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Future instruments to detect and characterise extrasolar planets

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Abstract

Nearly two thousand planets have been detected orbiting other stars, and many more will be found in the coming years with missions such as GAIA, CHEOPS, TESS, PLATO and numerous ground based surveys.

Very little is currently known of the chemical composition of exoplanet atmospheres, which can provide information about the origin and evolution of these distant worlds.

Spectroscopic observations of transiting planets and direct imaging are currently the most promising methods to characterise these atmospheres.

Ground and space-based observations (VLT, Keck, IRTF, Spitzer, and the Hubble Space Telescope) of exoplanets have shown the potentials of the transit method: current observations of hot gaseous planets have revealed the presence of alkali metals, water vapour, carbon monoxide and dioxide and methane in these exotic environments.

In addition, new instruments are coming online in the near future, which will enable us to observe these planets (e.g. JWST, SPHERE, GPI) and start understanding their properties. However, to fully characterise the atmosphere of exoplanets a dedicated space mission with ultra-stable broadband spectroscopy is needed.

In this talk I will present a summary of current concepts for space-based dedicated infrared spectroscopy instruments, and analyse the strengths and weaknesses of the designs [1,2,3,4] in the context of timeliness for exoplanet science in the next 20 years.

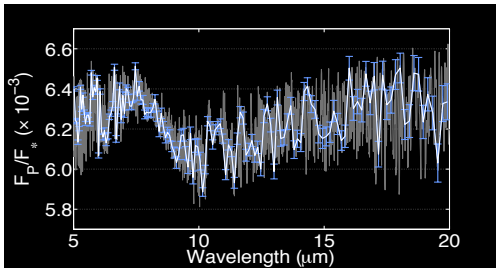

Figure 1: Simulated spectra for GJ 3470b in primary transit measurements, with calculated error bars for a dedicated exoplanet instrument on board SPICA. Spectra from Venot et al. (2014) [5].

References

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