Geophysical Research Abstracts
Vol. 13, EGU2011-3185, 2011
EGU General Assembly 2011

Ground-based spectroscopy of extrasolar planets

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In recent years, spectroscopy of exoplanetary atmospheres has proven to be very successful. When in the past discoveries were made using space-born observatories such as Hubble and Spitzer, the observational focus continues to shift to ground-based facilities. This is especially true since the end of the Spitzer cold-phase, depleting us of space-borne eye in the infra-red. A trend certain to intensify in the years to come with projects like E-ELT and TMT on the horizon.

So far several observational strategies have been employed from the ground. All of which are trying to solve the problems incurred by high systematic and telluric noise and are distinct in their advantages and dis-advantages. Using time-resolved spectroscopy, we obtain an individual lightcurve per spectral channel of the instrument. The benefits of such an approach are multifold since it allows us to utilize a broad spectrum of statistical methods.
Using new IRTF and VLT data, in the K and L-bands, we will illustrate the intricacies of two spectral retrieval approaches: 1) the self-filtering and signal amplification achieved by consecutive convolutions in the frequency domain, 2) the component separation of statistically independent sources using information entropy.

These novel techniques allow us to present new results on the hot-Jupiter HD189733b, showing strong methane emissions in both, K and L-bands at spectral resolutions of R $\sim$ 600. Using data from the IRTF/SpeX instrument, we will discuss the implications and possible theoretical models of strong methane emissions on this planet.