

## M1-PR01 : New insights on the first galaxies from the *James Webb Space Telescope*

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After its successful launch in December 2022, the *James Webb Space Telescope* (JWST) is now providing unprecedented, deep, and highly detailed images of our Universe. This capability allows for the characterization of the atmospheres of nearby exoplanets and the determination of physical properties of the most distant galaxies. Despite intense competition, the *Space Telescope Science Institute* (STScI) has promptly decided to publicly release a significant portion of the data acquired by this remarkable telescope.

In this context, STScI has released the deepest images and catalogs for one of the most well-known regions of the sky—the southern part of the *Great Observatories Origins Deep Survey* (GOODS-South). This project invites you to utilize JWST data obtained in 2023 for this field, enabling the study of the first populations of galaxies in the Universe. The primary objective of this project is to determine how the luminosity distribution of galaxies evolved within the first billion years of the Universe and showcase the impact of JWST on our understanding of the early Universe. You will develop several Python scripts in a *Jupyter Notebook* to read the JWST catalog, select galaxies within the first billion years, and extract the required information.

The theoretical component of this project will provide you with the foundational knowledge to understand galaxy formation and evolution, especially within the framework of hierarchical models in a cosmological context. It will also equip you with the latest insights into the study of distant galaxies before the advent of JWST. The initial five minutes of each lecture will be dedicated to a recent discovery in extragalactic astronomy made by the JWST in the past weeks.



Figure 1: The deepest image so far of our Universe obtained by the JWST in 2023.  
*Credit:* NASA, ESA, CSA, B. Robertson (UC Santa Cruz), B. Johnson (Center for Astrophysics, Harvard & Smithsonian), S. Tacchella (University of Cambridge), M. Rieke (Univ. of Arizona)