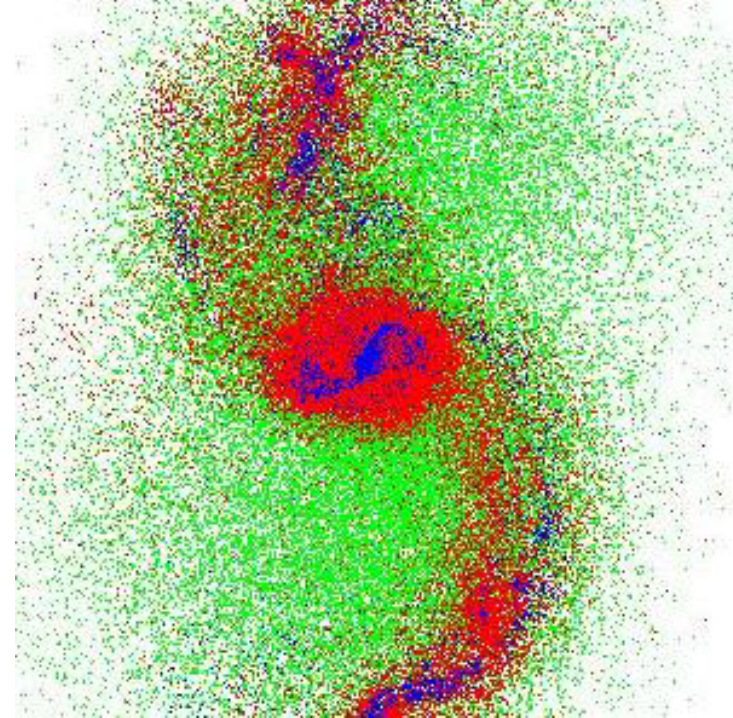
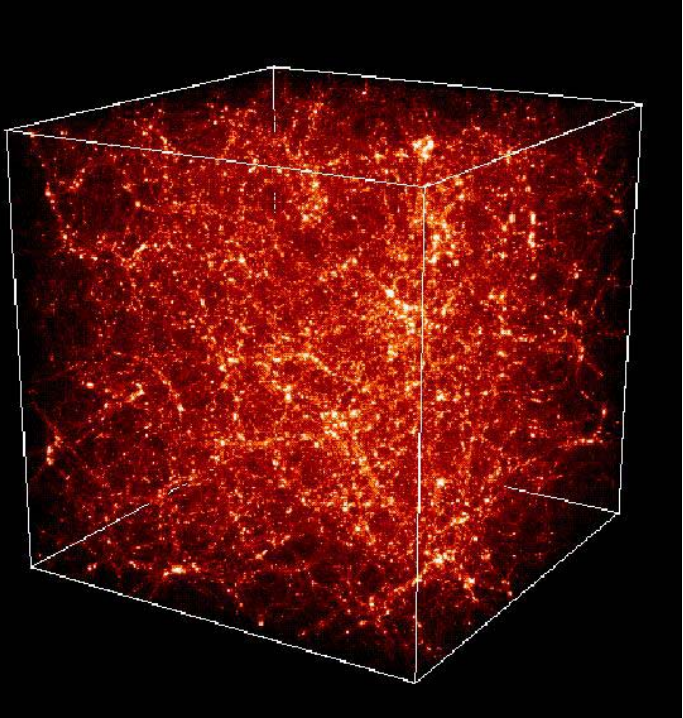




Predictions for ALMA with the HORIZON project

<http://www.obspm.fr/horizon>

Françoise COMBES, LERMA, Paris Observatory

Garching, 24 September 2004

Simulations of galaxy formation in the HORIZON project

- Simulate structure formation in a cosmological frame and predict the observational signatures as a function of various physical ingredients.
- Large volume, 2048^3 in a DM only simulation (2500 proc, CEA)
- Multi-Zooms simulations, with Hydro
- SAM exploitation
- Galaxy-scale simulations
- Provide to the community (observers and theoreticians) a friendly access to simulations results at international level.
- TVO, Theoretical Virtual Observatory

