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The kinematic identification of a thick stellar disc in M31

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We present the first characterization of a thick disc component in the Andromeda galaxy (M31) using kinematic data from the DEIMOS multi-object spectrograph instrument on Keck II. Using 21 fields in the South West of the galaxy, we measure the lag of this component with respect to the thin disc, as well as the dispersion, metallicity and scale length of the component. We find an average lag between the two components of <dv>=46.0+/-3.9km/s. The velocity dispersion of the thick disc is sigma_{thick}=50.8+/-1.9km/s, greater than the value of dispersion we determine for the thin disc, sigma_{thin}=35.7+/-1.0km/s. The thick disc is more metal poor than the thin disc, with [Fe/H]_{spec}=-1.0+/-0.1 compared to [Fe/H]_{spec}=-0.7+/-0.05 for the thin disc. We measure a radial scale length of the thin and thick discs of h_r=7.3+/-1.0 kpc and h_r=8.0+/-1.2 kpc. From this, we infer scale heights for both discs of 1.1+/-0.2 kpc and 2.8+/-0.6 kpc, both of which are ~2--3 times larger than those observed in the Milky Way. We estimate a mass range for the thick disc component of 2.4x10^{10}Msun< M_{*,thick} <4.1x10^{10} Msun. This value provides a useful constraint on possible formation mechanisms, as any proposed method for forming a thick disc must be able to heat (or deposit) at least this amount of material.

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