

Building the UV Legacy: Massive-Star Feedback from HST to HWO

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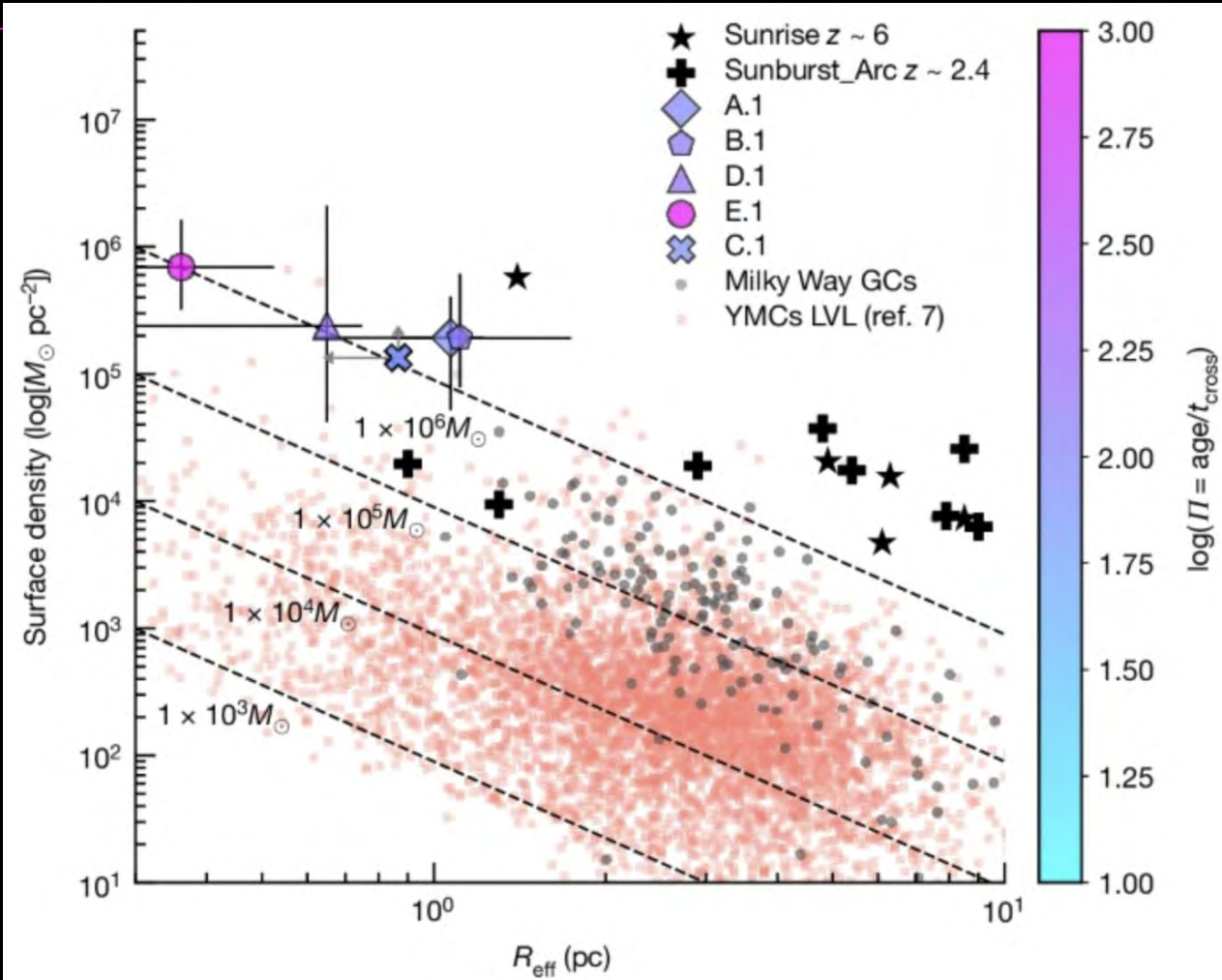
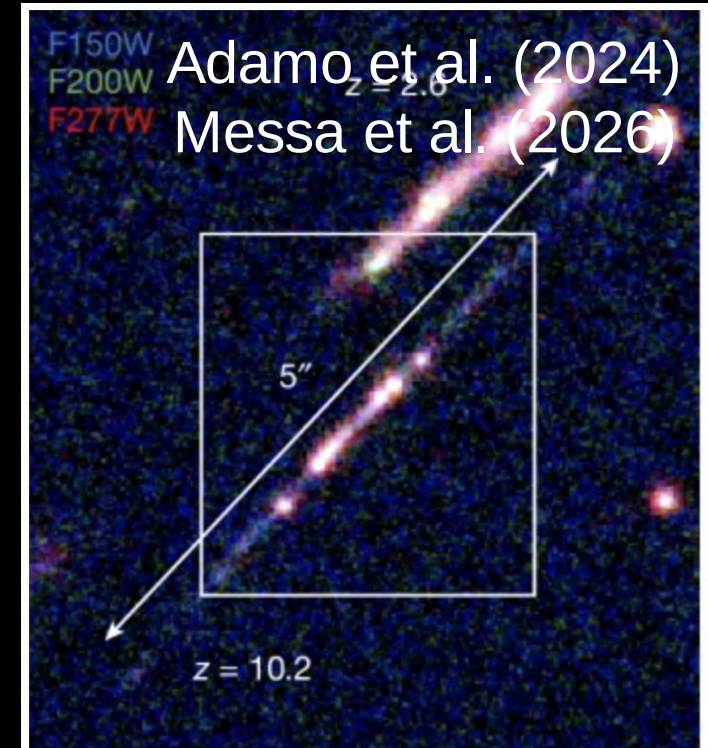


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From the HST UV Initiative to the Next UV Observatory
NUVA EMEETING

Star Clusters and Feedback: Massive clusters observed in Cosmic Gems arc at $z \sim 10$

