The Atmospheres of Hot Jupiters

Dr. Joel Schwartz *finished his PhD in Earth and Planetary Science in 2016 and will begin a Postdoctoral research position at the McGill Space Institute in the Fall of 2016. His research uses computer models to simulate how energy moves through extremely large exoplanets that are extremely close their stars.*

What question were you trying to answer?

There were actually several questions, but it all boils down to, "What can the public data tell us about the atmospheres of very big, very hot exoplanets?" These are what we call "Hot Jupiters."

Imagine if you took Earth, dumped hydrogen on it until it turned into a liquidy-gassy ball 10x bigger across, then shoved it 50x closer to the Sun — that's like a Hot Jupiter. They have day/nightsides that never change and there's nothing like them in our Solar System.

What did you find?

We learned that Hot Jupiters are dark in visible light but would look shinier if you could see infrared light, so these planets could have interesting clouds. The more you bake Hot Jupiters with starlight, the worse their winds are at warm up their nightsides (in most cases, at least).

What does doing your research look like?

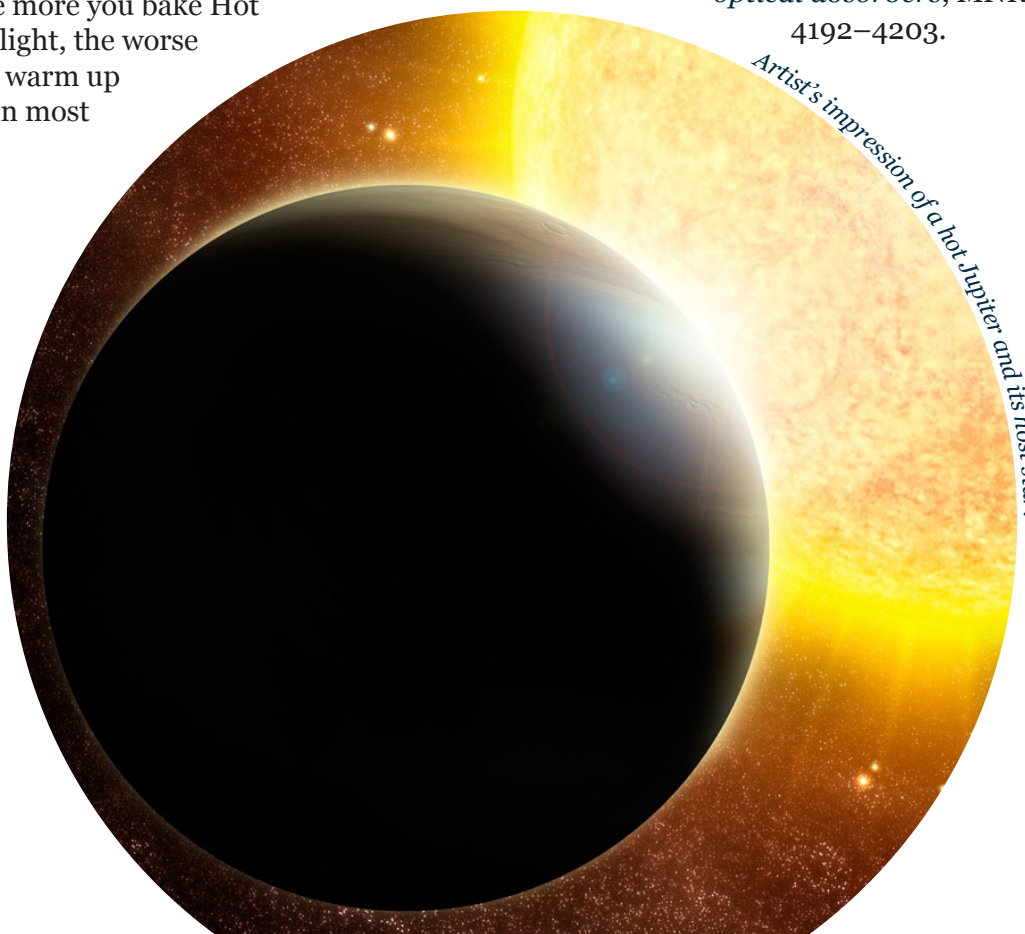
Computer work all the way: I search and collect data online, calculate things with software code I write, and make colorful graphs and pictures to help explain it all.

But the second I could do field work on an exoplanet...I'm there!

Why this is important

This study represents the best statistics we have about the bulk atmospherics of irradiated giant planets. We confirmed trends that previous studies had seen (e.g. more stellar irradiation means less day-to-night heat transport) and found other trends of our own (e.g. Hot Jupiters having reflective infrared clouds based on Bond albedos). And most importantly, our technique for inferring these atmospheric properties could be applied to temperate terrestrial planets down the line.

Schwartz, **J C**, and **N. B. Cowan** (2015), *Balancing the energy budget of short-period giant planets: evidence for reflective clouds and optical absorbers*, MNRAS 449, 4192–4203.



Artist's impression of a hot Jupiter and its host star.