The Impact of JWST on the Stellar Initial Mass Function (IMF)



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Indirect estimates suggest that the IMF depends on galactic properties



Indirect estimates of the IMF include:

-- Spectral line fitting

(e.g., Conroy & van Dokkum 2012, Conroy et al 2013, La Babera et al 2013)

-- Dynamical modeling

(e.g., Cappellari et al. 2012, Treu et al 2011, Dutton et al 2013) Indirect results consistently suggest that higher mass galaxies have steeper IMFs (more low mass stars).

IMF depends on global galaxy properties.

Direct measurements suggests IMF is universal in varying environments throughout Milky Way

Indirect results consistently suggest that IMF depends on global galaxy properties

Need to directly measure IMF in galaxies distinct from the Milky Way



The dwarf galaxy satellites offer opportunity to *directly* measure IMF beyond the Milky Way.

Direct Measurements of the IMF



MW: Bochanski et al (2010) SDSS star counts SMC: Kalirai et al (2013) 121 ACS orbits Ursa Minor: Wyse et al (2002)

12 WFPC2 orbits

IMF slopes are inconsistent with MW, but at 2-sigma level

The Satellites of the Milky Way

The dwarf galaxy satellites of the Milky Way offer opportunity to *directly* measure IMF in a galaxy other than the Milky Way.



The ultra-faint galaxies discovered in SDSS since 2006 offer new chance to measure IMF in environment different from Milky Way.

Direct Measurements of the IMF



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20 ACS orbits

Coma: in prep 24 ACS orbits

Direct Evidence for IMF Variations

Direct evidence for systematic IMF variations with galactic environment.



IMF Studies in the Infrared

Low mass main sequence stars produce more flux in the infrared



-- At optical wavelengths, the goal of 0.1 M_{sun} is beyond HST capability

-- In the infrared, 0.1 M_{sun} can be achieved for only nearest Milky Way satellites

IMF Studies in the Infrared - WFC3



HST Cycle 21 WFC3 award to measure IMF of one UFD down to 0.17 M_{sun}

Stay tuned: Data taken last week!

IMF Studies in the Infrared -- WFC3 vs. JWST

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JWST will open a new era of direct IMF studies

Key Question: Does IMF depend on global galaxy properties, if so why?