Обзор ArXiv/astro-ph, 16-23 февраля 2022 года

От Сильченко О.К.

ArXiv: 2202.07662

A Tilt in the Dark Matter Halo of the Galaxy

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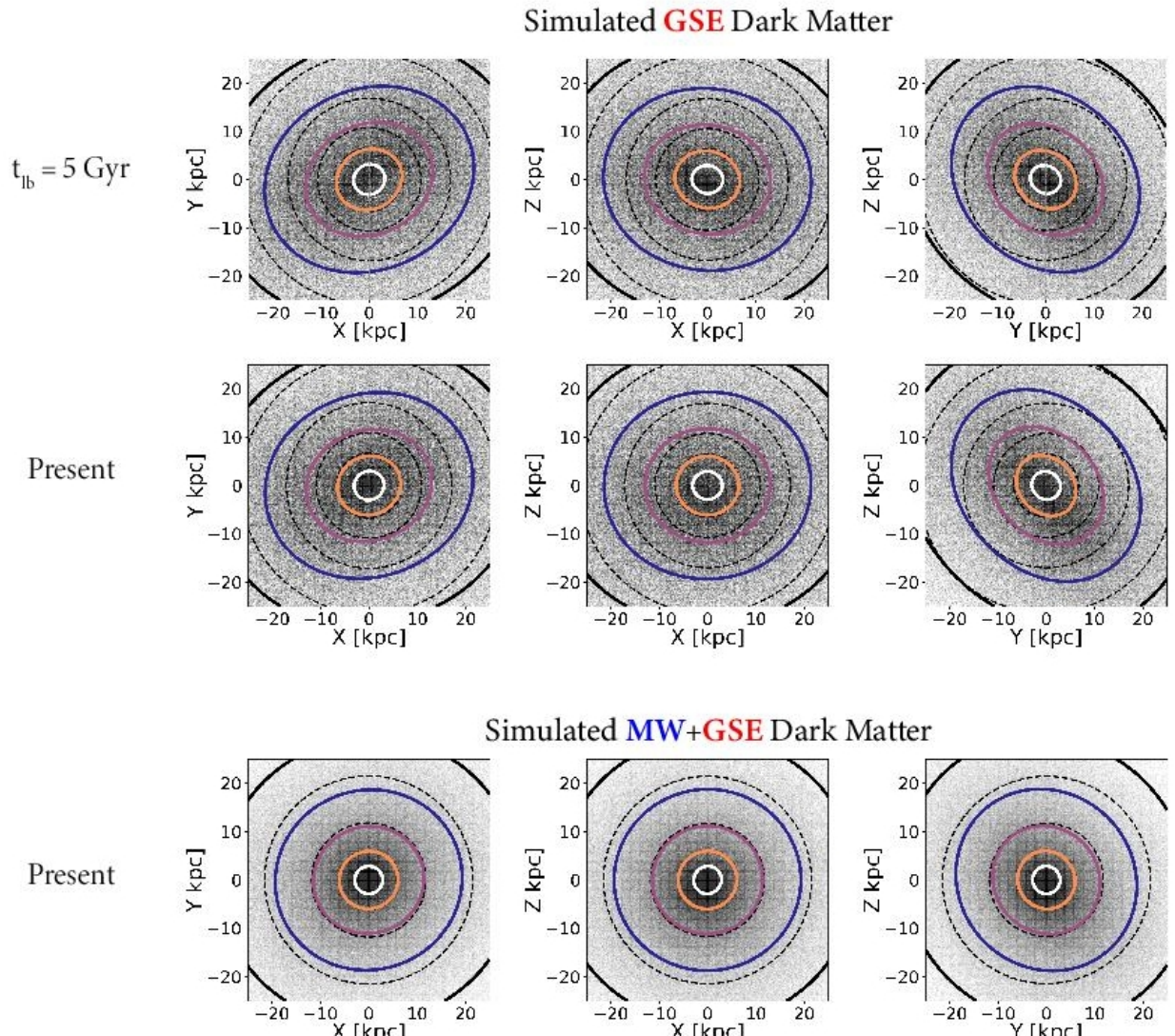
ABSTRACT

