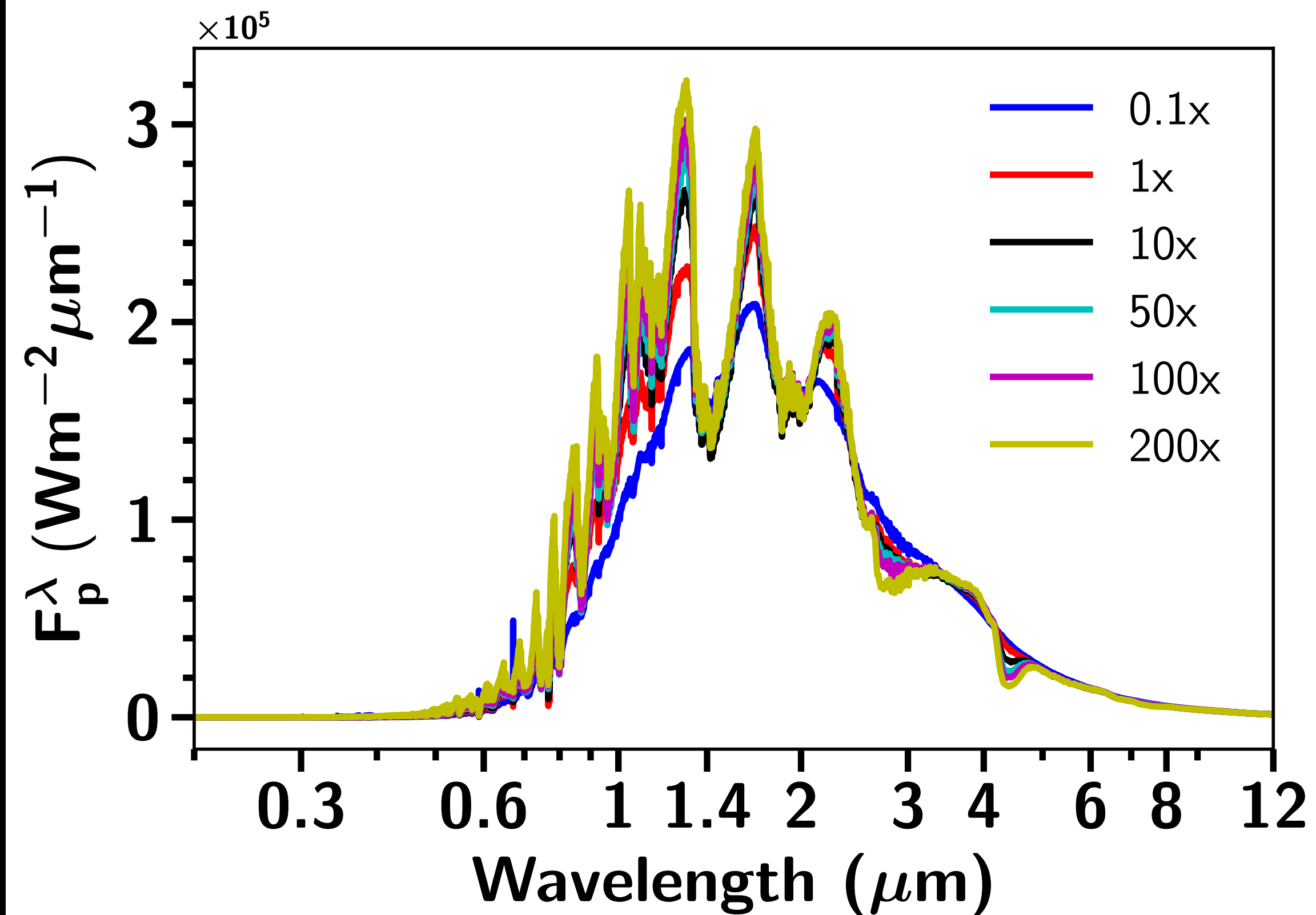
Alkali Line Profiles



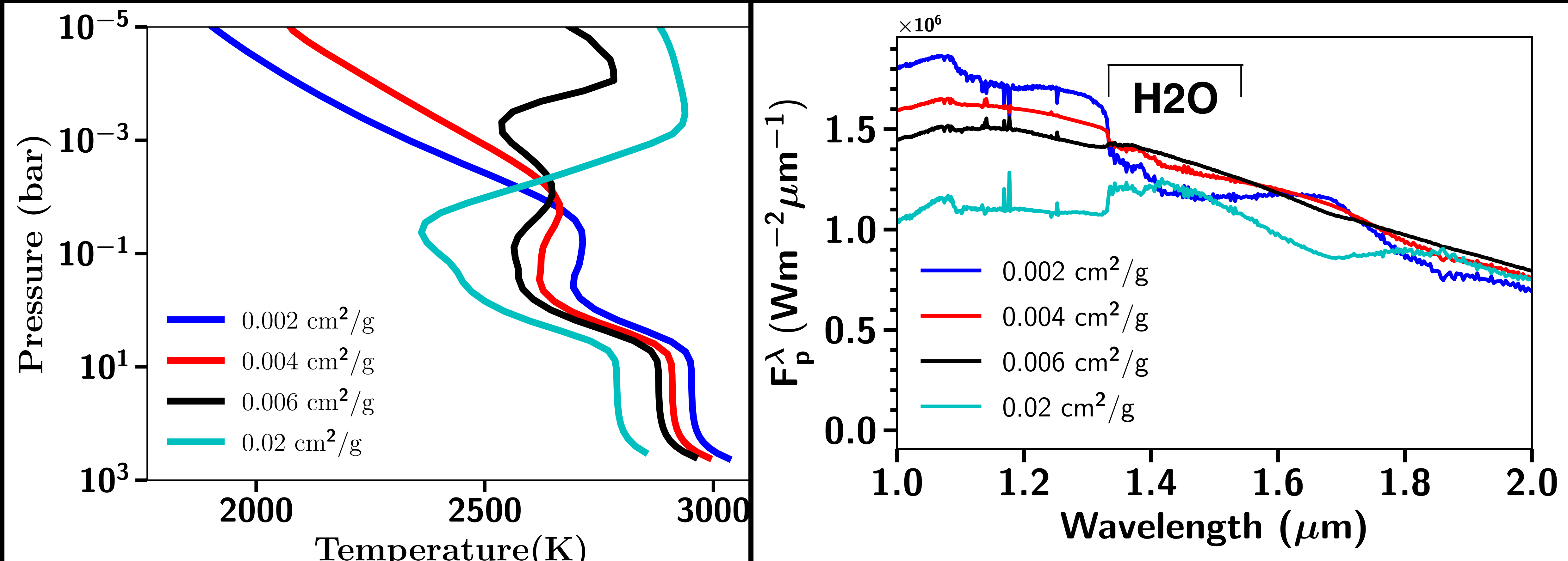
