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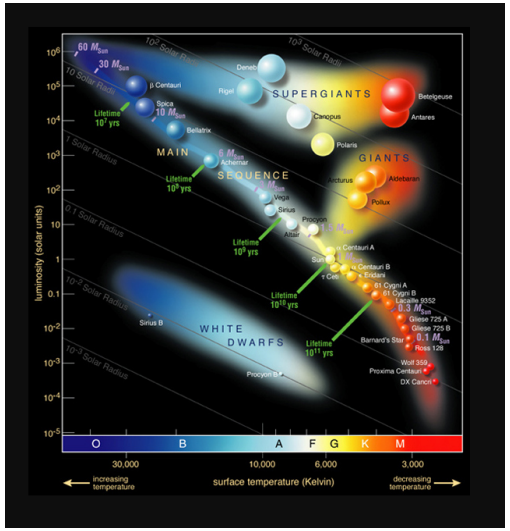
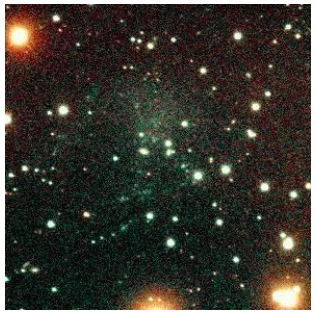
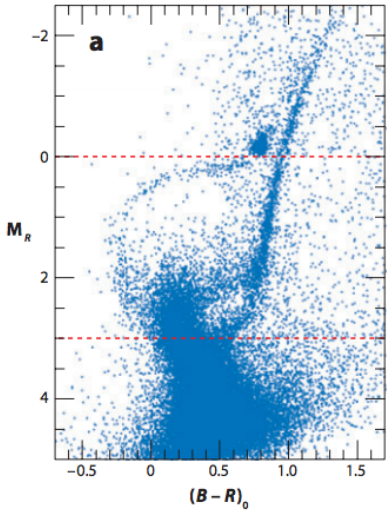


So what is this?





2

Giant Branch

Red Clump

Horizontal Branch

MSTO

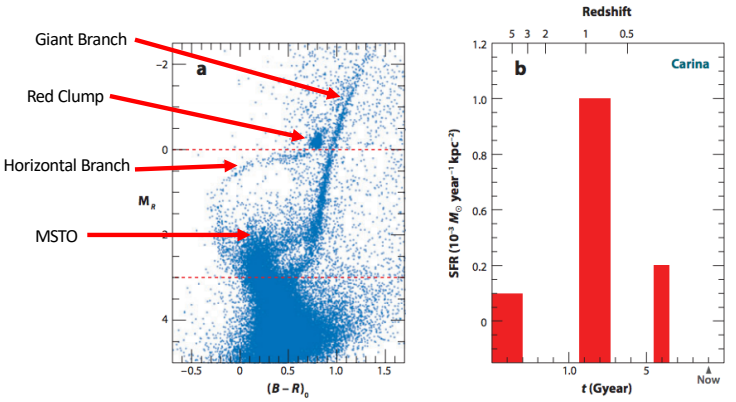
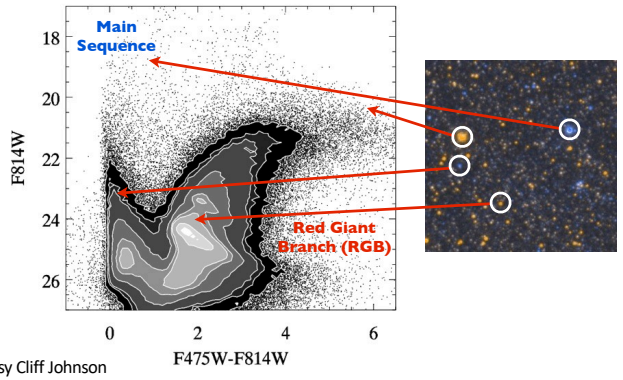


Figure 4

(*a*) A color-magnitude diagram of the Carina dwarf spheroidal (obtained by M. Mateo with the CTIO 4-m and MOSAIC camera, private communication) in the central 30′ of the galaxy. This clearly shows the presence of at least three distinct MSTOs. (*b*) The star-formation history of the central region of Carina determined by Hurley-Keller, Mateo & Nemec (1998), showing the relative strength of the different bursts. The ages are also shown in terms of redshift.

