Determining the structure and composition of hot Jupiter's atmospheres using high resolution spectroscopy

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Abstract

Chapter I. Motivation and layout

- Goal of the thesis: what is to be studied (problem formulation and main purpose of the project);
- Layout: how the thesis is structured;
- What are the benefits of studying exoplanets' atmospheres?
    - Understanding the physics happening in the atmospheres of other planets outside our own planetary system is a goal itself – it is particularly interesting to understand if there's a temperature inversion;
    - It is potentially useful to pinpoint the region where the exoplanet was formed in the early stages of the planetary system;
    - This method may be a new accurate indirect measurement of some macroscopical quantities of the studied exoplanet (its velocity, for instance);

Chapter II. Introduction and state of the art

- Studying a hot Jupiter's atmosphere
    - Composition – which molecules and in which composition;
    - Structure – temperature profile;
    - What are the different existing models?
- How to determine the composition and structure of a hot Jupiter's atmosphere?
    - Transit method
        - How does it work?
        - Already done by X and Y (some examples), brief explanation of the different methods used by the mentioned authors (different types of eclipse and observations) and also of the results obtained (which exoplanet, which composition and which structure);
        - What are the limitations of this method?
    - Alternatively: high-resolution spectroscopy
        - How does it work?
        - It has already been done by W and Z (examples and references, like: 'for planet P this and that composition and structure were determined…');
- The purpose of this specific project is determining the composition and structure of **HD 209458 b**'s atmosphere
    - Although this is a transiting exoplanet, high-resolution spectroscopy will be used for the purpose of this project;