Exploiting the state of the art of direct imaging data: combining forward model and retrieval to analyse SPHERE observations

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The characterisation of the exoplanets evolved recently thanks to the development of the second generation of direct imaging instruments, especially SPHERE. The resolution and wavelength range available now gives access to an increase in accuracy and in the number of physical parameters that can be constrained. SPHERE observations are a combination of narrow band filters between J and K and spectroscopy between Y and H. We first show how a forward model (Exo-REM) may be used to obtain the physical parameters of the target. Then we use the results of this first approach as an a priori for the retrieval code (NEMESIS) on the same dataset. We also apply a Nested Sampling version of NEMESIS complementary to the more traditional Optimal Estimation mode. We compare the results of the various approaches highlighting the advantages of each. We give the resulting physical parameters constrained by these approaches to show what SPHERE can determine alone in terms of exoplanet characterisation.