Molecular detectability in exoplanetary emission spectra

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Of the many recently discovered worlds orbiting distant stars, very little is yet known of their chemical composition. With the arrival of new transit spectroscopy and direct imaging facilities, the question of molecular detectability as a function of signal-to-noise (SNR), spectral resolving power and type of planets has become critical. We study the detectability of key molecules in the atmospheres of a range of planet types, and report on the minimum detectable abundances at fixed spectral resolving power and SNR. The planet types considered --- hot Jupiters, hot super-Earths, warm Neptunes, temperate Jupiters and temperate super-Earths --- cover most of the exoplanets characterisable today or in the near future. We focus on key atmospheric molecules, such as CH4, CO, CO2, NH3, H2O, C2H2, C2H6, HCN, H2S and PH3. We use two methods to assess the detectability of these molecules : a simple measurement of the deviation of the signal from the continuum, and an estimate of the level of confidence of a detection through the use of the likelihood ratio test over the whole spectrum.