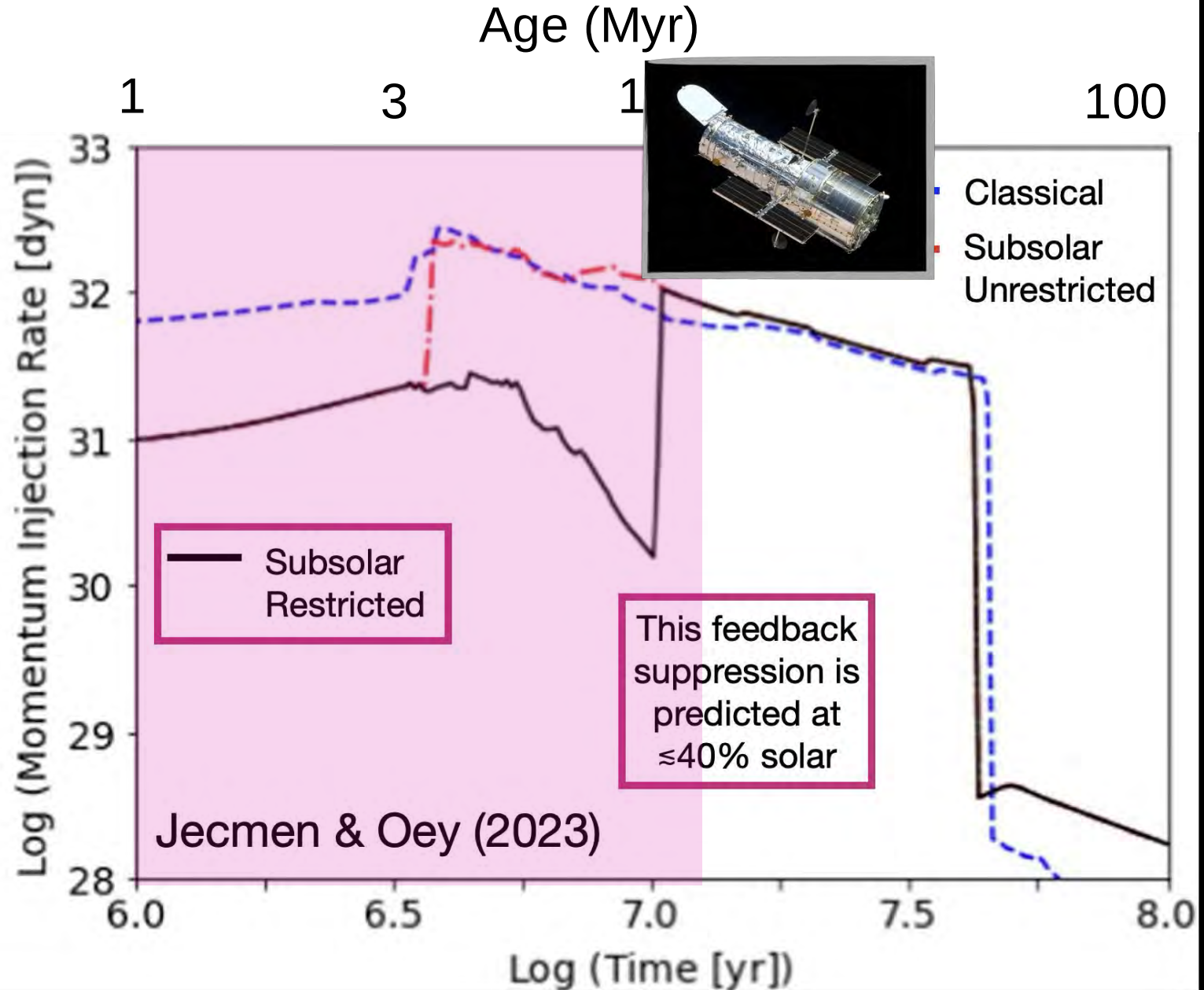


- Stellar surface densities 3 orders of magnitude higher than typical young star clusters in the local Universe
- Similar clusters predicted by feedback-free starburst model (e.g., Dekel et al. 2023)

Massive-star Mechanical Feedback in Metal-poor conditions:

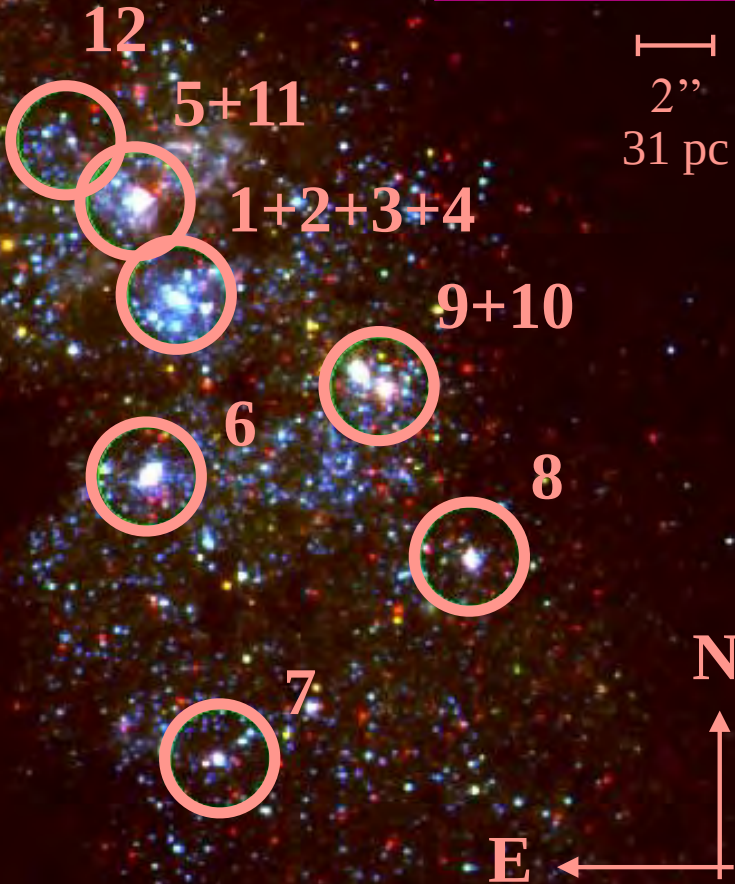
Theoretical Predictions

- Weaker winds (Vink 2022)
- Massive stars directly collapsing to black holes (Zhang 2008, Patton & Sukhbold 2020)
- Removal of massive stars through dynamical processes (Oh & Kroupa 2016)



