UCF Physics: AST 6165 Planetary Atmospheres

Spring 2020 Homework 9
DUE Thursday, 2 April 2020

Reading for this assignment: Andrews, 4 – 5.3.
Problems:

1. (10 points) Why do waves propagate in an atmosphere? What measurable quantity is different (and how) between the state of the atmosphere at the start of wave propagation and after all propagation has ceased? How and why does it cease? Consider an idealized, single disturbance. Please be concise! You can answer this in about three sentences.

2. (10 points) A Hadley cell cycles air meridionally between the equator and 20° latitude. Consider air above the equator that gets circulated to 20° without changing altitude. Assuming no zonal wind at the equator, what is the mean speed and direction of the trade winds at 20°? (Hint: This is not a complicated fluid-dynamics problem!)

3. (10 points) A public talk attendee asks, "How come you guys can't predict the weather?" Give a correct answer that takes less than a minute to say out loud, is understandable by an 11th grader, and that includes at least three of the reasons.

4. (40 points) Sketch the interior of each IAU planet. Label the layers, draw the magnetic field, and explain its origin and relative field strength. Which planet has the strongest field, the weakest, the best and worst spin-aligned, and why? Do as much as you can from memory, then fill in the rest.