The Color-Magnitude Diagram (CMD)

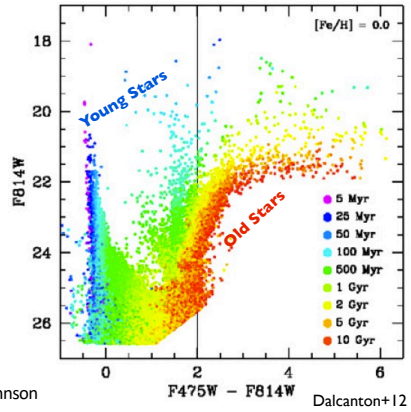
Real galaxies ....



Courtesy Cliff Johnson

4

Age Dating with CMDs



Courtesy Cliff Johnson

Dalcanton+12

Isochrones

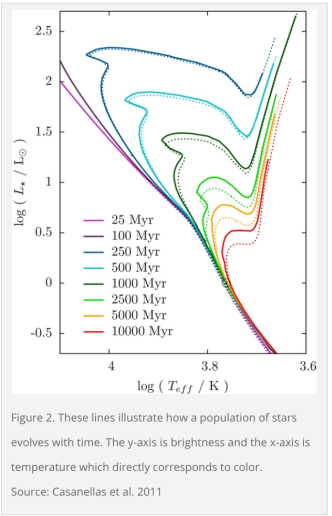
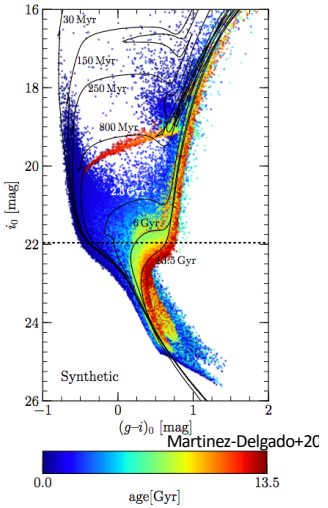


Figure 2. These lines illustrate how a population of stars evolves with time. The y-axis is brightness and the x-axis is temperature which directly corresponds to color.

Source: Casanellas et al. 2011

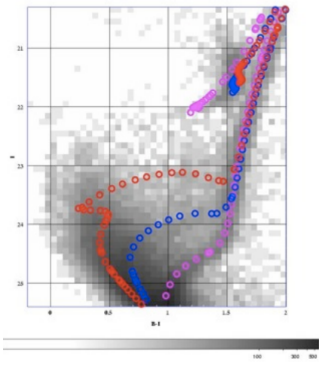


Martinez-Delgado+2C

6

eriving SFH from CMDs: SFH of a quenched dwarf: Leo I

$M_* \sim 5 \times 10^6 M_\odot$



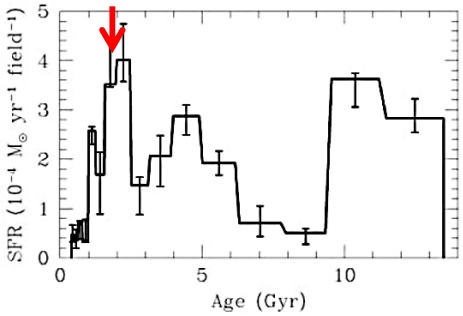
mecker-Hane in prep, Gallart+1998

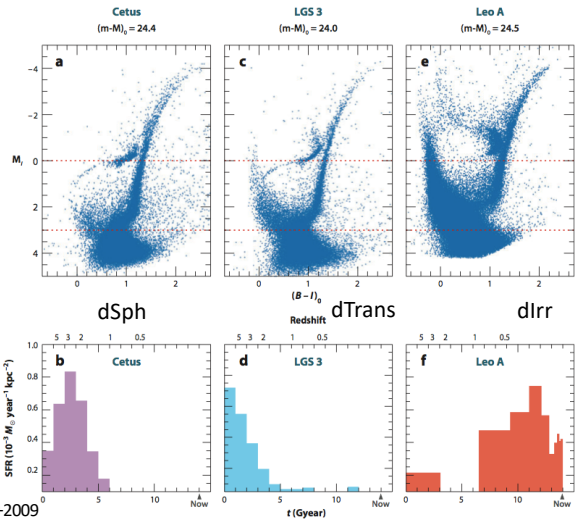
Orbits: HST Proper motions

Accretion by Milky Way

2 Gyr ago (Sohn, GB+2013)

Rapid quenching (Wetzel+2015)