Understanding Feedback:

Characterizing massive star clusters and their impact onto the ISM



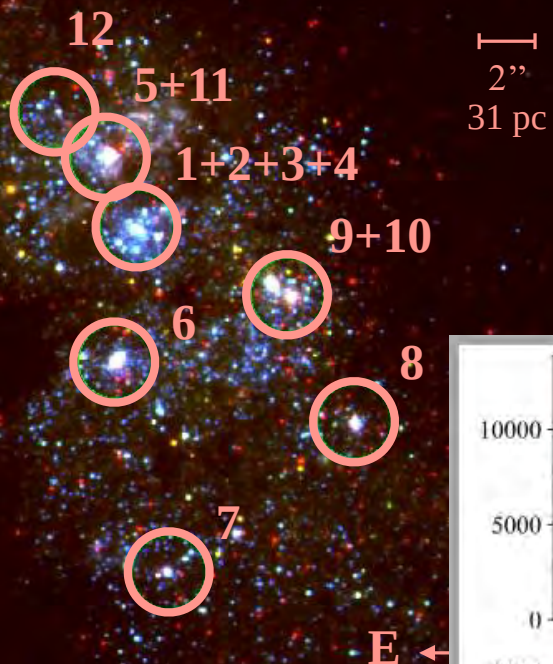
- (1) Compact Galaxy
- (2) Low Metallicity
- (3) Nearby

NGC 5253

Blue Compact Dwarf Galaxy

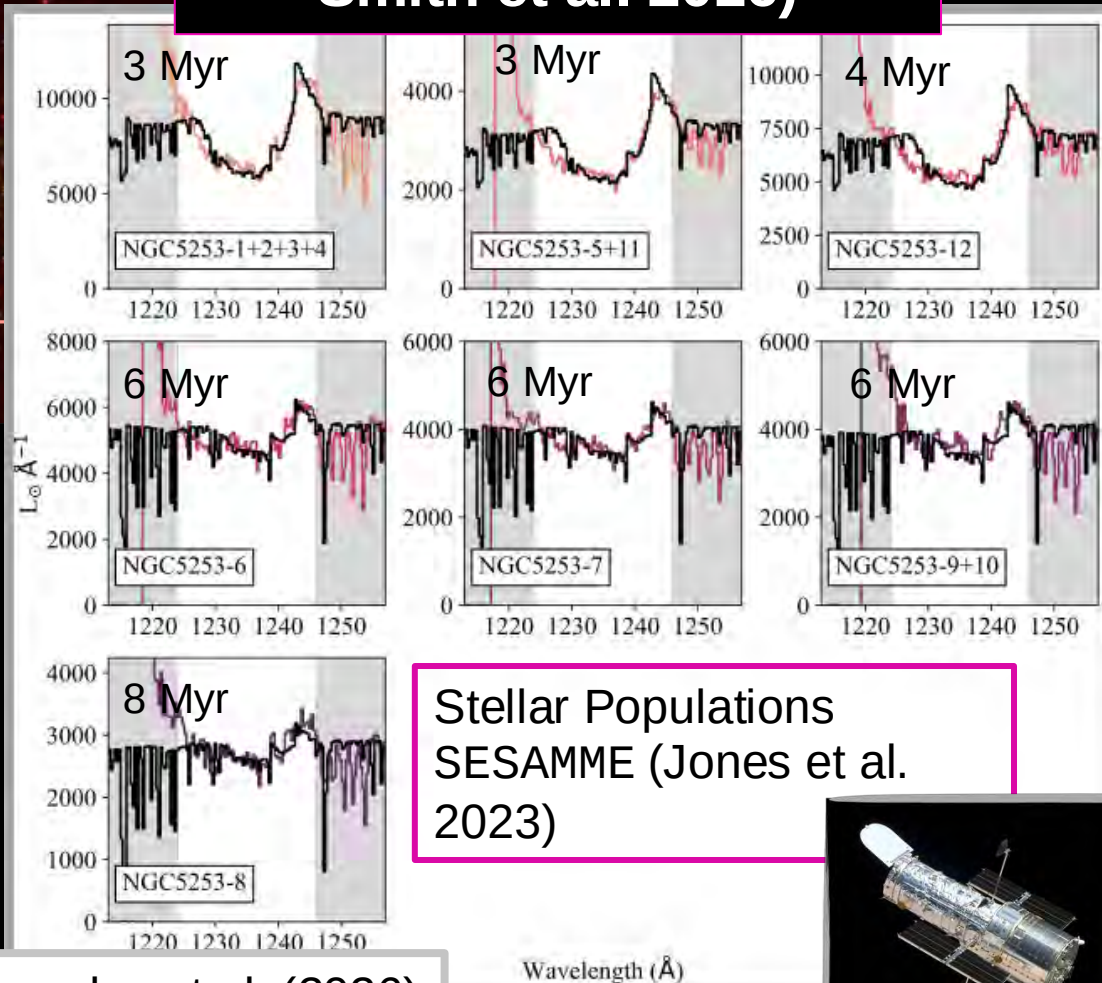
$Z \sim 30\% Z_{\odot}$ (Monreal-Ibero et al. 2012)

3.3 Mpc (Sabbi et al. 2018)



Stellar Clusters

(Calzetti et al. 2015,
Tremonti et al. 2001,
Smith et al. 2016)