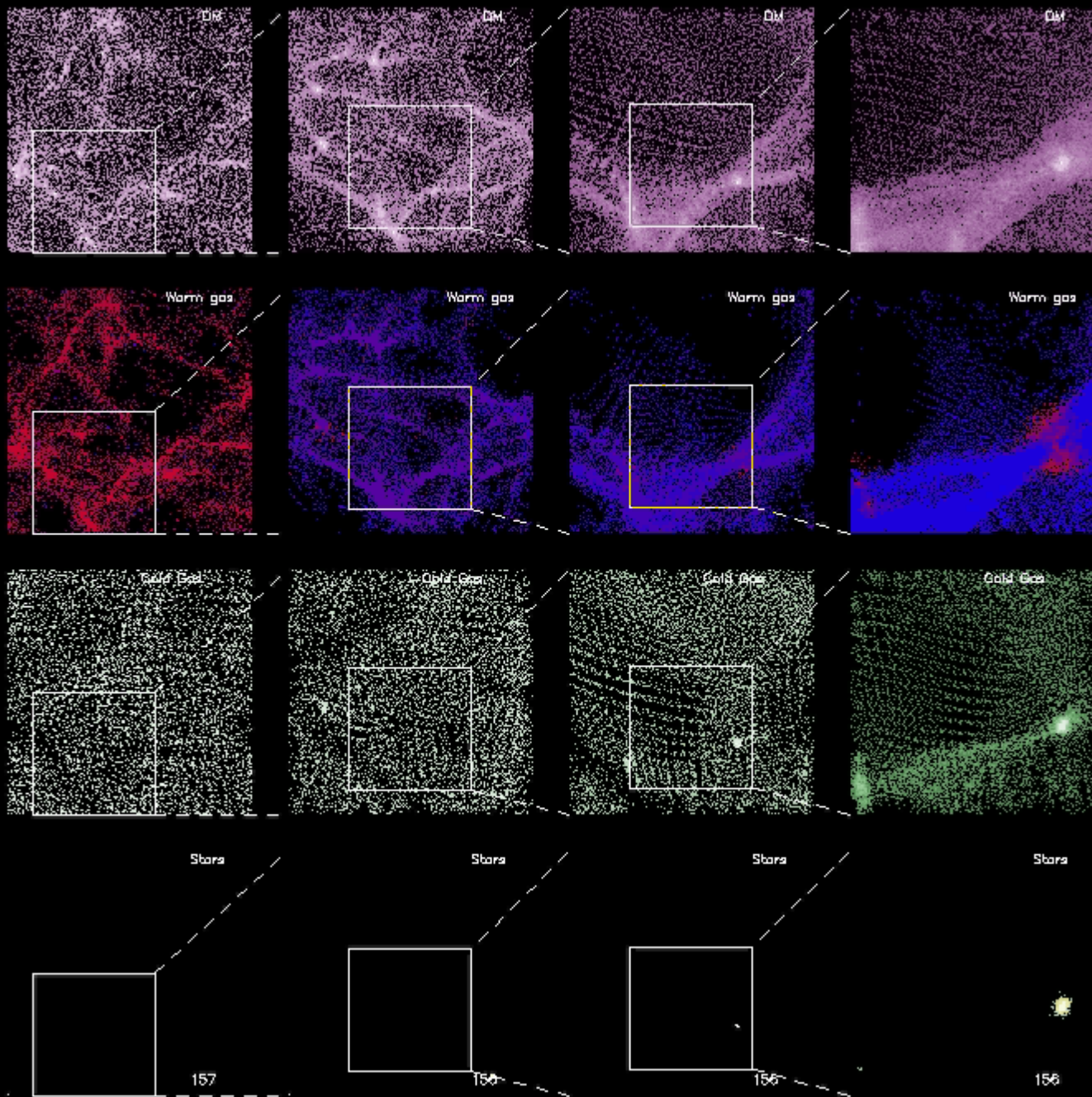
5 co-I's and collaborators

J-M. Alimi, S. Colombi, F. Combes, B. Guiderdoni, R. Teyssier

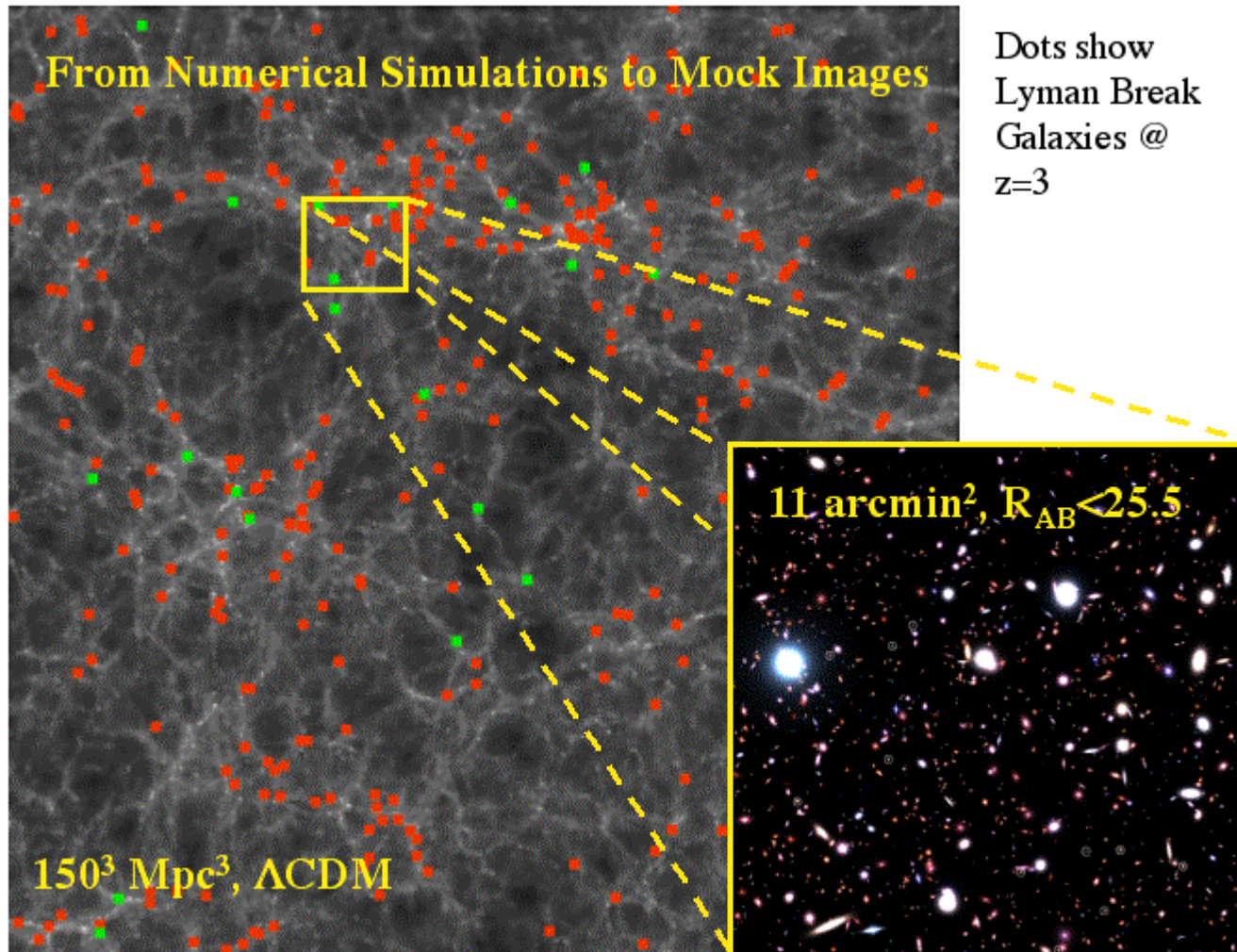
4 « phases »

4 Zoom levels
from 20 to 2.5 Mpc.

$z = 3$. (from. $z=10$.)



GalICS (SAM) <http://galics.iap.fr>



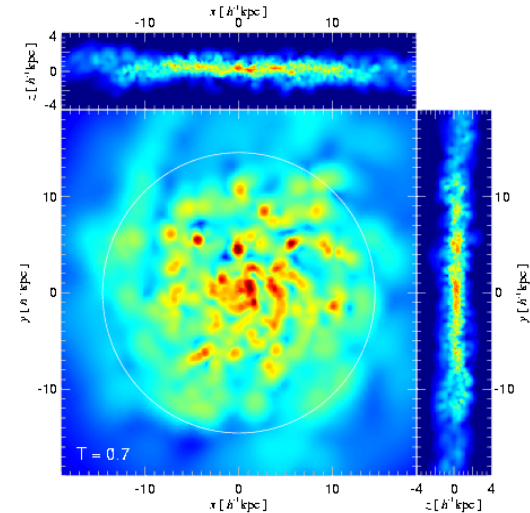
Galaxy Formation:

Towards high resolution:

