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Brightness temperature of synchronic exoplanets measured by infrared photometry: Method and perspective

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We present an original method to measure the temperature at the surface of "hot Jupiter" type exoplanets by relative photometry in the infrared at around 10 μm in N spectral band. The method is described and validated by numerical simulations. Thermal radiations from an exoplanet and its parent star are analysed. Geometrical configurations of extra-solar planet rotating synchronously around parent star are explored for a feasibility study of the detection. A Jupiter size planet on orbit at 0.025 astronomical unit from Sun-like parent star should have a harmonic signature of up to 0.2 % in amplitude with a period of the planet's orbital duration. Such signature is difficult to detect when making absolute measurements, but by differential methods of analyses, and using radiative transfer model to take into account background sky contribution of the Earth atmosphere, such relative accuracy can be reached. Some results of simulations are presented for observations: (i) on a 120 cm telescope with dedicated instrumentation, to be developed, at Observatoire de Haute-Provence in France; and (ii) on a 400 cm telescope at altitude 4000 m with dedicated instrumentation. Perspective of this technique is that it can enhance significantly planet detection possibilities, measurement of planet properties such surface temperature and existence of an atmosphere around exoplanets.