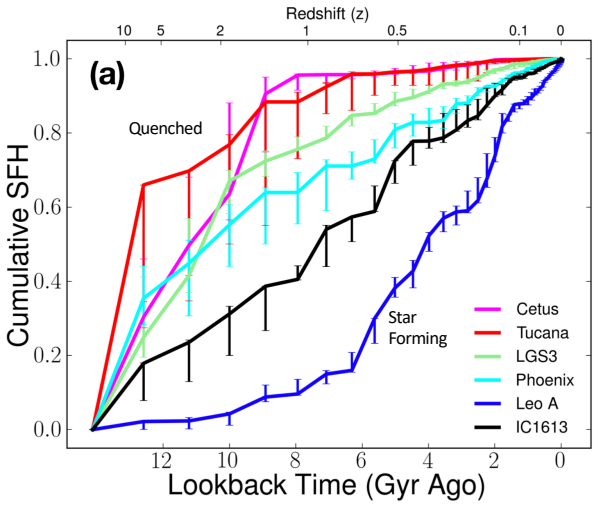
Tolstoy+2009

8

Cumulative SFHs

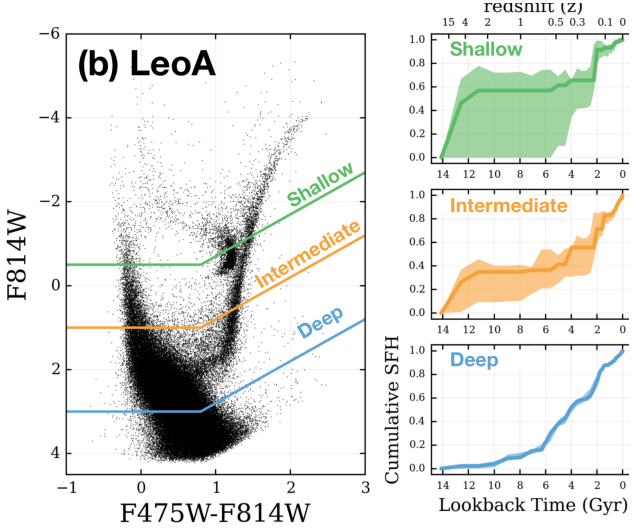
The SFHs of isolated (>300 kpc from the MW/M31) dwarf galaxies measured from deep CMDs (Skillman et al. 2014). The varied SFHs trace their diverse assembly history. *HST* can only provide deep CMDs for 9 isolated galaxies, while *JWST* can access hundreds.

WST ERS Proposal
PI Weisz



The Need for JWST

JWST ERS Proposal
PI Weisz



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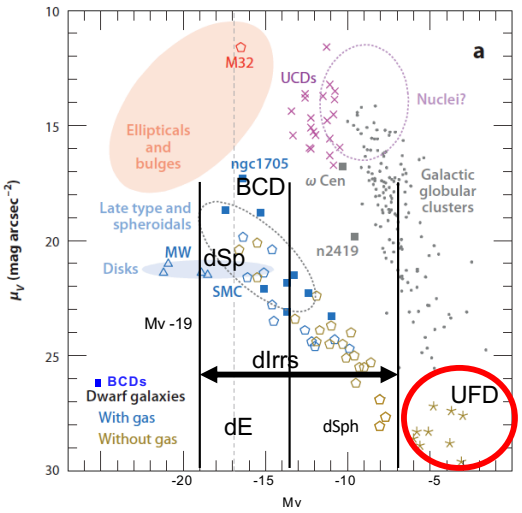
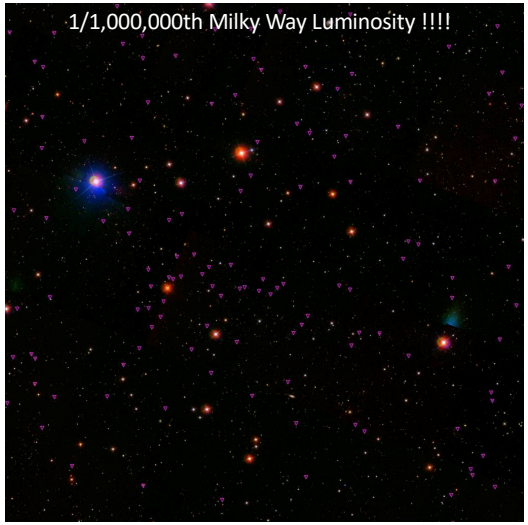
Ultra Faint Dwarfs
$M^* < 10^5\ M_\odot$



