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# Cosmic evolution of star formation modes in the Milky Way.

Alvaro Segovia Otero\*<sup>1</sup>

<sup>1</sup>Lund Observatory – Sweden

## Abstract

Understanding how stars are formed from the available gas reservoir lies at the core of galaxy formation and evolution and is key for unravelling its long-lasting unknowns. More specifically, which physical mechanisms are behind star formation and does their interplay differ across galactic scales and cosmic time? The details of these questions are far from being resolved, yet numerical simulations have proven to be an outstanding testing tool. Within the context of VINTERGATAN, a state-of-the-art cosmological zoom-in simulation describing a formation channel of the Milky Way, star formation properties can be thoroughly examined. In this talk I will identify different modes of star formation focusing on the impact of a gradually building galactic disk. From a more global perspective I will illustrate the trajectory of our simulated galaxy on the Kennicutt-Schmidt and sSFR-Mass planes, using gas depletion timescales, gas density PDFs and disk settling tracers as a function of redshift. I will discuss to which extent our simulated galaxy is capable of disentangling the degeneracy in the aforementioned diagrams, that is, what is the observed response of the gas in a galaxy at the earliest stage of its formation, in an environment of frequent interactions, and during the more quiescent evolution. I will conclude with hints on the derived star formation efficiencies at 50 pc scale, and whether the gas behaviour is ultimately modulated by smaller-scale or larger-scale physics.

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\*Speaker