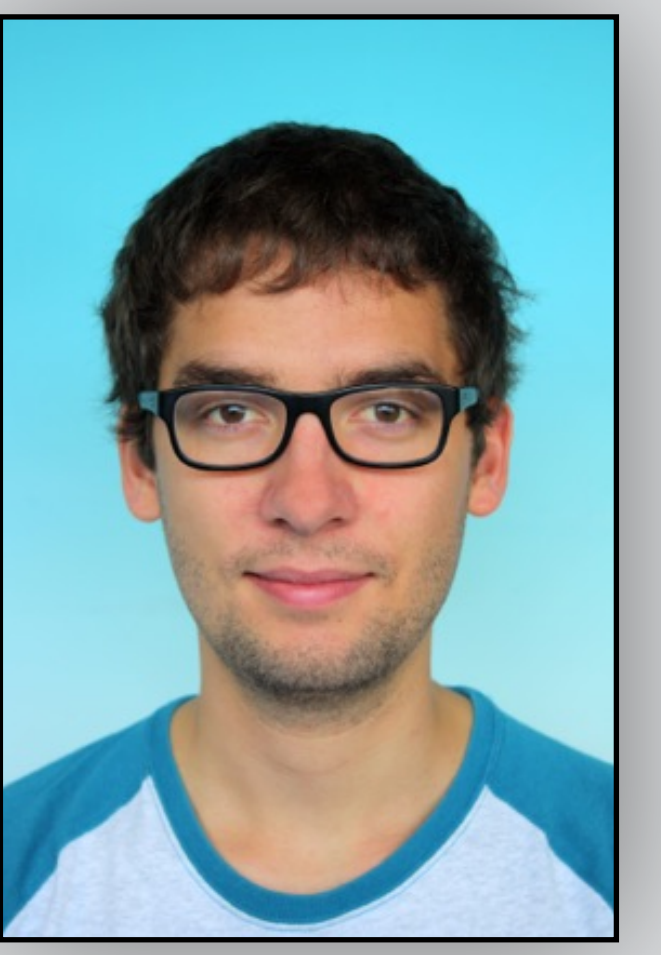
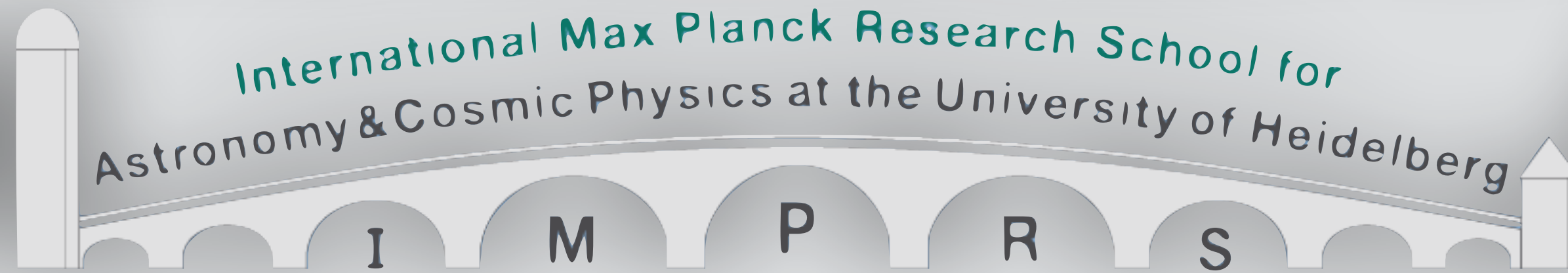


PETIT Pressure-Temperature Iterator and Spectral Emission Calculator for Planetary Atmospheres

