The unusual vertical mass distribution of NGC 4013 seen through the Spitzer Survey of Stellar Structure in Galaxies (S4G)

Sébastien Comerón, Bruce G. Elmegreen, Johan H. Knapen, Kartik Sheth, Joannah L. Hinz, Michael W. Regan, Armando Gil de Paz, Juan-Carlos Muñoz-Mateos, Karín Menéndez-Delmestre, Mark Seibert, Taehyun Kim, Trisha Mizusawa, Eija Laurikainen, Heikki Salo, Jarkko Laine, E. Athanassoula, Albert Bosma, Ronald J. Buta, Dimitri A. Gadotti, Luis C. Ho, Benne Holwerda, Eva Schinnerer, Dennis Zaritsky

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NGC 4013 is a nearby Sb edge-on galaxy known for its "prodigious" HI warp and its "giant" tidal stream. Previous work on this unusual object shows that it cannot be fitted satisfactorily by a canonical thin+thick disk structure. We have produced a new decomposition of NGC 4013, considering three stellar flattened components (thin+thick disk plus an extra and more extended component) and one gaseous disk. All four components are considered to be gravitationally coupled and isothermal. To do so, we have used the 3.6micron images from the Spitzer Survey of Stellar Structure in Galaxies (S4G). We find evidence for NGC4013 indeed having a thin and a thick disk and an extra flattened component. This smooth and extended component (scaleheight z_EC kpc) could be interpreted as a thick disk or as a squashed ellipsoidal halo and contains ~20% of the total mass of all three stellar components. We argue it is unlikely to be related to the ongoing merger or due to the off-plane stars from a warp in the other two disk components. Instead, we favor a scenario in which the thick disk and the extended component were formed in a two-stage process, in which an initially thick disk has been dynamically heated by a merger soon enough in the galaxy history to have a new thick disk formed within it.

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