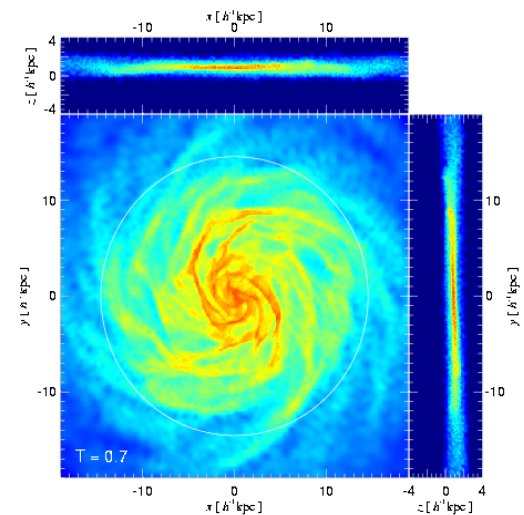
- ~ 1980: 10^4 part
- ~ 1990: 10^5 part
- ~ 2000: 10^{6-7} part

→ Resolution of $10^3 M_\odot$ per particle
an **important goal**: 10^8 to 10^9 part

- The **mass spectrum** of molecular clouds
- The stellar **IMF**
- Influence of **dynamical friction** on **bars**
- The **angular momentum** problem
- Dynamics of **black holes** at the center of galaxies

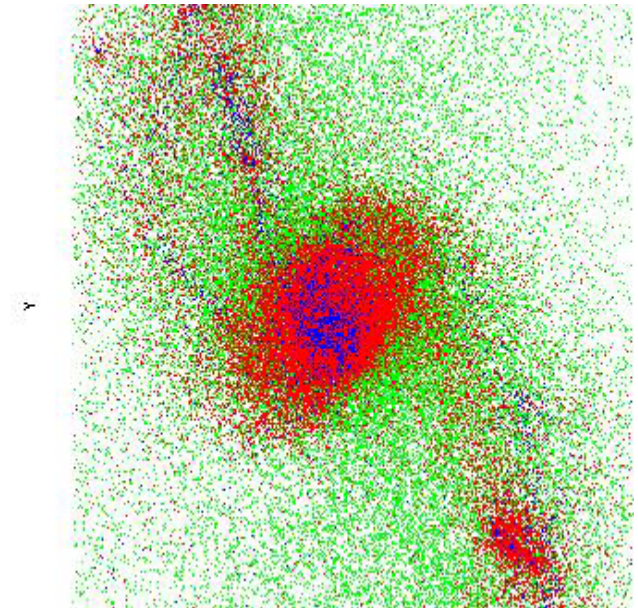
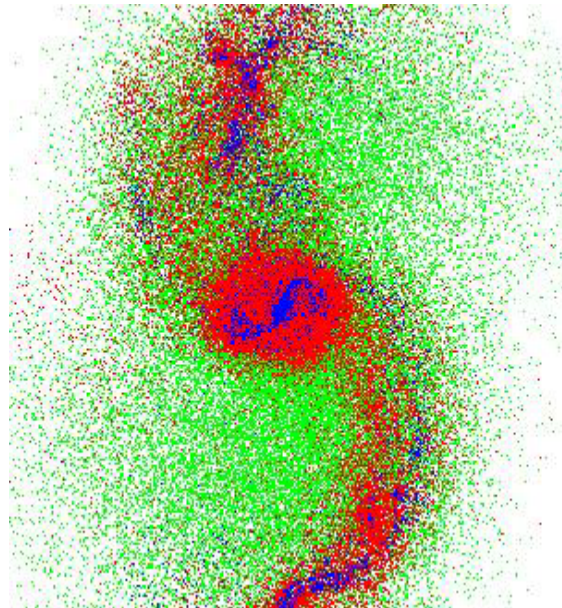
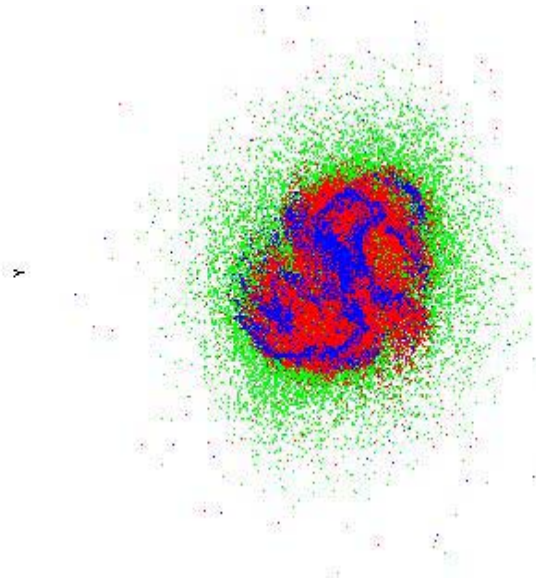
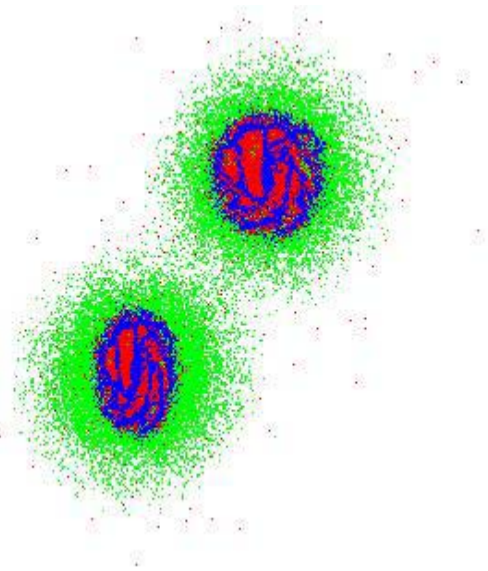


