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Exploring the Climate of Exoplanets

In the last two decades, the astrophysical community discovered a multitude of planets orbiting other stars. The variety of planetary environments that these exoplanets may harbour is still unknown. Most importantly it propels the fundamental scientific and philosophical quest of searching for the first detection of life beyond our own planet. As more observational data become available, models of exoplanetary atmospheres are essential, at a first level to interpret the data and more importantly to reproduce and explain the physical and chemical processes that generate the climate of planets.

In this presentation, I will summarize the main new advances in the characterization of exoplanet atmospheres and describe the new state-of-the-art 3D atmospheric model I have developed from scratch called THOR. Our new model can explore the large diversity of planets to understand how their climates are generated and maintained. THOR has been used to interpret observations of hot Jupiter planets from the Spitzer and Hubble Space Telescope space missions. I will present the comparison between the predictions from our 3D simulations and observations, and discuss what we discovered on the thermal structure, distribution of clouds and chemistry of hot Jupiter atmospheres.

I will also discuss how we are testing an advanced version of THOR to study planet's habitability and search for life in exoplanets.

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