Recent observations of the stellar halo have uncovered the debris of an ancient merger, Gaia-Sausage-Enceladus, estimated to have occurred $\gtrsim 8$ Gyr ago. Follow-up studies have associated GSE with a large-scale tilt in the stellar halo that links two well-known stellar over-densities in diagonally opposing octants of the Galaxy (the Hercules-Aquila Cloud and Virgo Overdensity; HAC and VOD). In this paper, we study the plausibility of such unmixed merger debris persisting over several Gyr in the Galactic halo. We employ the simulated stellar halo from Naidu et al. (2021), which reproduces several key properties of the merger remnant, including the large-scale tilt. By integrating the orbits of these simulated stellar halo particles, we show that adoption of a spherical halo potential results in rapid phase mixing of the asymmetry. However, adopting a tilted halo potential preserves the initial asymmetry in the stellar halo for many Gyr. The asymmetry is preserved even when a realistic growing disk is added to the potential. These results suggest that HAC and VOD are long-lived structures that are associated with GSE and that the dark matter halo of the Galaxy is tilted with respect to the disk and aligned in the direction of HAC-VOD. Such halo-disk misalignment is common in modern

С каким гало пришла GSE и как это повлияло на Млечный Путь?

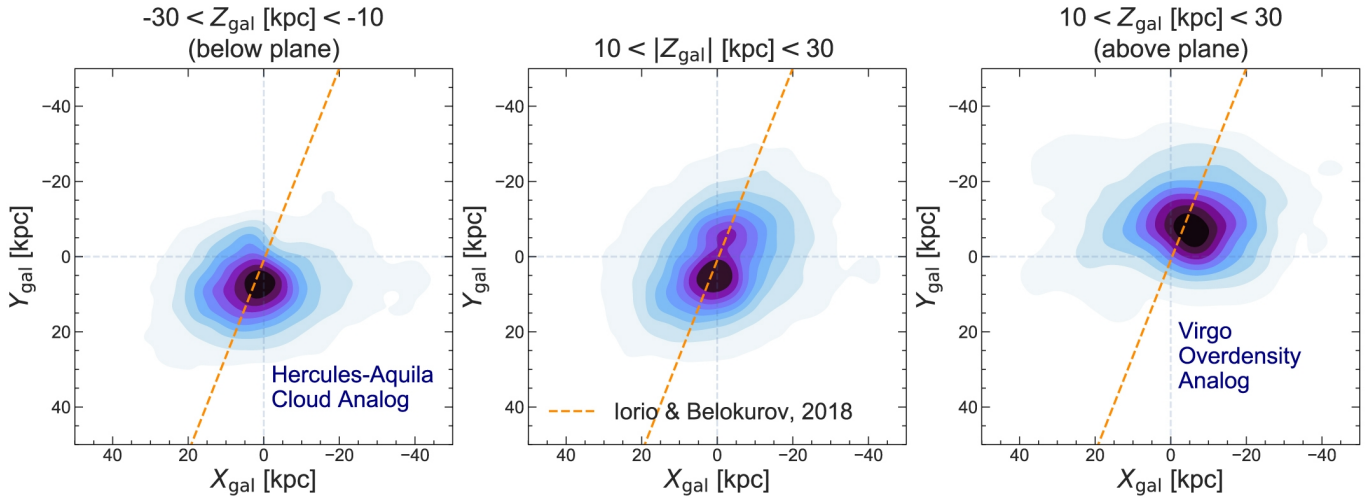


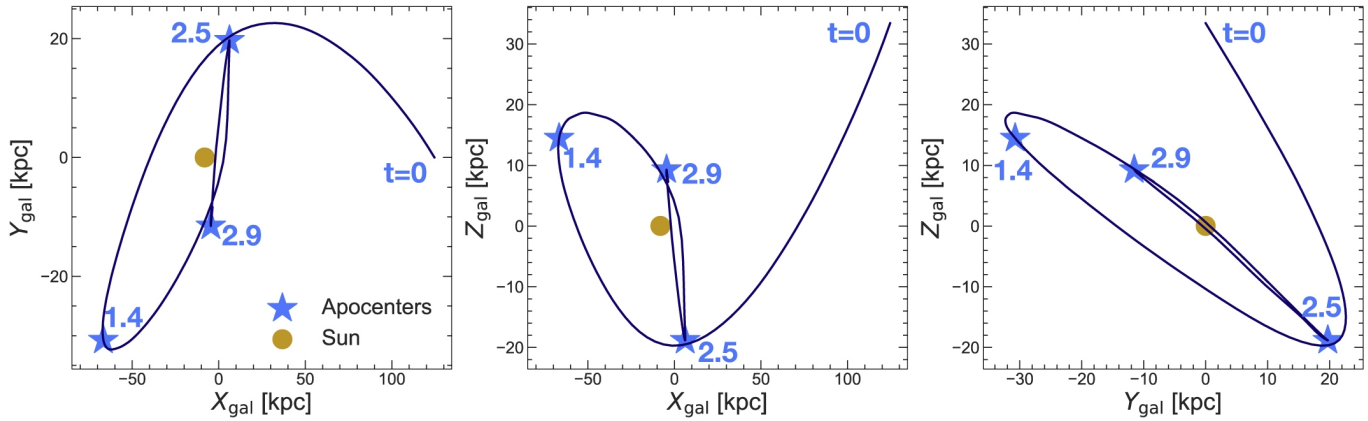
N-body от Naidu et al. (2021)