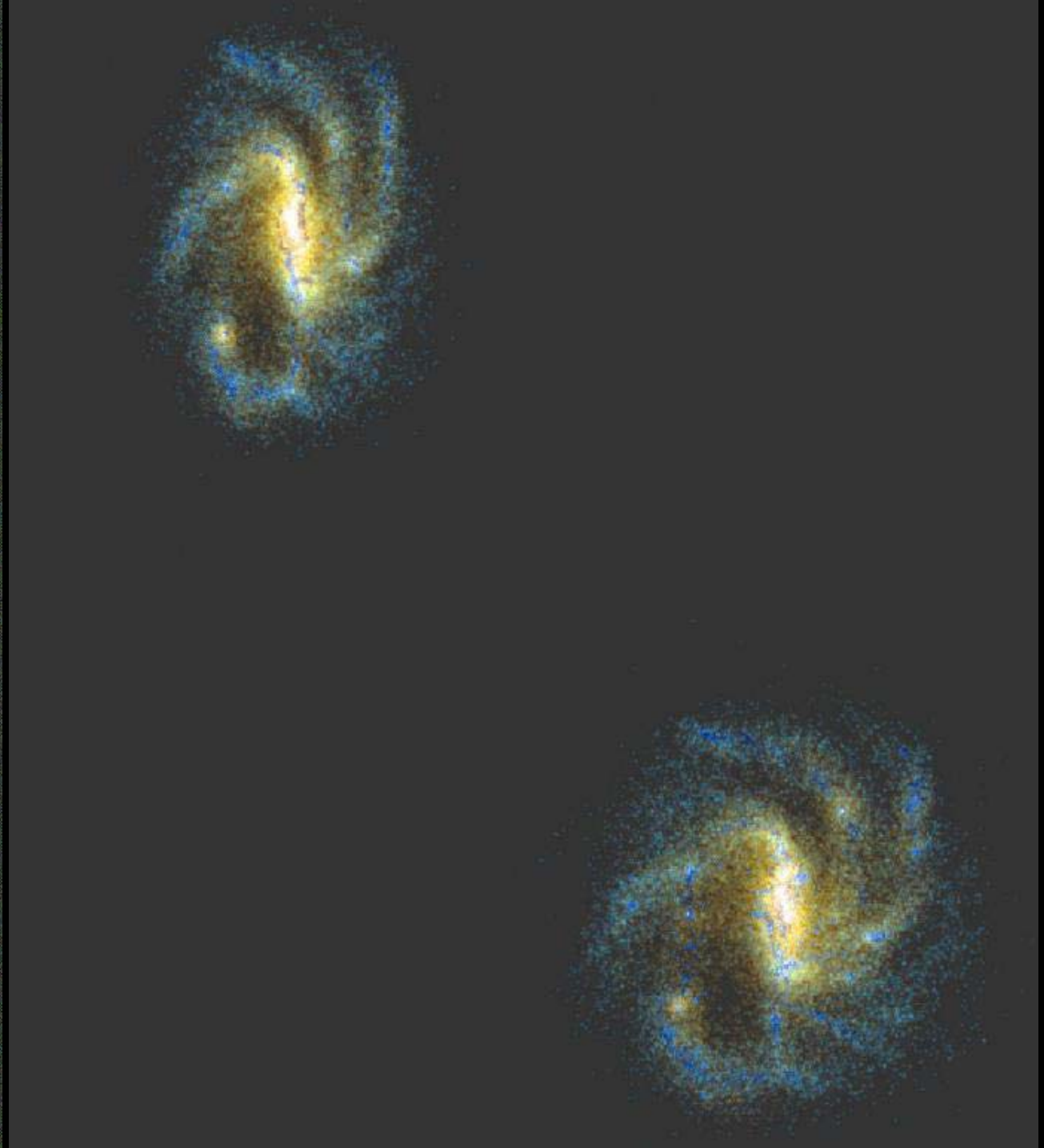
35 000 particles

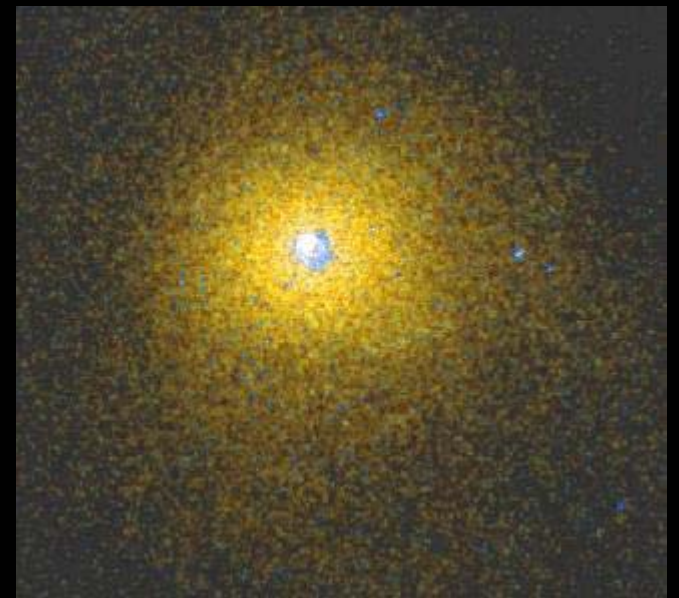