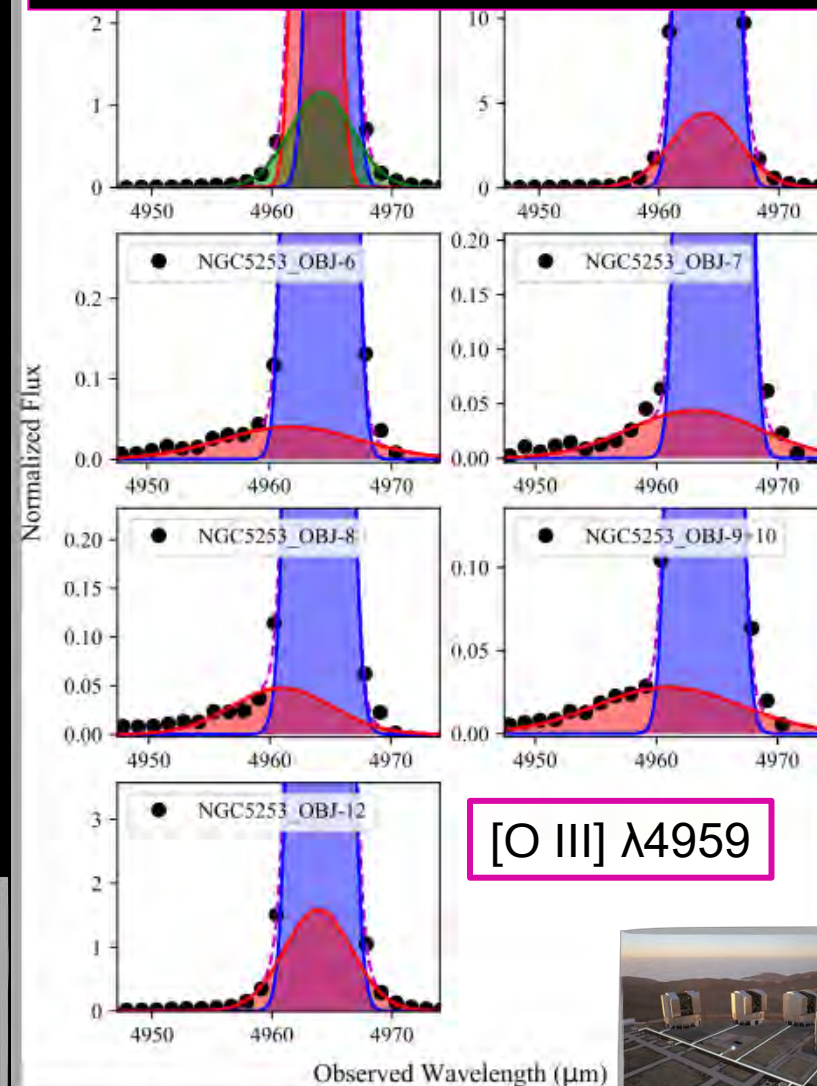
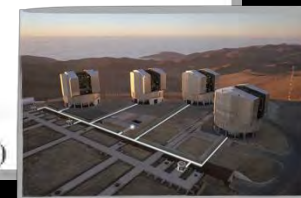
Stellar Populations
SESAMME (Jones et al.
2023)

Hernandez et al. (2026)

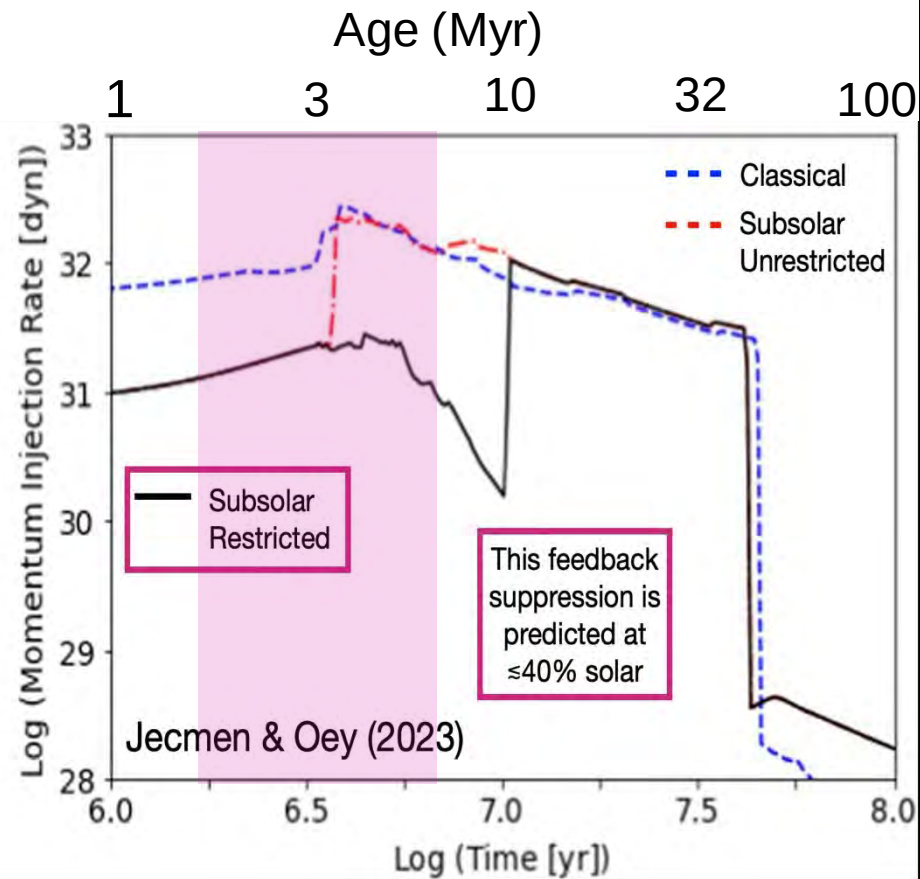
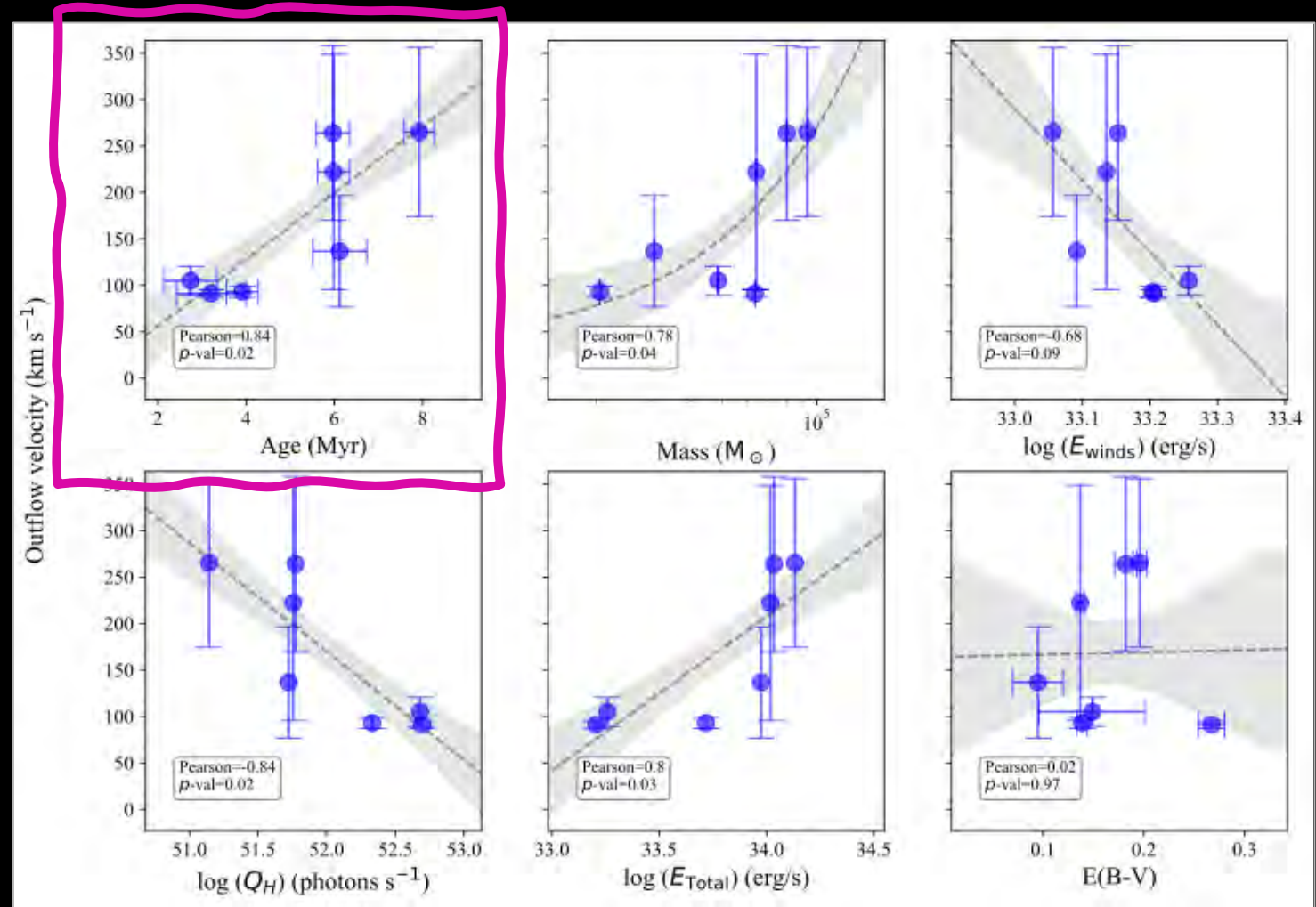


