Inner Tail Gas Asymmetries and Fallback in the Jellyfish Galaxy NGC 4858

Harrison Souchereau*[1], Jeffrey Kenney[1], Pavel Jachym[2], and Stephanie Tonnesen[3]

[1]Yale University – New Haven, CT 06511, États-Unis
[2]Astronomical Institute, Czech Academy of Sciences – Bocni II 1401, Prague, 14100, République tchèque
[3]Flatiron Institute – 162 5th Avenue, New York, NY 10010, USA, États-Unis

Résumé

Gaseous evolution due to ram pressure acceleration of material that has been pushed out of the disk, but not fully stripped, can be a complex process. We explore this "inner tail" evolution using high-resolution (∼1" = 460pc) ALMA CO(2-1) observations of the Coma cluster jellyfish galaxy NGC 4858, obtained from the ALMA-JELLY large program. We compare this spectacular observational data to a suite of state of the art ENZO "wind tunnel" galaxy simulations, where we vary the disk-wind angle between runs. In our observations, we find numerous structural and kinematic features indicative of the effects from strong, inclined ram pressure, including an asymmetric inner gas tail. We also find kinematic signatures of fallback: gas clumps that had been previously pushed out of the disk but are now falling inwards. We propose a simple, torque-focused mechanism that would create asymmetric inner-tail morphologies regardless of the presence of pre-existing spiral structure. These asymmetries are supported by the results of our simulation suite which also confirm where fallback is to be expected based on the galaxy's rotation and the ram pressure wind direction. We find that while fallback occurs in all simulations more inclined than 45 degrees, the fallback rates are largest for angles closer to edge-on. We also find that star formation is elevated for more inclined winds, and can lead to the generation of a "leading edge plume": shell-like structures of stars upstream from the galaxy disk.

Mots-Clés: jellyfish galaxies : galaxy simulations :

*Intervenant