Differences in radial differential rotation inversions for solar-like stars due to uncertainties in stellar models

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Abstract

Measurements of rotational splittings for solar-like stars dependent on radial order for solar-like stars are imminent. These splittings can be used to invert for the radial rotation profile of the star. However, these inversions rely on rotational kernels derived from a stellar model. It is important to understand how uncertainties in the stellar models affect the inverted rotation profiles. We compute synthetic rotational splittings for three radial rotation profiles: solid body, a step function and a smooth function of radius, from rotation kernels derived from stellar models of HD52265 perturbed in mass, age, metallicity, helium abundance and mixing length parameter. We impose realistic noise on these synthetic splittings and then invert for the radial rotation by performing regularised least squares (RLS) and step-function fit inversions using the rotation kernels derived from the best-fit model. We present the level of uncertainty in the measured splittings required for the standard deviation of the RLS inverted rotation profile to be on the same order of the differences between the inverted rotation profiles.

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