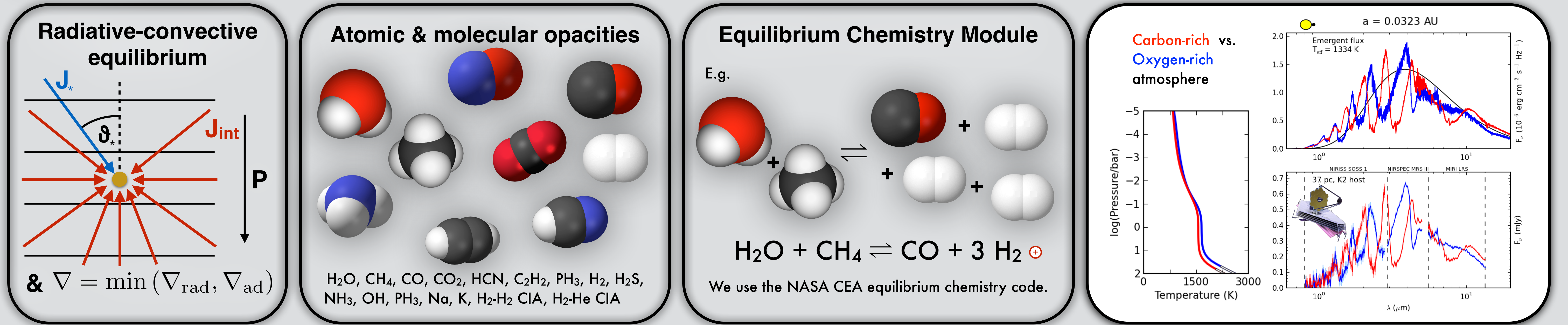


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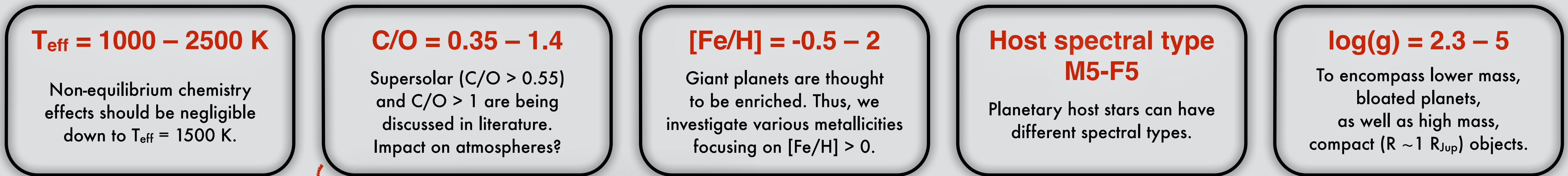
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The code:



In prep.: A grid of hot jupiter atmospheres

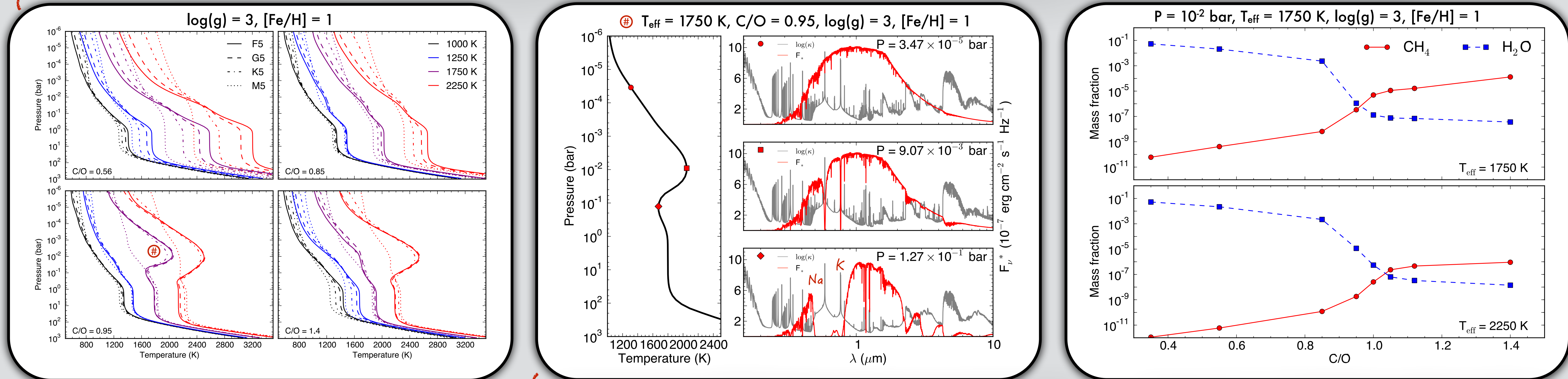
We study the properties of atmospheres using our code by varying parameters which are important for setting the atmospheric and spectral shape.



