Can we use the nearby velocity distribution to constrain the properties of the bar and the spiral arms of the MW? Gaia capabilities

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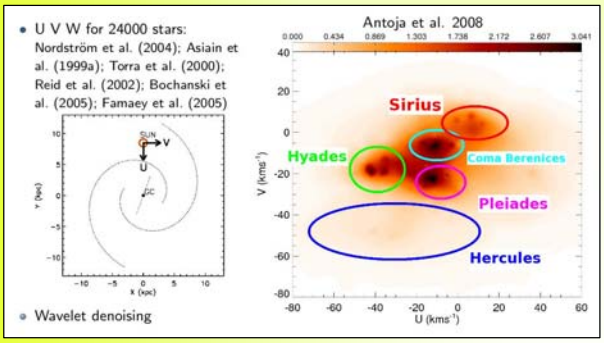
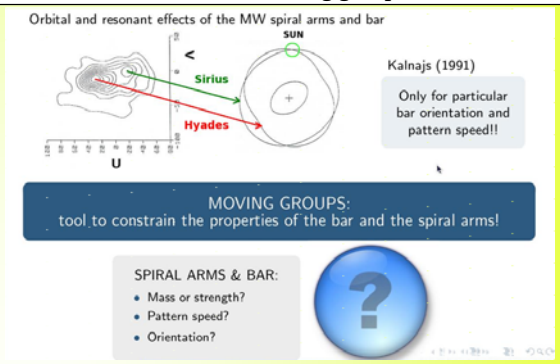
Abstract

It has been shown that the effects of the bar and the spiral arms of the MW can induce kinematic groups in the local stellar velocity distribution. In this presentation we aim to explore to what extent we can use the kinematic imprints to constrain the large-scale structure of the MW and its recent evolution. We have performed test particle simulations in a flexible MW potential that is consistent with several observational constraints in order to explore the phase space available to the local stellar distribution. Our results show that the bar and the spiral arms create strong kinematic imprints on the velocity distributions. When the spiral arms and the bar act together, individual imprints of each component can be still identified in the final velocity distributions. The spiral arms crowd the kinematic region of Hercules and not only the bar, as traditionally believed. The arms also induce slightly tilted kinematic branches that resemble some of the observed ones. The low angular momentum moving groups such as Arcturus can have an origin related to the bar acting on a relatively hot stellar disc, which introduces a new perspective on the interpretation of its extragalactic origin. We and that the induced stellar kinematics groups depend on the structure and dynamics of the model and on the initial conditions of our experiments. We discuss several future perspectives in the field in order to definitively disentangle the origin of the different kinematic groups in the solar neighbourhood and finally constrain some properties of the MW and its evolution. **We also evaluate the Gaia capabilities to provide new insights into the study of moving groups.**

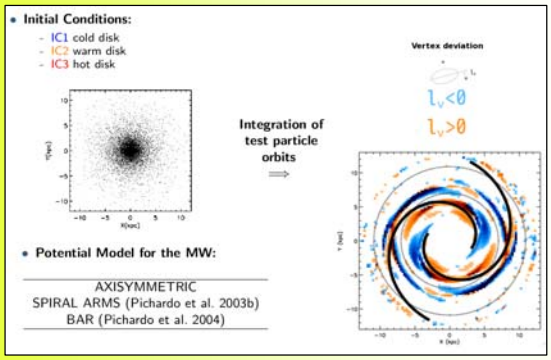
What are moving groups



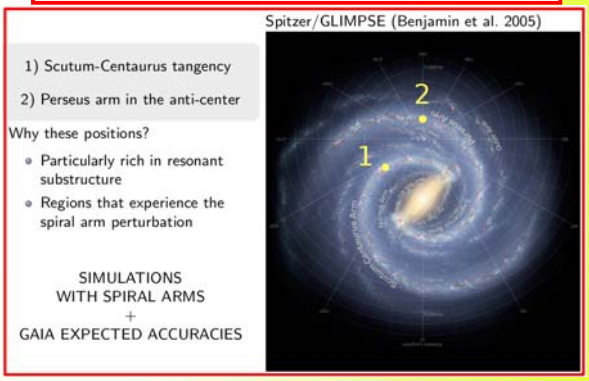
Interest of moving groups



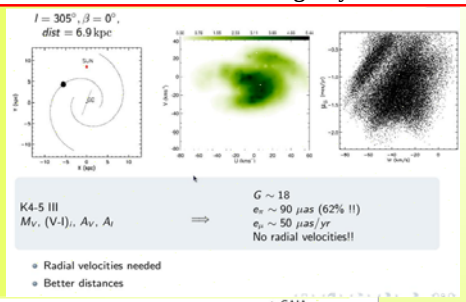
Simulation method

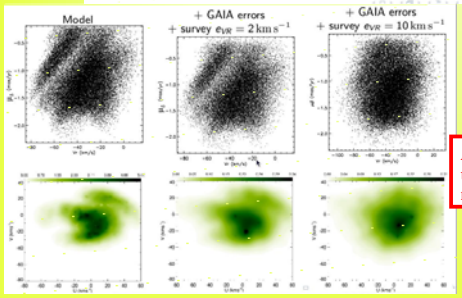


GAIA EXPECTED ACCURANCIES



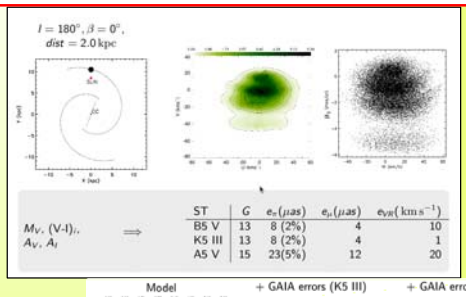
Scutum-Centaurus tangency



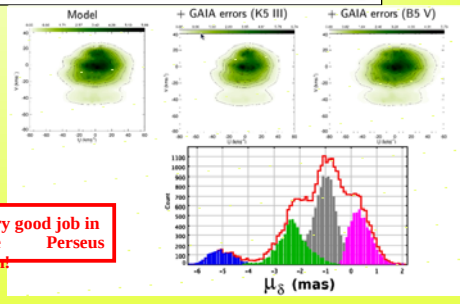


Accurate Vr in the IR are mandatory

Perseus arm in the anti-center



ST	G	$e_\pi(\mu as)$	$e_\mu(\mu as)$	$e_{VR}(km\,s^{-1})$
B5 V	13	8 (2%)	4	10
K5 III	13	8 (2%)	4	1
A5 V	15	23(5%)	12	20



Very good job in the Perseus arm!

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