Effect of Metallicity (WASP-17b)



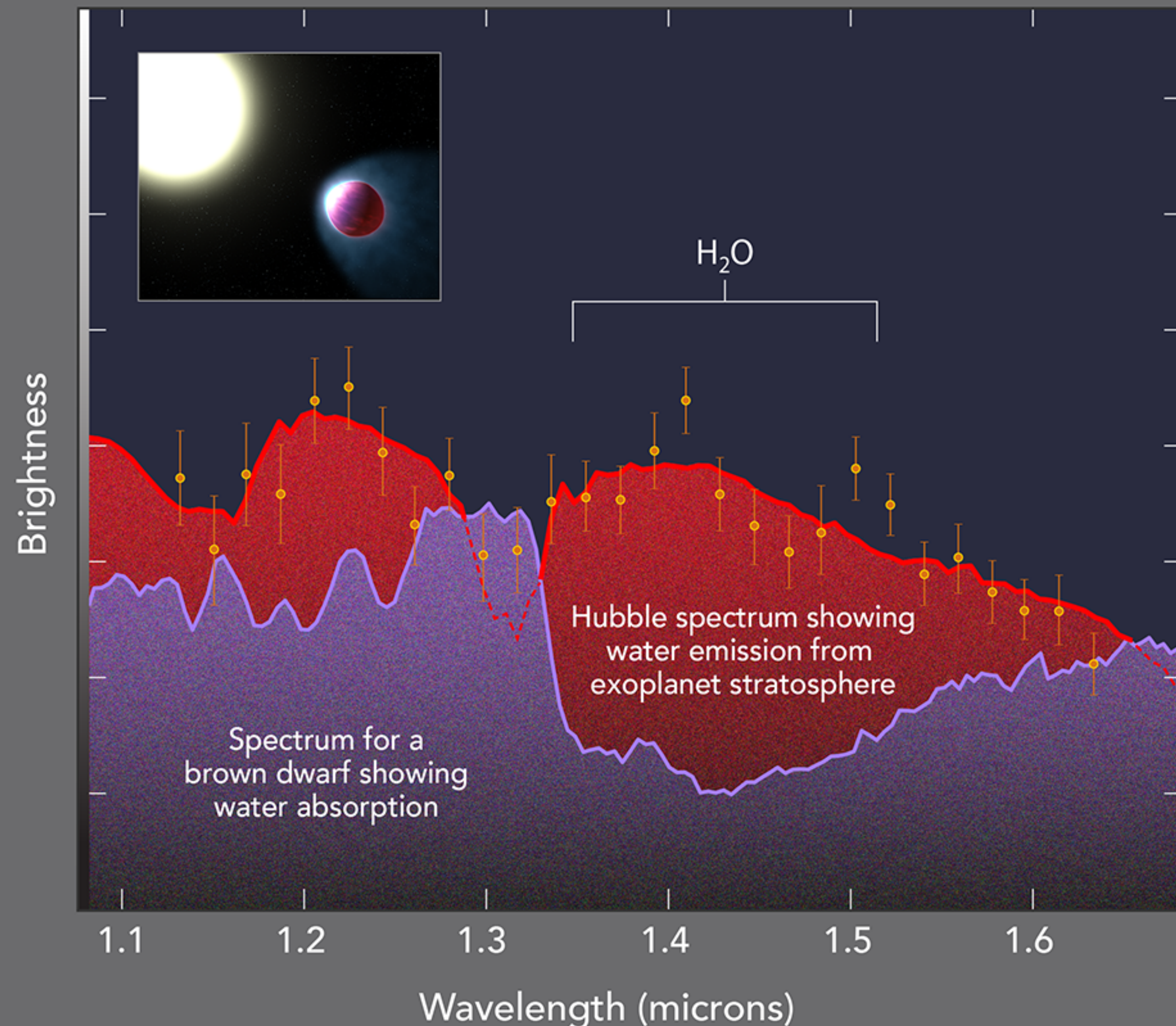
Effect of Metallicity (WASP-17b)