Ionized Gas

(Monreal-Ibero et al. 2010,
Westmoquette et al. 2013)



Stellar Feedback Suppression? NGC 5253

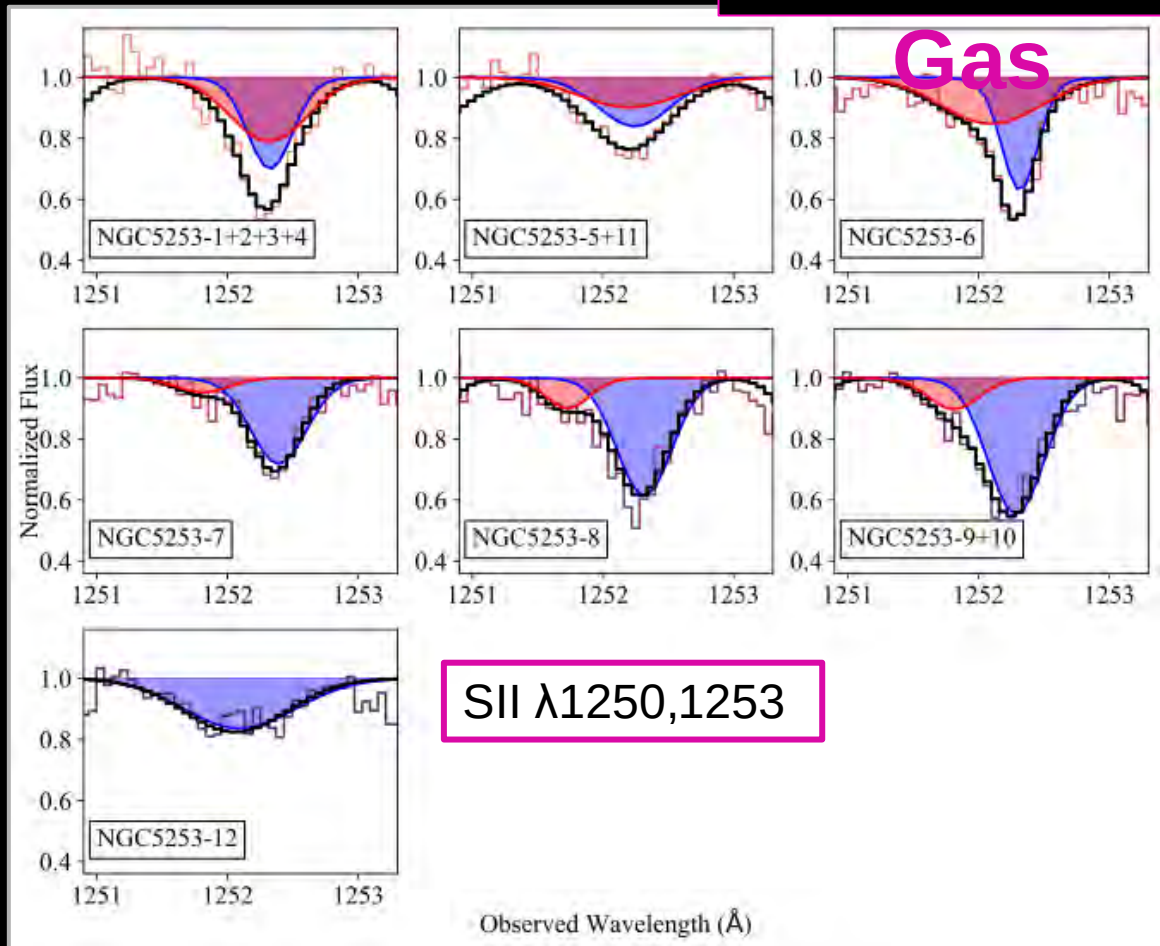
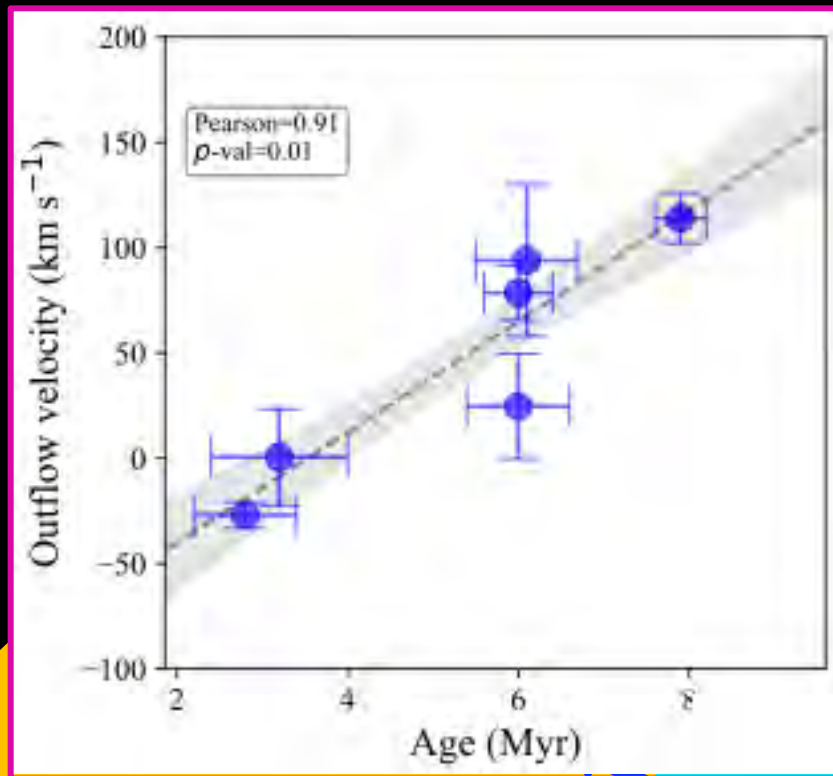