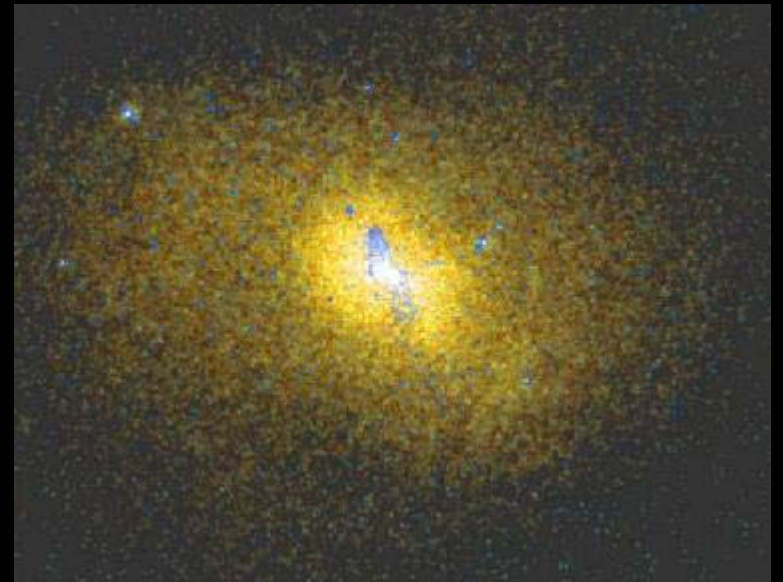
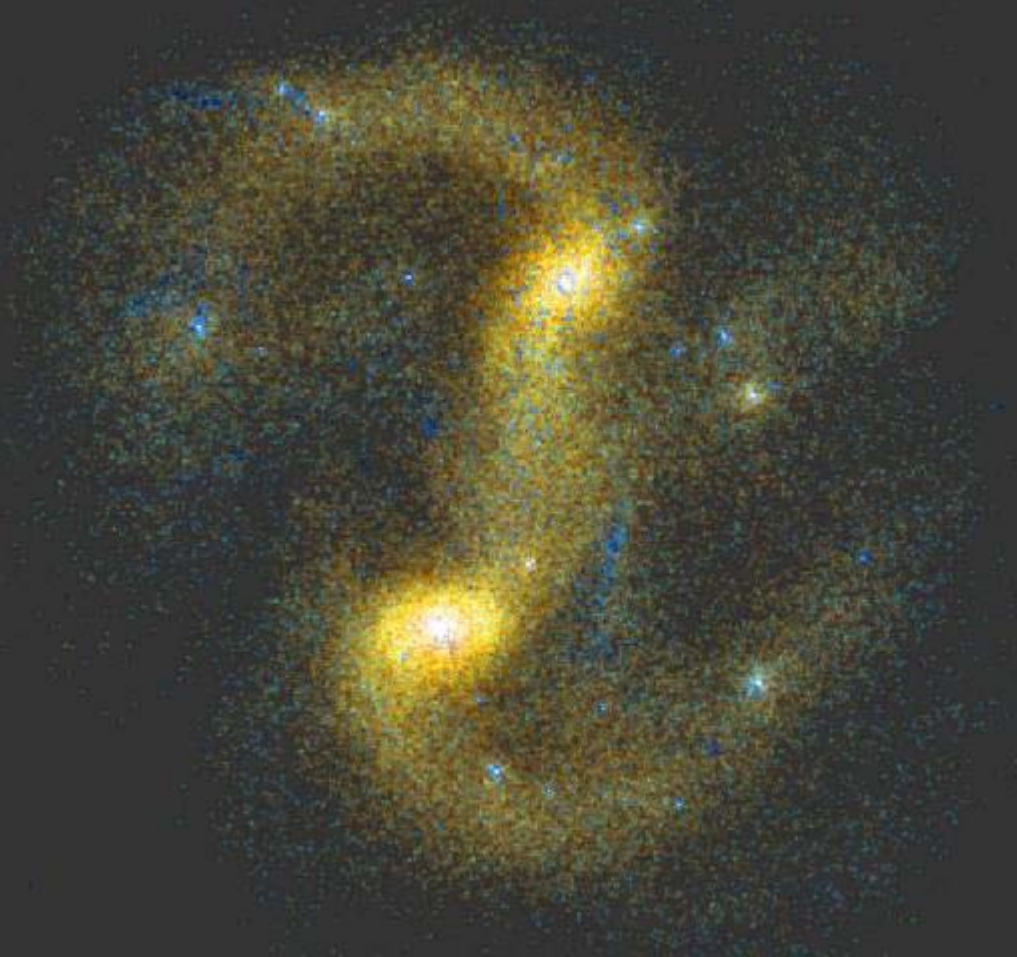


