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COMMISSION 5 **STELLAR AND PLANETARY ATMOSPHERES**

ATMOSPHERES STELLAIRES ET PLANETAIRES

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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.

We are living a revolution in the data available to investigate stellar and planetary atmospheres. Spectroscopic surveys of stars in the Milky Way have grown to include millions of targets, both at low- and high-resolution, reaching other galaxies in the Local Group. The rate of exoplanet discovery has been dramatically sped up with transit searches from space, followed-up with space and ground-based spectroscopy that allows the characterization of the atmospheres of both exoplanets and their host stars. Now, more than ever, there is a need to sharpen our theoretical tools and streamline their use.

2. Activity in 2019

The success of the Kepler mission and its K2 follow-up is now being followed by TESS (Ricker et al. 2019), launched in April 2018. The set of ultra-high resolution stable spectrographs used for ground-based follow-up is now strengthened with CARMENES (Quirrenbach et al. 2016), ESPRESSO (Pepe et al. 2014), PEPSI (Strassmeier et al. 2018), SPIROU (Donati et al. 2018), or HPF (Metcalf et al. 2019). These instruments provide, in addition to ultra-high radial velocity precision, in some cases at the level of 0.1 m/s, high spectral purity spectral line profiles to study in detail both exoplanets and stars.

The collection of high-resolution high signal-to-noise ratio stellar spectra provided by the APOGEE project has reached nearly half a million for some 280,000 unique stars in the latest data release (DR16; Ahumada et al. 2019), and in parallel the HERMES GALAH survey has made rapid progress, publishing parameters and abundances for over 300,000 stars (Buder et al. 2018). The analysis of these data sets is fully automated, but based on classical one-dimensional model atmospheres, while more advanced analysis using detailed Non-LTE and 3D models are still limited to very few objects (e.g. Amarsi et al. 2019).

It is also worthwhile highlighting progress in calculations and measurements of atomic and molecular data necessary for modeling stellar and planetary atmospheres. This has led to the creation of consortia, e.g. VAMDC. Among the most widely-used data bases are those maintained by Kurucz at Harvard, Van Hoof's, or the one at NIST, which have been recently complemented with molecular databases such as CDMS, ExoMol, GhoSST, JPL, GEISHA, HITRAN, HITEMP, or MolLIST. The development of codes for computing exoplanet atmospheres, both based on purely theoretical grounds or retrieval techniques, is also on the fast lane (Hubeny 2017, Madhusudhan 2018).

In 2019, the main activity of our commission has been to support the organization of several meetings and symposia on subjects closely related to the study of stellar and planetary atmospheres. Arrangements are underway to organize a collection of useful links to data, spectral libraries, radiative transfer codes, and atomic and molecular data bases. With a membership of 250 scientists, we hope and expect this commission to remain relevant in the coming years.

Carlos Allende Prieto
president of the Commission

References

Ahumada R., et al., 2019, arXiv, arXiv:1912.02905
Amarsi A. M., Nissen P. E., Skúladóttir Á., 2019, A&A, 630, A104
Buder S., et al., 2018, MNRAS, 478, 4513
Donati J.-F., et al., 2018, haex.book, 107, haex.book
Hubeny, I. 2017, MNRAS, 469, 841
Kanodia S., et al., 2018, SPIE, 10702, 107026Q, SPIE10702
Madhusudhan N., 2018, haex.book, 104, haex.book
Pepe F., et al., 2014, arXiv, arXiv:1401.5918
Pepe F., et al., 2014, arXiv, arXiv:1401.5918
Ricker G., 2019, ESS, 51, 100.01
Strassmeier K. G., et al., 2018, SPIE, 10702, 1070212, SPIE10702