Tolstoy+ 2009

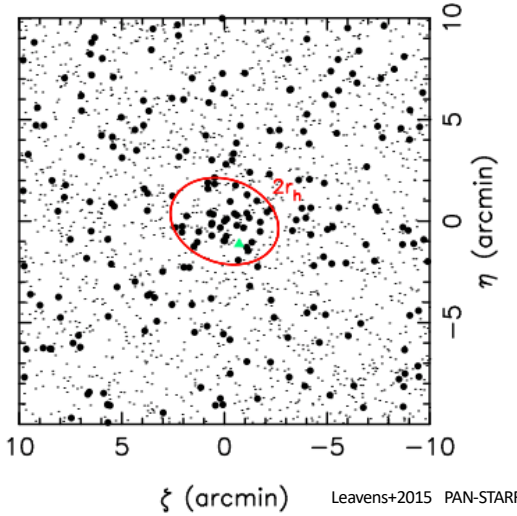
Ursa Major I:

Willman + 2005



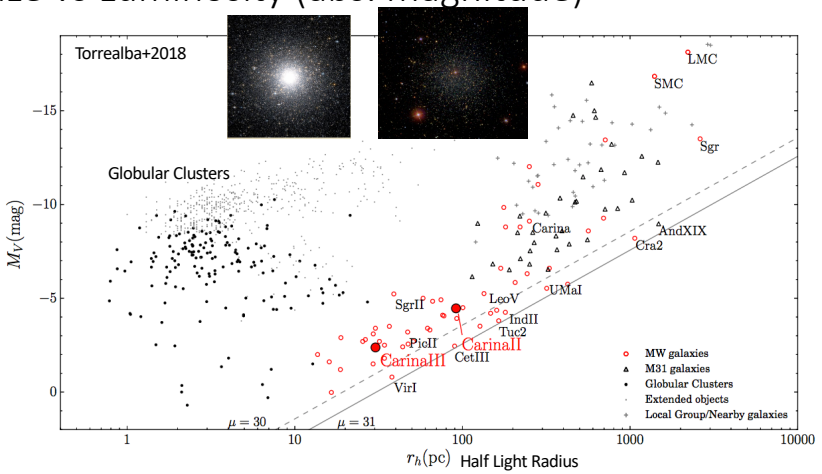
Diameter
~ 13000 Ly

12



Leavens+2015 PAN-STARRS discovery paper

Size vs Luminosity (abs. magnitude)



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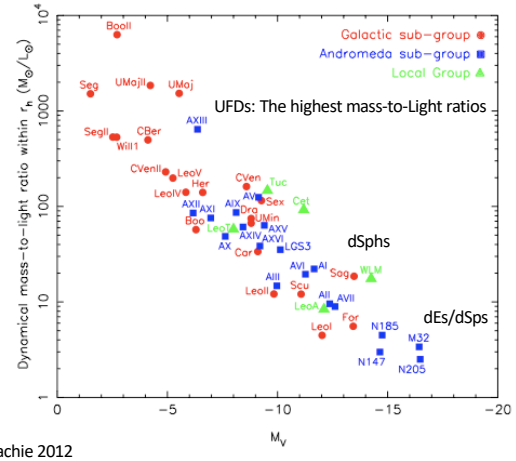
$M_{Dynamical}$ /L Ratios

Segue (Seg) only has a stellar mass of 340 Msun!



McConnachie 2012

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Isochrone fitting to CMDs of UFDs

Green Isochrone:
Old: 13.2 Gyr,
Metal Poor [Fe/H] = -2.3

Single age population.

