Connecting ground-based high-resolution spectroscopy and ARIEL: From atmospheric details to demographics

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Abstract:
Ground-based high-resolution spectroscopy plays a crucial role in exoplanet atmosphere studies, enabling the detection of individual species and atmospheric dynamics via resolved spectral lines. Instruments such as ESPRESSO, HARPS, and MAROON-X in the optical, along with CRIRES+, SPIRou, and NIRPS in the near-infrared, have already provided detailed insights into hot giant planets. With the upcoming ELT, METIS and ANDES will extend this reach to smaller, cooler planets—including temperate terrestrial worlds.
In this talk, I will provide an overview of current and future capabilities from the ground, and explore how they complement ARIEL's space-based survey of ~1000 exoplanet atmospheres. While ARIEL will reveal broad chemical and thermal trends across planetary populations, ground-based observations uniquely probe vertical structure, wind patterns, and chemical gradients. Together, they offer a powerful synergy: linking detailed atmospheric physics to large-scale trends, and advancing our understanding of planet formation and evolution.