Stellar Feedback Suppression?

NGC 5253

Neutral

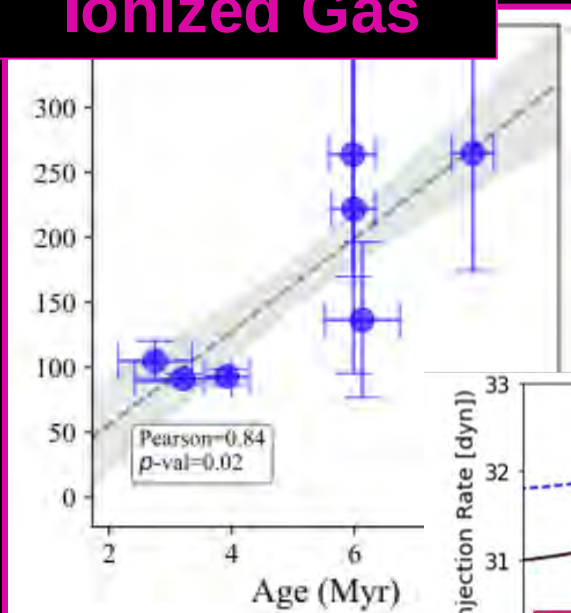
Gas



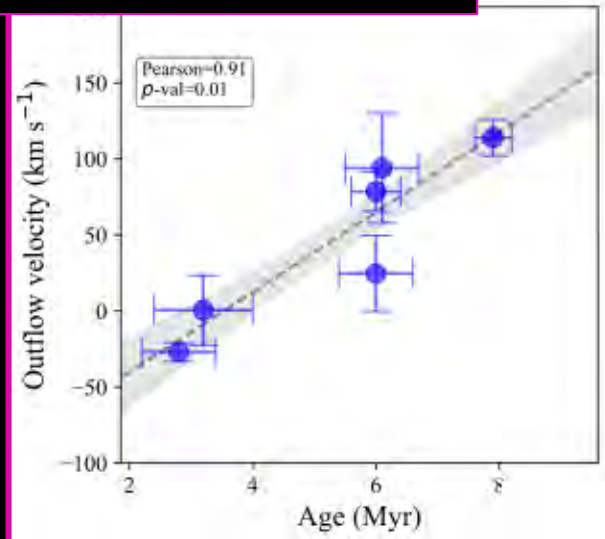
H

H II

Ionized Gas

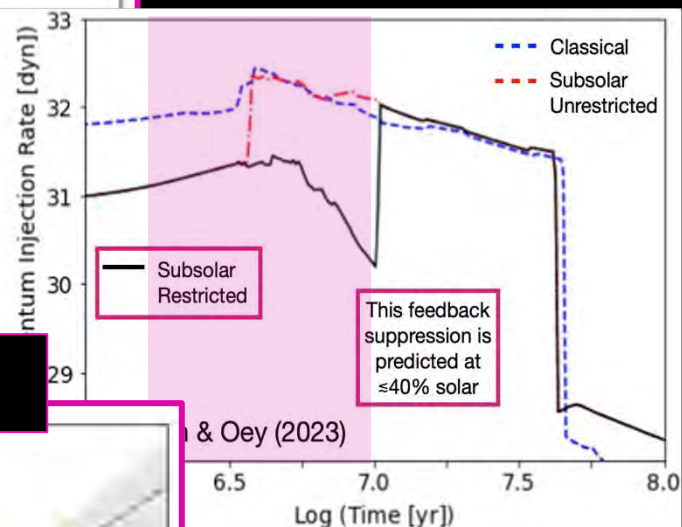


Neutral Gas

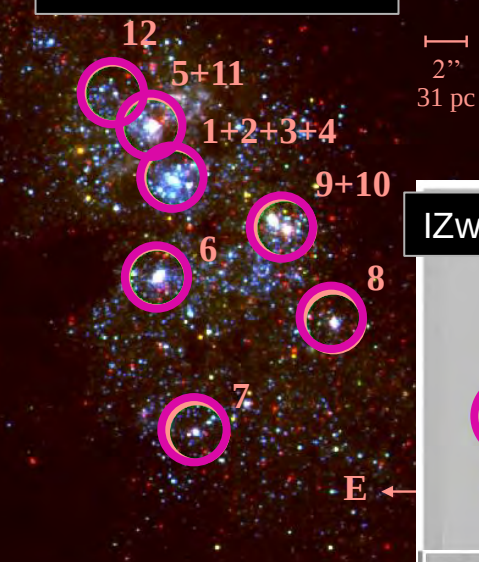


Stellar Feedback Suppression at $\sim 30\% Z_{\odot}$

- Older (>4 Myr) clusters are associated with higher velocity outflowing multi-phase gas
- Statistically-significant trend in outflow velocities and stellar ages hint at the absence of delayed SNe feedback at $\sim 0.3 Z_{\odot}$
- **Next:** Test theoretical expectations at lower metallicities – HST FUV critical to characterize these young stellar populations and their surrounding ISM