that closely resembles GSE based on H3 data (Conroy et al. 2019). This simulation is a 2.5:1 total mass ratio merger of the Milky Way at $z = 2$ with a dwarf galaxy on an inclined, retrograde orbit. The resulting z-component of the angular momentum L_z and galactocentric distance $r_{\rm gal}$ distributions of the merger match those of the GSE sample from the H3 survey (Naidu et al. 2020). Remarkably, the simulation also reproduces HAC/VOD-like stellar overdensities in the correct galac-

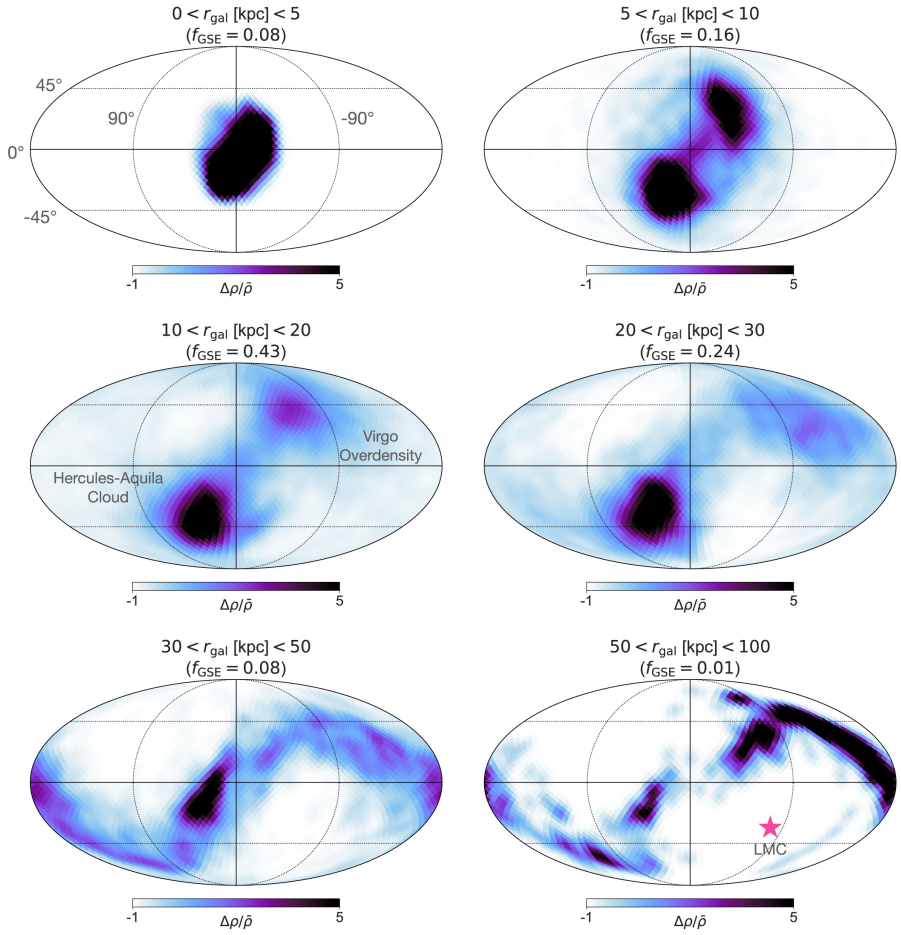
Большой мерджинг 10 млрд лет назад!

Naidu et al. (2021)