Grid results (I):

Hints on formation history of planet?

Late host star types lead to steeper temperature profiles! (Host star photospheric temperature and planet atmospheric temperatures increasingly comparable)



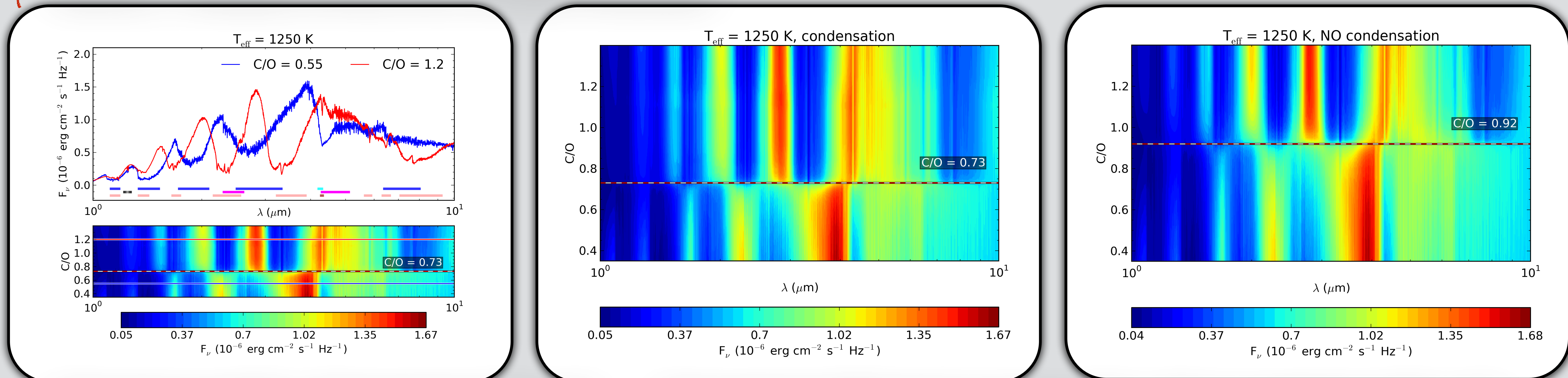
Inversions for $T_{\text{eff}} \gtrsim 1750 \text{ K}$ for $\text{C/O} \gtrsim 1$!

Inversions due to alkali heating and decreased cooling ability.

Chemistry (⊙): Little CH_4 and H_2O at $\text{C/O} \sim 1$
 => Low cooling ability => inversion!

Grid results (II): Water vs. methane rich spectra as a functions of C/O and condensation for $T_{\text{eff}} \approx 1500 \text{ K}$.

Chemistry (⊙): Atmospheres H_2O (low C/O) or CH_4 (high C/O) dominated!



C/O transition value ($\text{H}_2\text{O} \rightarrow \text{CH}_4$ domination) at $\text{C/O} = 0.73$

With condensation: MgSiO_3 locks O, transition at $\text{C/O} = 0.73$, w/o condensation at $\text{C/O} = 0.92$

Conclusions

- The $\text{H}_2\text{O} \rightarrow \text{CH}_4$ transition could occur at C/O as low as **0.73** for $T_{\text{eff}} \approx 1500 \text{ K}$. Retrieval results like " $\text{C/O} < 1$ " could thus indicate even lower upper boundaries for C/O , if condensation is included.
- Atmospheres with $\text{C/O} \sim 1$ and $T_{\text{eff}} \gtrsim 1750 \text{ K}$ can have inversions caused by alkali heating. It is unclear whether such planets can form, however.

Outlook, next steps

- The (grid) paper will be submitted soon.
- Next we will include cloud opacities and transmission spectra.
- Inclusion of non-equilibrium chemistry