Direction des Sciences de la Matière
IRFU
Service d'Astrophysique

# Soutenance de thèse du Service d'Astrophysique

## STRUCTURAL PROPERTIES OF CLUMPY GALAXIES AND SPHEROIDS AT HIGH REDSHIFT

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This thesis explores with a two-fold approach the still unanswered question of how distant galaxies evolve through cosmic time: on one side it focuses on star-forming clumpy galaxies, on the other it investigates the size evolution of passive compact ones.

It is now well known that the irregular morphology, dominated by bright patches of star formation (clumps), is an ubiquitous feature of star-forming galaxies at cosmic noon. Nevertheless, clumps' nature, fate, and contribution to galaxy evolution are still highly debated. I will discuss the in-depth study of a newly born clump that I discovered in the disk of a galaxy at redshift $z \sim 2$, and the analysis of a full statistical sample of distant clumpy galaxies that I assembled. These two works led to the conclusion that at least some clumps form due to violent disk instability in gas-rich, turbulent galaxies, and that they are likely long-lived. It supports numerical simulations indicating that clumps could migrate inward and play an important role in bulge growth.

Moreover, simulations predict that disk contraction and stabilization due to the growth of the central bulge might be linked with the formation of compact, passive galaxies that are commonly observed at redshift $z \sim 2$. The discovery of a galaxy population with smaller sizes, at fixed stellar mass, than local counterparts ignited an important debate concerning the possible mechanisms that could inflate galaxies. I will discuss the analysis of a sample of passive galaxies at redshift $z \sim 1.5$ which, at face value, suggests that multiple minor mergers could be the main drivers of their size increase with time.