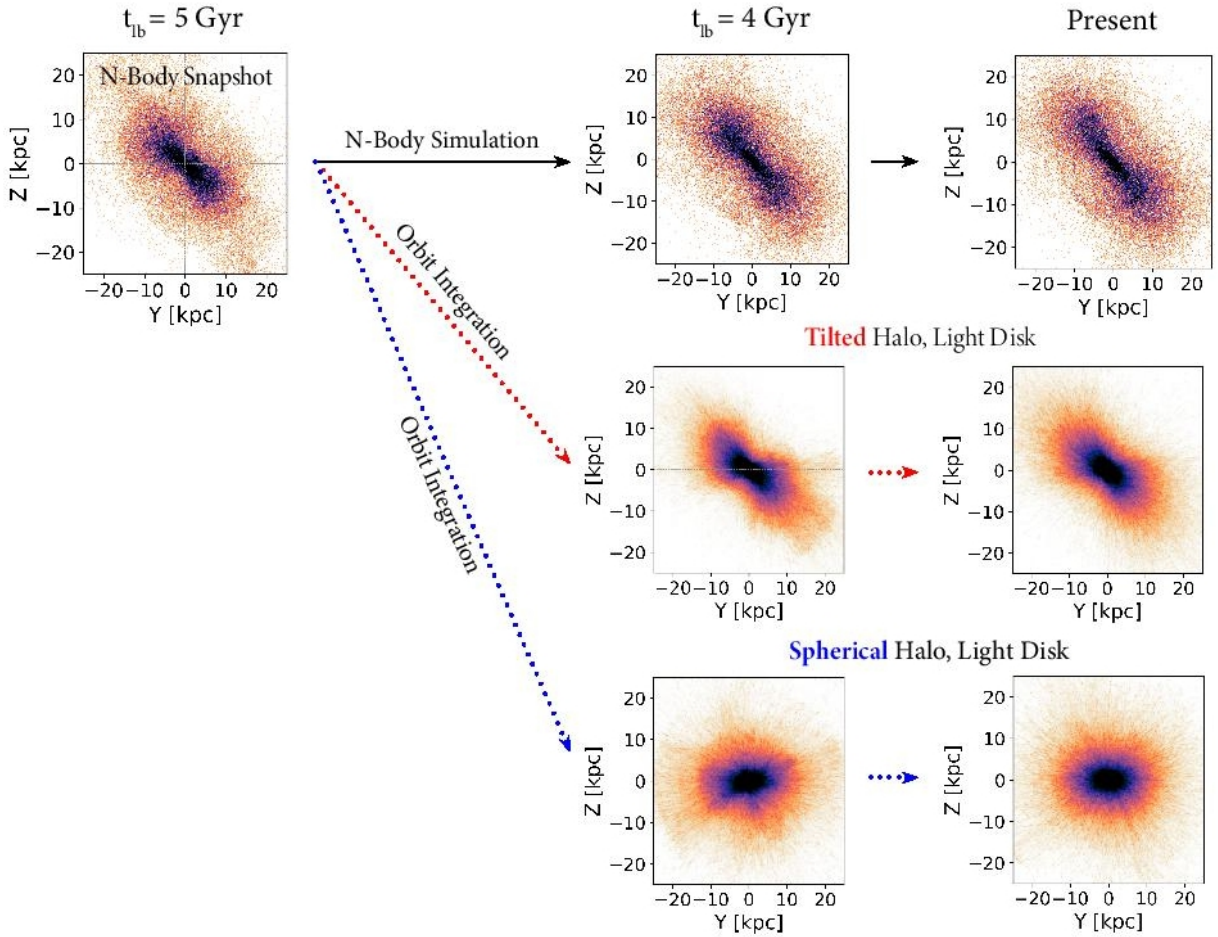




Naidu et al.(2021): GSE+VOD+HAC



Вопрос: не рассосутся ли эти концентрации за 10 млрд лет?



А это зависит от формы темного гало!