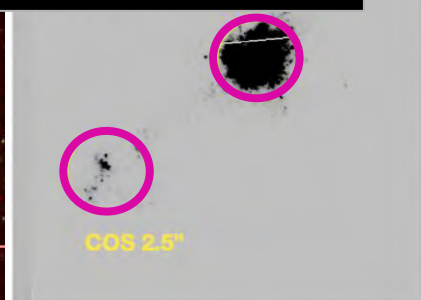


NGC5253 - 0.3 $Z_{\odot}$



UV Legacy of Metal-Poor Young Stellar Populations

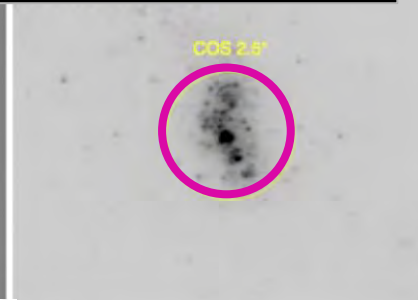
IZw18 - 0.02 $Z_{\odot}$



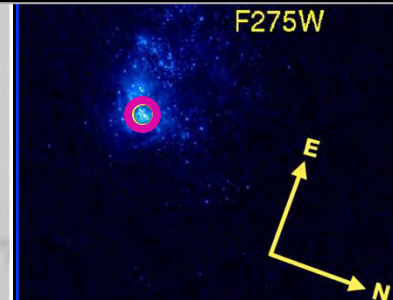
SBS0335 - 0.03 $Z_{\odot}$



SBS1415- 0.08 $Z_{\odot}$



UGCA281- 0.15 $Z_{\odot}$



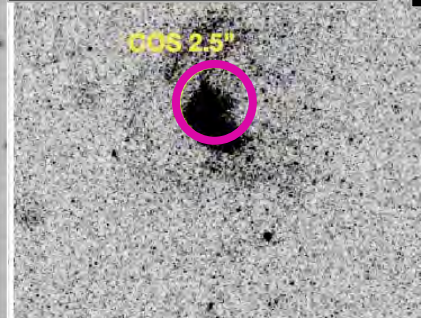
Mrk71 - 0.15 $Z_{\odot}$



NGC1705- 0.2 $Z_{\odot}$



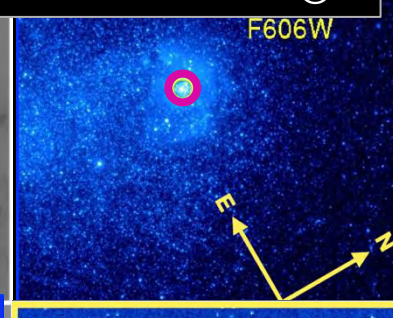
DDO68 - 0.03 $Z_{\odot}$



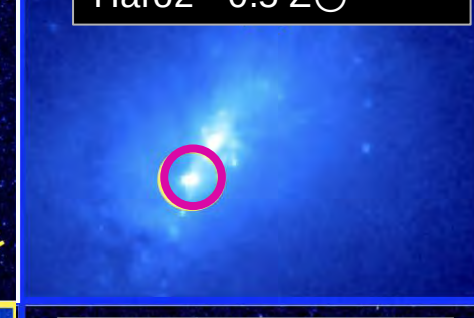
NGC4670- 0.35 $Z_{\odot}$



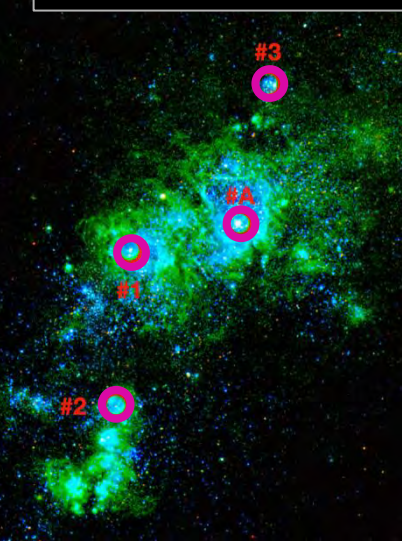
UGC4483- 0.07 $Z_{\odot}$



Haro2 - 0.5 $Z_{\odot}$



NGC4214 - 0.3 $Z_{\odot}$



