Schneider et al. (2022)

THE DEEP ATMOSPHERES OF HOT GAS GIANTS

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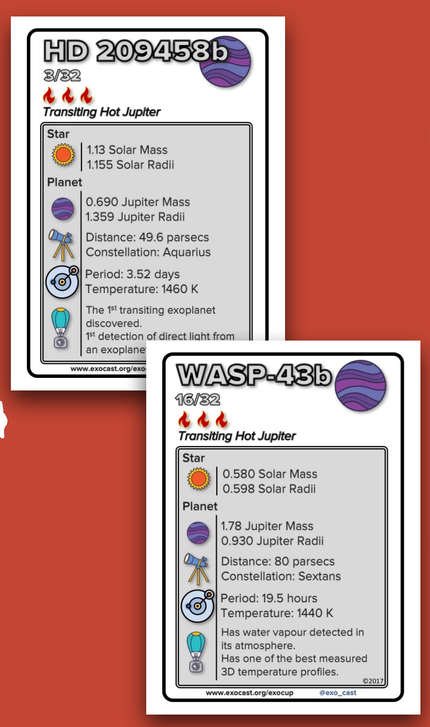
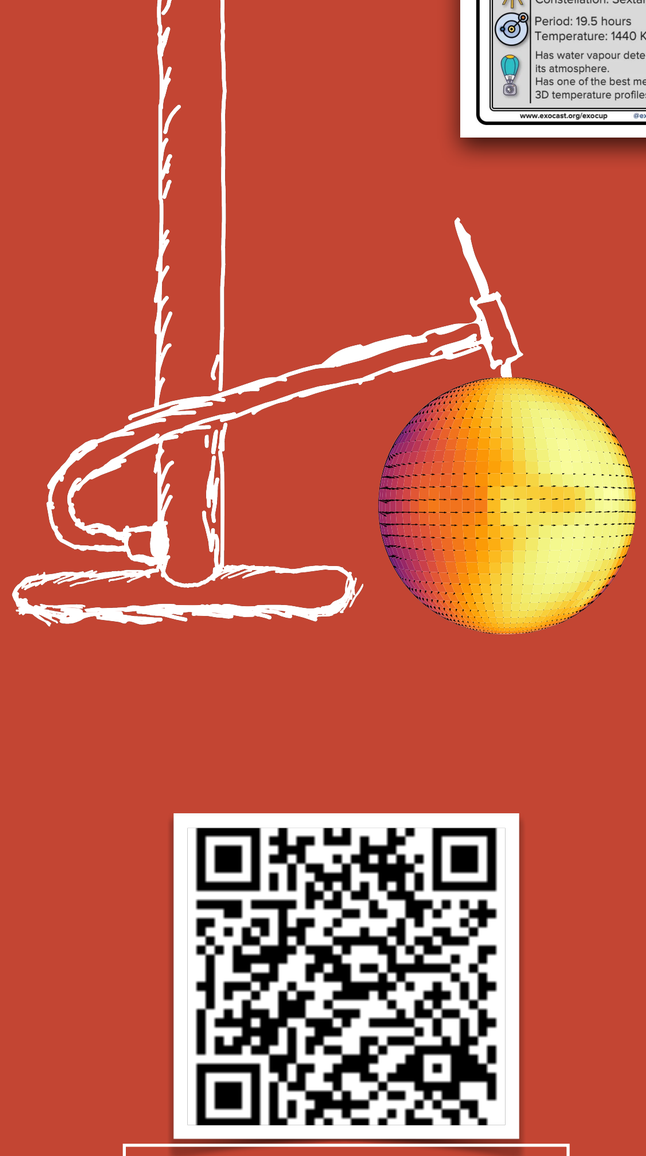
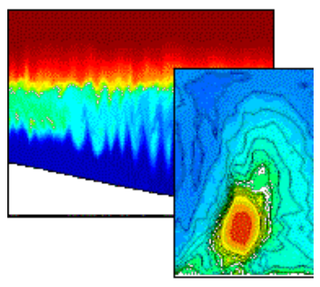
Can vertical advection of heat from the upper atmosphere inflate/heat the deep atmosphere?