В сферическом гало НАС и VOD исчезают в первый миллиард лет

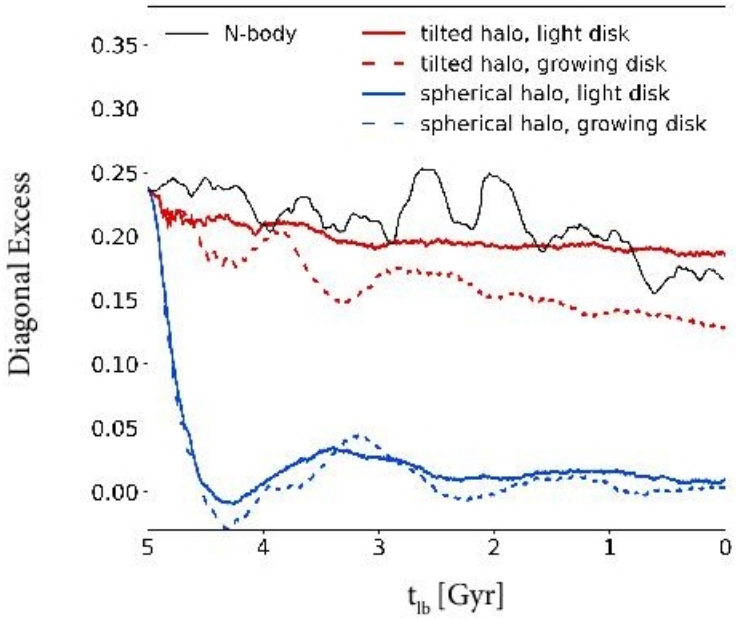
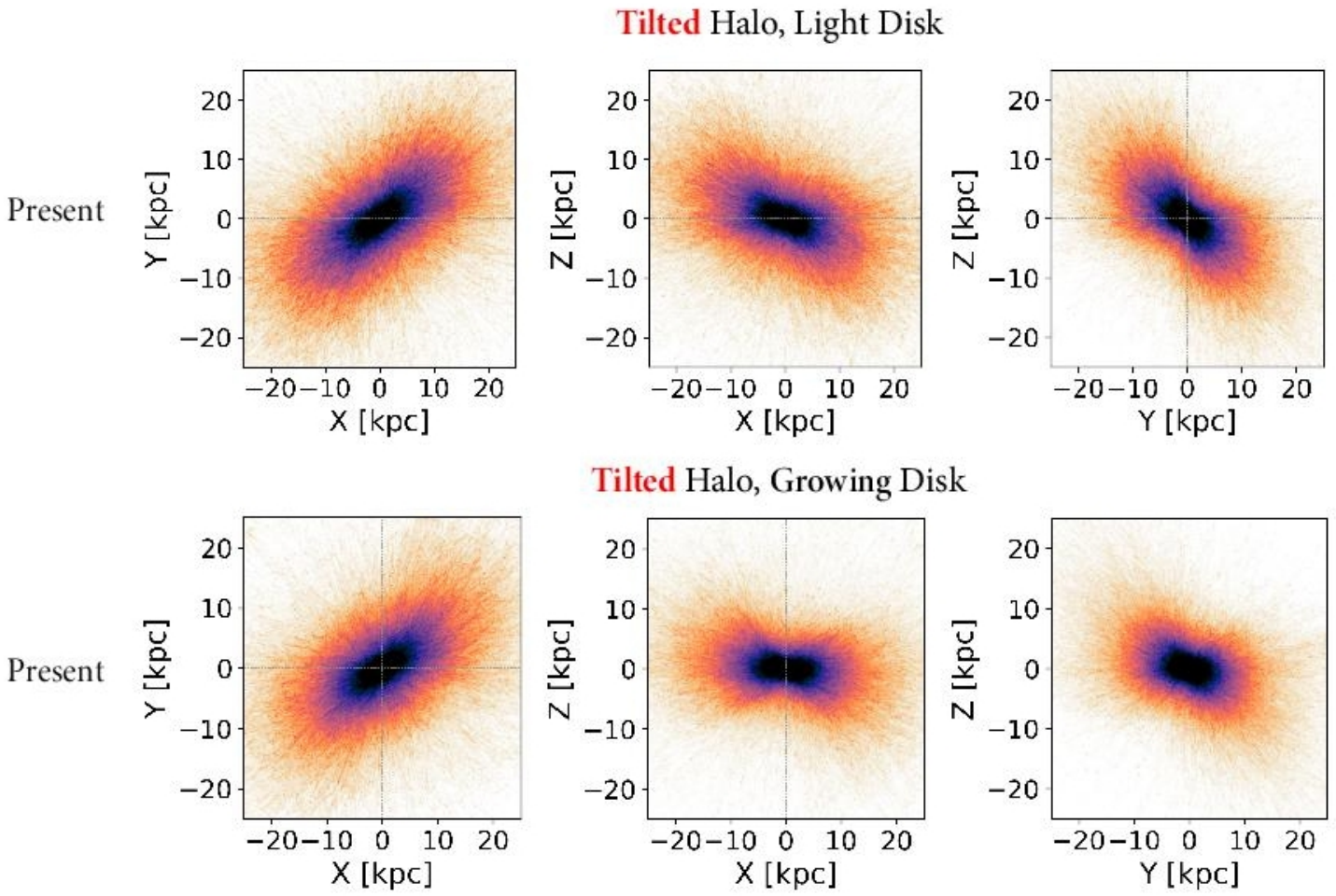


Figure 5. Excess fraction of stars in diagonally opposing octants of the Galaxy as a function of time, defined in equation 1. This diagonal excess is an indicator of the degree to which orbits are spatially mixed. In the N-body and tilted halo models, the initial asymmetry persists beyond 5 Gyr, while in the spherical halo models the asymmetry is erased by the first Gyr.

...а в триаксиальном наклонном - остаются!

Этому не мешает формирование тонкого звездного диска MW



А вот по локальному (D< 3 кпк) звездному гало триаксиал можно и не заметить…