280 000 particles

GALMER Standard merger N=240 000



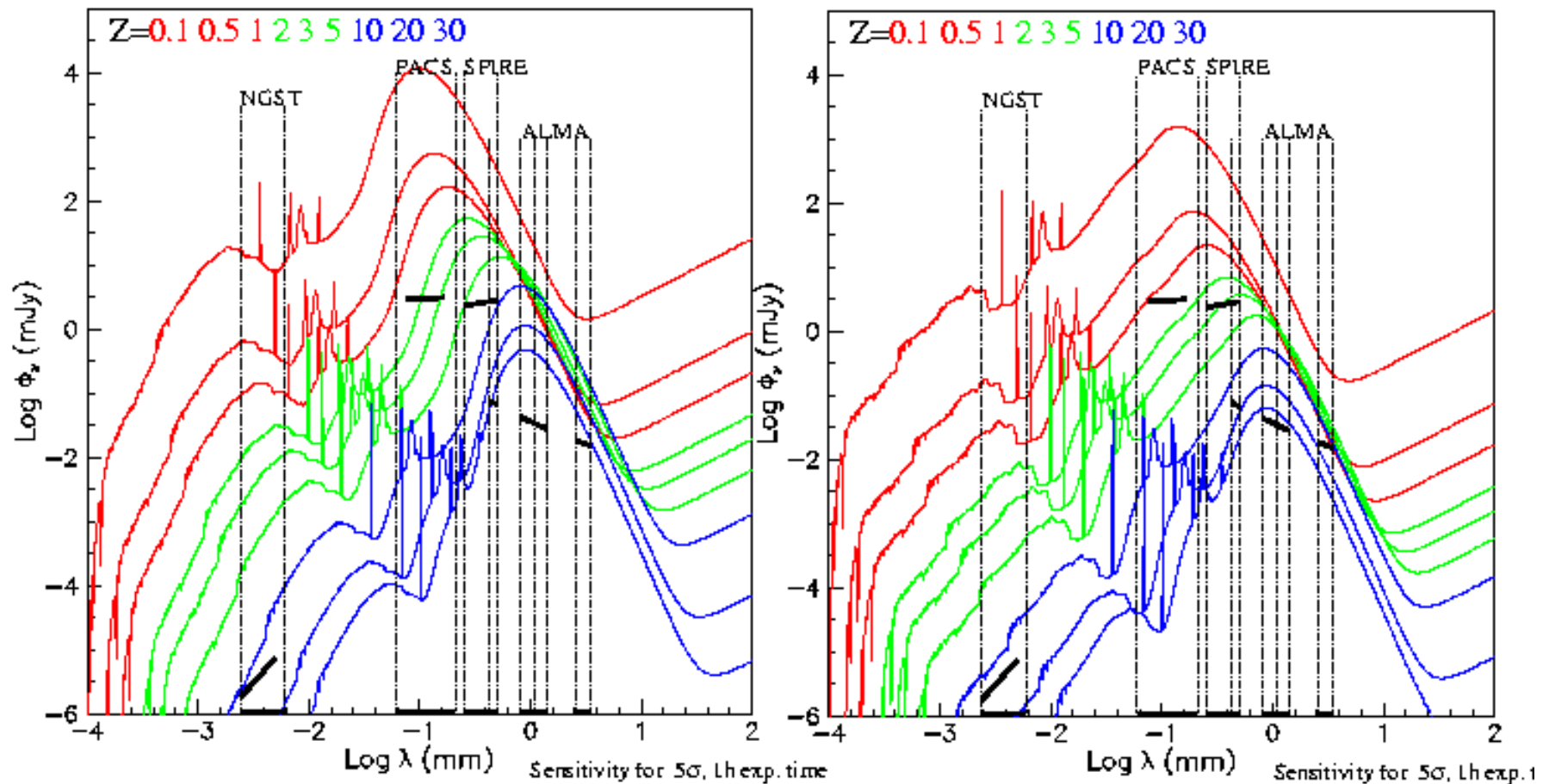




Cattaneo et al 2004

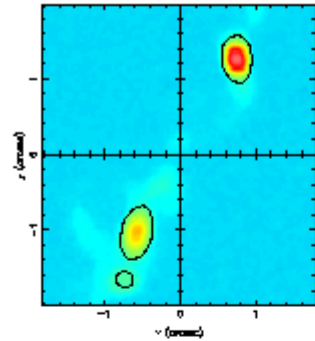
Detection limits with Herschel, ALMA and JWST

Strong starburst – $L_{\text{IR}} = 2.2 \times 10^{12} L_{\odot}$ – $\text{SFR} = 373 M_{\odot} \text{ yr}^{-1}$ Moderate starburst – $L_{\text{IR}} = 1.8 \times 