expeRT/MITgcm

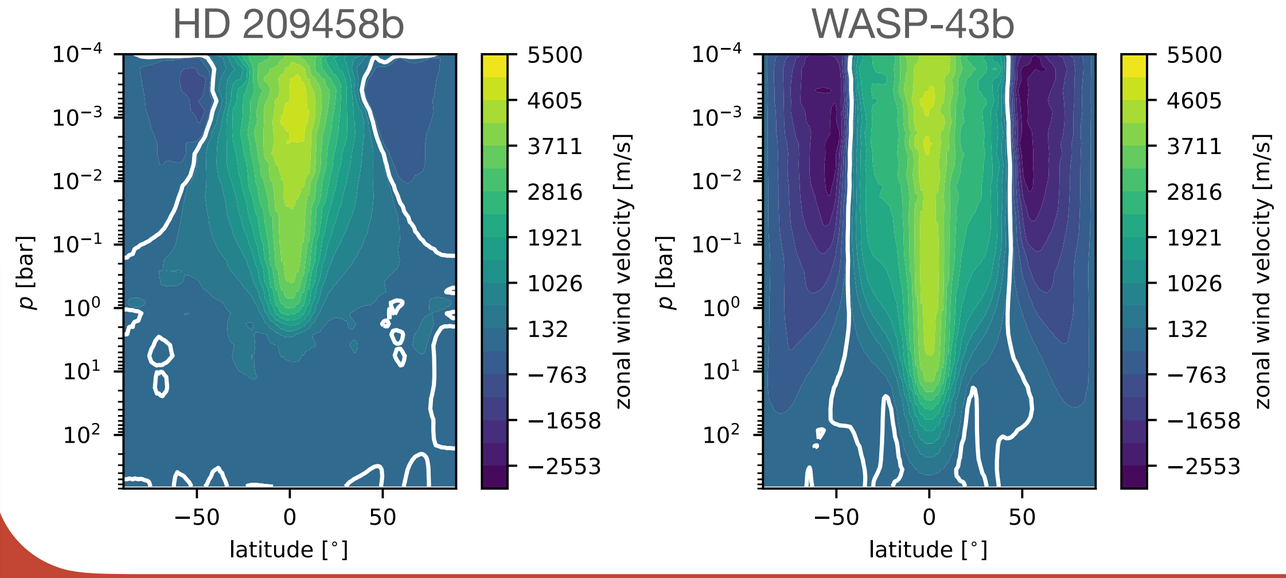
Novel fast non-gray climate model



Hydrodynamics

Radiative Transfer

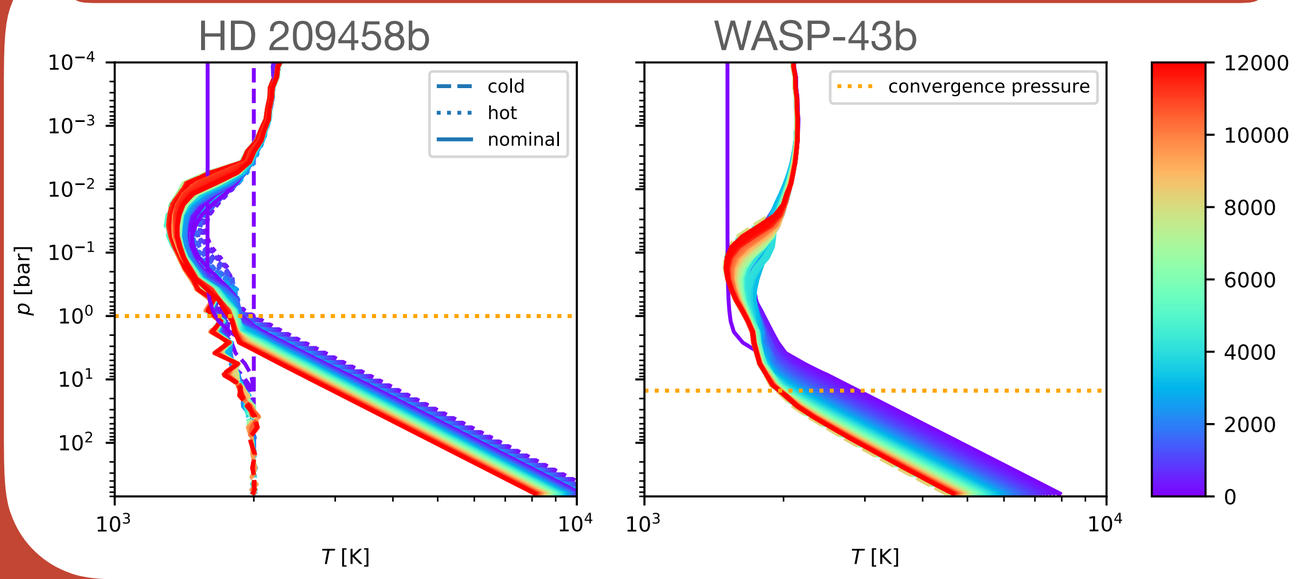
Fig.1: Zonal mean wind velocities



The short rotation rate of WASP-43b induces a deep wind jet.

HD 209458b exhibits a shallow wind jet

Fig.2: Temperature evolution at the substellar point



WASP-43b cools down much faster than HD209458b.

We find that this can be explained solely by the different values of the surface gravity

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CONCLUSION

Using our new non-gray GCM, we confirm that the difference in rotation rate between those two planets leads to different dynamics in the deep atmosphere (Fig. 1).
However, we did not find evidence for inflation caused from dynamical advection of heat, but instead conclude that the deep atmospheres of both planets are subject to radiative heating and cooling (Fig. 2).

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