Brown+2014 ApJ 796

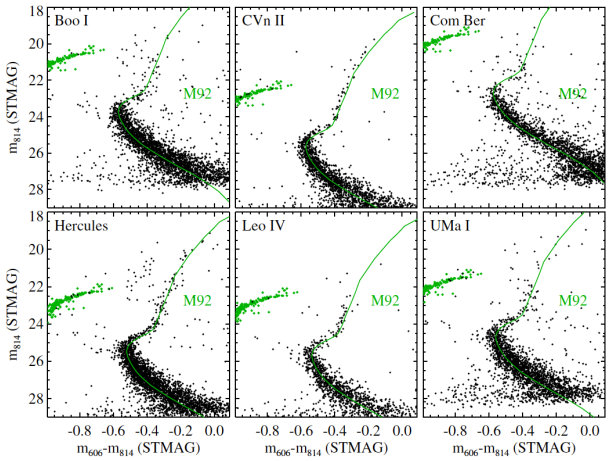


Figure 1. CMD of each UFD in our sample (black points). For reference, we show the empirical ridge line for the MS, SGB, and RGB in M92 (green curve), alon with the HB locus in M92 (green points). The M92 fiducial has been placed at the distance and reddening for each galaxy (Table 1), matching the luminosity of H stars and the color of the lower MS stars. Because the CMD of each galaxy looks, to first order, like that of a ancient metal-poor globular cluster, the stellar populatic of each galaxy is dominated by ancient metal-poor stars. The CMDs of these galaxies are all extremely similar to one another, implying they have similar stell populations and star formation histories.

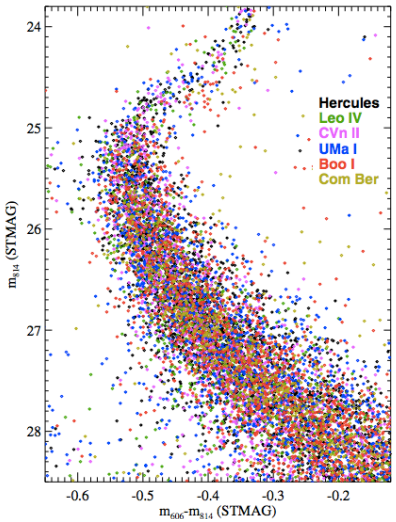
16

Brown +2014

CMD of each UFD (colored points) shifted to the distance and reddening of Hercules dwarf and zoomed into the CMD region most sensitive to age.

The similarities of the six CMDs imply that the UFD populations are extremely similar in age and metallicity.

A global event caused quenching



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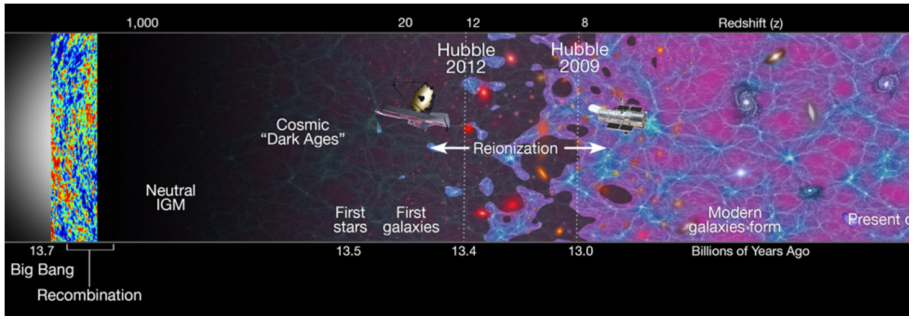
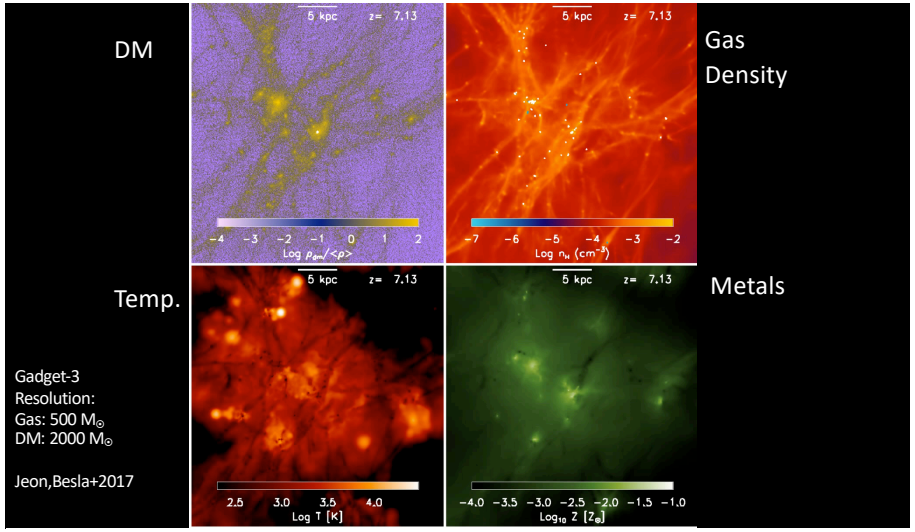
Reionization
z ~ 10-6 ?



