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**COMMISSION 5** **STELLAR AND PLANETARY ATMOSPHERES**

*ATMOSPHERES STELLAIRES ET PLANETAIRES*



**COMMISSION G5 WORKING GROUPS**

**Div. G / Commission 5 WG** **Stellar Spectral Libraries**

## TRIENNIAL REPORT 2015-2018

### 1. Introduction

The scope of the work of the Commission goes all the way from theory and modeling of stellar and planetary atmospheres to observational spectroscopic studies of these objects. The main emphasis is given to bridging the gap between the theorists/modelers and the observers/spectroscopists, rather than concentrating on these topics individually. In practice, the main thrust is on addressing the issues of how to make theory more useful for observers, and how to make observations more powerful by judiciously using a proper theoretical description.

Created during the 2015 IAU reform, this Commission extends the scope of the previous Commission 36 Theory of Stellar Atmospheres to investigate the atmospheres of substellar mass objects, such as brown dwarfs and exoplanets. The reason for this is that modeling atmospheres and predicting spectra of substellar objects is conceptually very similar to studying classical stellar atmospheres, and therefore a fruitful interaction between the stellar and planetary communities will be mutually beneficial. The Commission actively promotes such interaction.

### 2. Developments within the past triennium

Research activity in the field of stellar and planetary atmospheres has been frenetic in the last three years. The investigation of exoplanets has been revolutionized by the Kepler mission's identification of a large number of candidates, and efforts are now focused on future missions (e.g. Ricker et al. 2015; Rauer et al. 2016; Tinetti et al. 2015). More detailed spectroscopic observations of planetary transits are driving theoretical research on exoplanet atmospheres, and in particular on the dynamics of planetary atmospheres

for strongly irradiated planets (e.g. Budaj et al. 2015; Hubeny 2017; Kataria et al. 2017; Line et al. 2017; Zhang & Showman 2016).

On the stellar side, we have witnessed significant advances in the availability of atomic data for improved theoretical calculations (Barklem 2017; Mashonkina et al. 2016, 2017; Preval et al. 2017; Tennyson et al. 2016). New large-scale libraries of stellar spectra have been produced (e.g. Bohlin et al. 2017; Hutchinson et al. 2016; Levenhagen et al. 2017; Zamora et al. 2015), which together with a new generation of software and tools for spectroscopic analyses (e.g. Dafonte et al. 2016; Garcia Pérez et al. 2016; Ness et al. 2015), and large-scale spectroscopic surveys (see, e.g., Bland-Hawthorn & Sharma 2016; Majewski et al. 2017), are increasing the samples of stars with known chemical compositions by orders of magnitude. Significant progress has also been made in our ability to study and understand the least massive stars and brown dwarfs (e.g. Bayo et al. 2017; Souto et al. 2017).

In this time period, our commission has promoted the organization of several meetings and symposia on subjects closely related to the study of stellar and planetary atmospheres. It has also paved the road for a cross-disciplinary discussion on how to gather and distribute atomic and molecular data that are critical for producing realistic models of stellar and substellar atmospheres.

## 3. Closing remarks

The traditional division between stellar and planetary atmospheres is disappearing, thanks to the exploding research in exoplanets and the growing interest on brown dwarfs. Now, more than ever, it is crucial to join efforts, define standards, and make sure the appropriate connections are in place to maximine the rate of discovery. This situation makes the role of our commission very important, ensuring the relevant discussions take place out in the open, giving everyone involved an opportunity to be heard. With a healthy membership of 239 scientists, we hope and expect this commission to remain relevant in the coming years.

Ivan Hubeny
*president of the Commission*

Carlos Allende Prieto
*vice-president of the Commission*

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