10^{11} L_{\odot}$ – $\text{SFR} = 32 M_{\odot} \text{ yr}^{-1}$

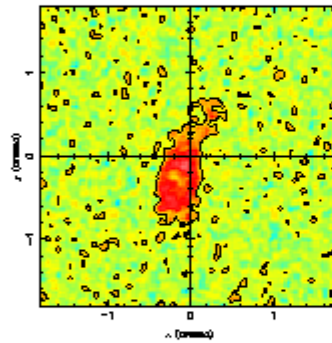
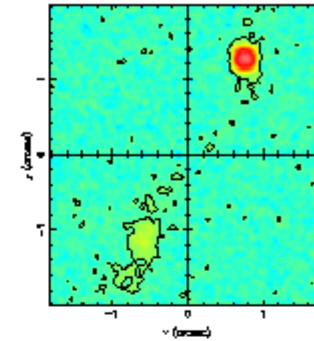


Melchior et al 2001

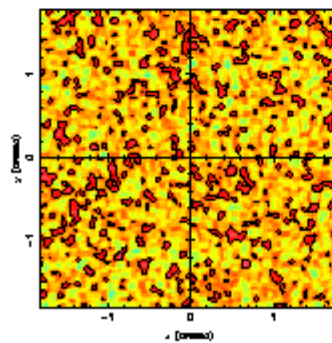
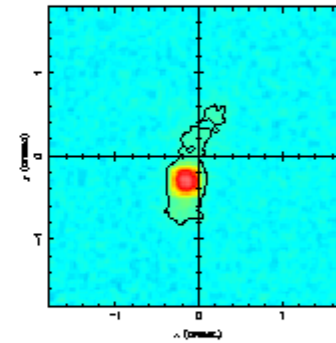
Predictions with JWST and ALMA



$Z=1$

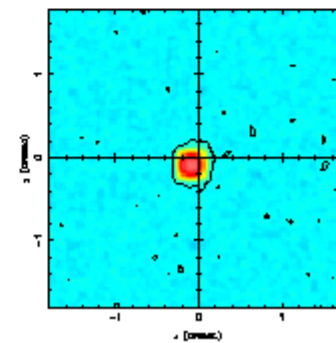


$Z=4$



JWST

$Z=7$



ALMA