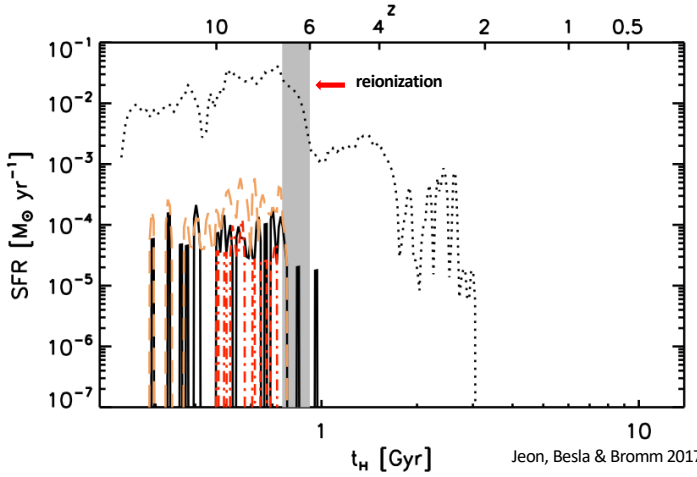
Reionization is Patchy: https://www.youtube.com/watch?v=kifF3RYcfn0

20



SFHs: Reionization + Feedback

Onorbe+2015,
Wheeler+2015,
Simpson+2013
Corlies+2018



Jeon, Besla & Bromm 2017

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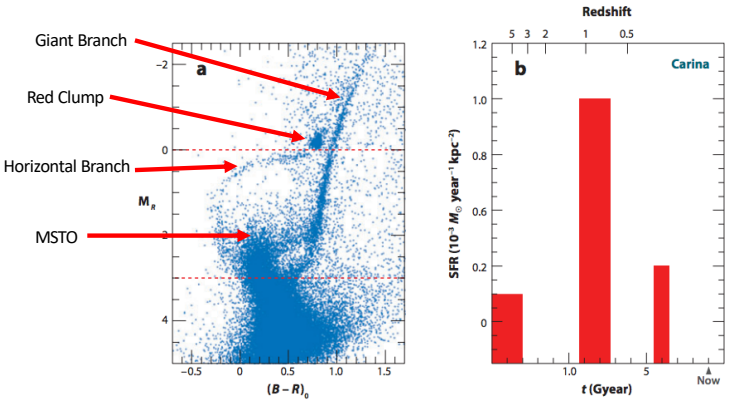
Reasons for why Satellite Galaxies are quenched

- Tidal Sharing
- Ram Pressure Sharing
- Preservation (cut off of gas supply)

But for the smallest galaxies,
Feedback from stars
&
Reionization
Also matter.



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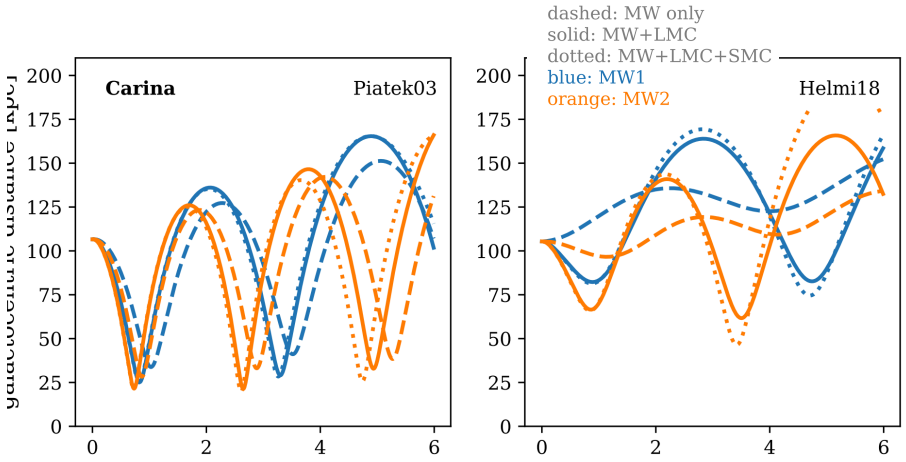

Patel + 2020. arXiv:2001.0174