Inversions (WASP-121b)



Comparison of WASP-121b Stratosphere with Brown Dwarf Atmosphere





Application of Grid

nature
International journal of science

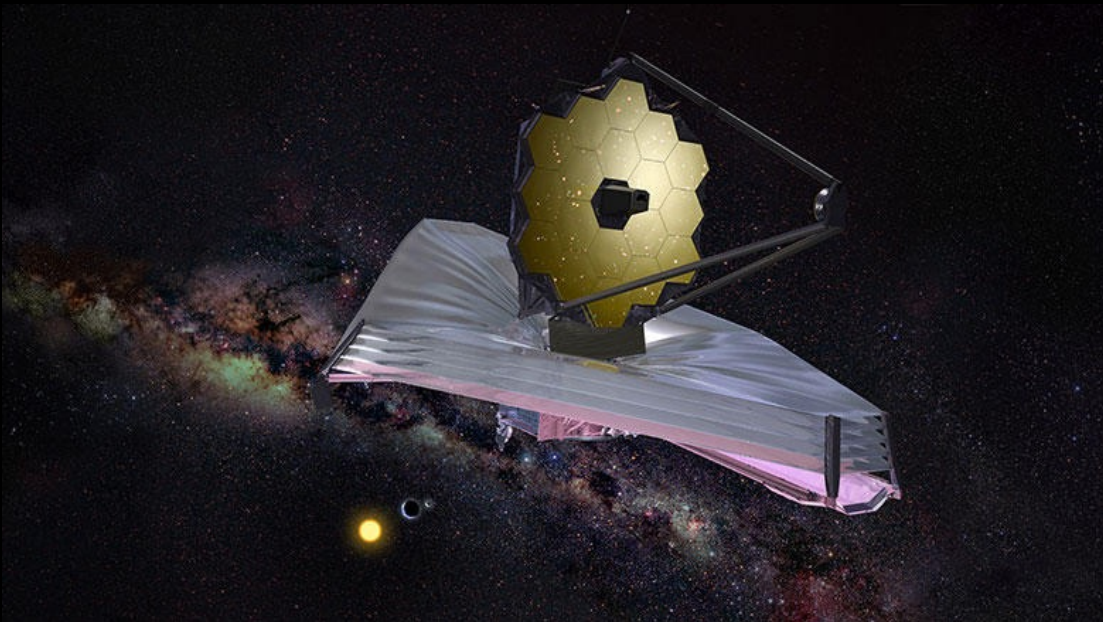
Letter | Published: 02 August 2017

An ultrahot gas-giant exoplanet with a stratosphere

Thomas M. Evans , David K. Sing, Tiffany Kataria, Jayesh Goyal, Nikolay Nikolov, Hannah R. Wakeford, Drake Deming, Mark S. Marley, David S. Amundsen, Gilda E. Ballester, Joanna K. Barstow, Lotfi Ben-Jaffel, Vincent Bourrier, Lars A. Buchhave, Ofer Cohen, David Ehrenreich, Antonio García Muñoz, Gregory W. Henry, Heather Knutson, Panayotis Lavvas, Alain Lecavelier des Etangs, Nikole K. Lewis, Mercedes López-Morales, Avi M. Mandell, Jorge Sanz-Forcada, Pascal Tremblin & Roxana Lupu - Show fewer authors

Nature **548**, 58–61 (03 August 2017) | [Download Citation](#) 

**First Detection of Stratosphere
(Temperature Inversion)
in Exoplanet Atmosphere**



Conclusions

- ★ **This Library can be used to choose best targets for characterization using JWST.**
- ★ **Constrain P-T profiles of various hot Jupiter and warm Neptune exoplanet atmospheres.**
- ★ **Detect key molecular species.**
- ★ **Constrain various physical and chemical processes like type of condensation, inversions, recirculation factor, metallicity, C/O ratio etc.**



Thank You

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**If you need any more information on the library/grid
please talk to me.**