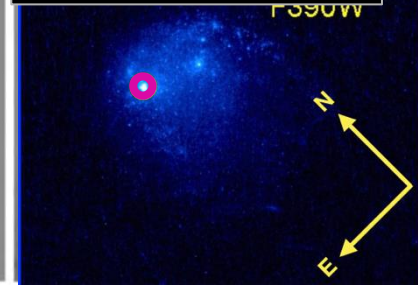
NGC4449- 0.4 $Z_{\odot}$



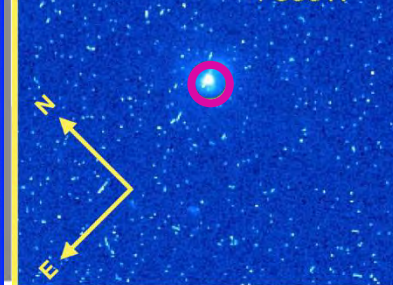
NGC3690 - 0.7 $Z_{\odot}$



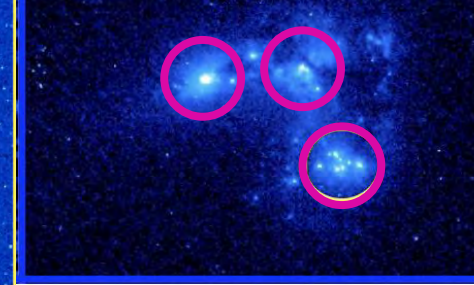
UM461 - 0.1 $Z_{\odot}$

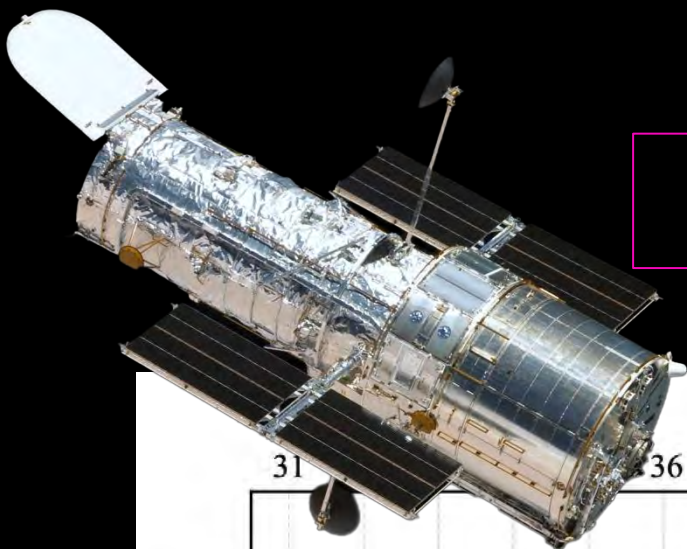


Pox186 - 0.15 $Z_{\odot}$



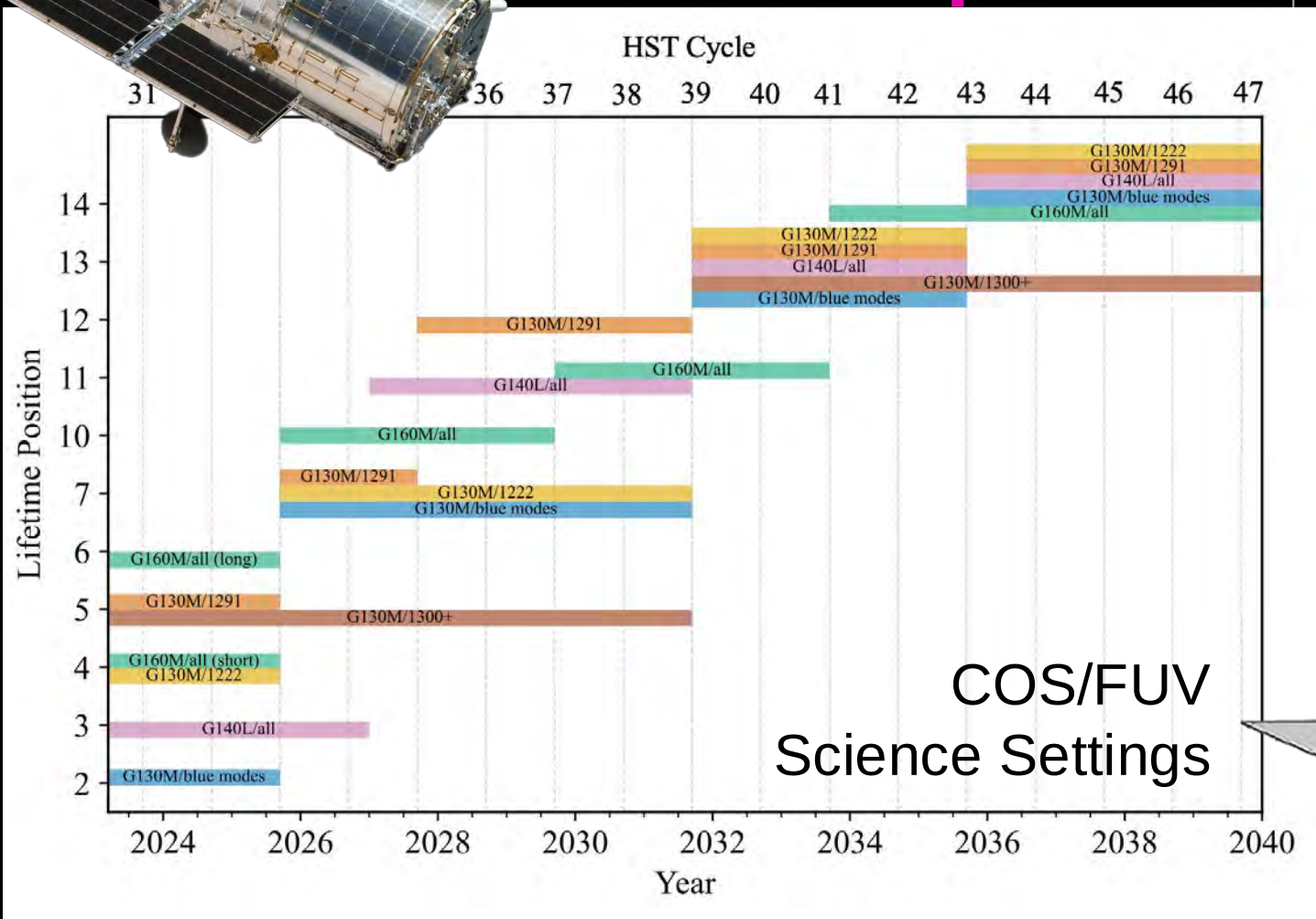
Haro11 - 0.3 $Z_{\odot}$





Shrinking the UV Gap

- HST/FUV spectroscopy will remain essential until HWO, due to its medium-resolution observations
- Legacy programs will address questions about massive-star feedback at low metallicity while establishing critical empirical benchmarks and precursor science for HWO



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