What we can learn from simulations of galaxies

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Modelling and simulations have been key tools to probe physical processes, or mock the formation and evolution of astrophysical objects, since decades. They have now advanced as far as mocking entire universes, or detailed micro-physics, connecting with state-of-the-art observations in a way that would have been hard to envision 20 years ago. This still comes with a price to pay when we realise the limitations associated with such an exercise.

In this course, I will provide a glimpse of the potential of simulation work in the context of galaxy formation and evolution. I will emphasise my views on "what is a hydrodynamical simulation" and "how to use it", acknowledging the need to look back at the scientific (deductive, inductive) approach. I will focus on galaxies, and its key ingredients including stars, dark matter and most importantly the ISM. This course is meant as a first exposure to the experimental nature of "simulations", hoping it can help all researchers (observers, modellers, theoreticians) either to use those tools, or at least consider the associated results with reason.