A trimodality in the distribution of star formation in galactic bars

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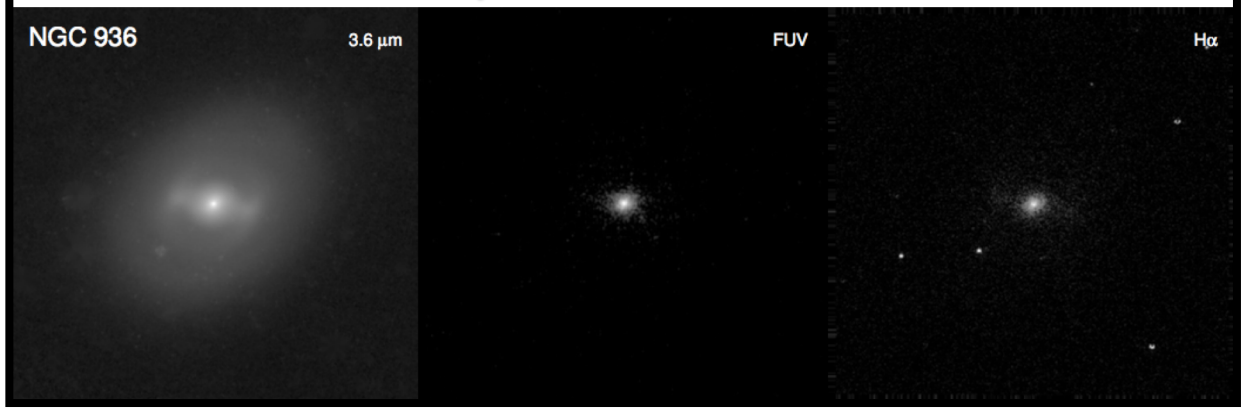
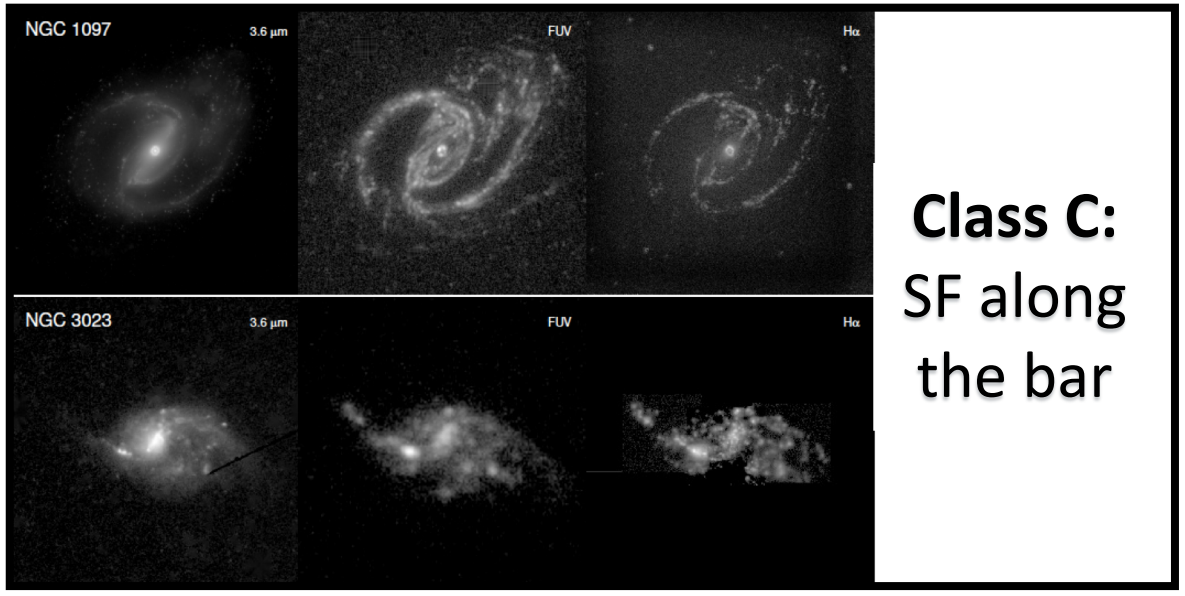
We report a trimodal behaviour of the spatial distribution of ionised gas within bars in the S^{4}G survey, in which star-forming bars are most common among late-type galaxies. We use archival *GALEX* far- and near-UV imaging for 772 barred galaxies and a compilation of 433 continuum-subtracted Hα images. We use both stacking techniques and visual classifications. Bars are important agents in the regulation of the star formation activity, sweeping the disk gas and triggering central starbursts.

Bars are known to gradually funnel gas to the central parts of disk galaxies. Yet, it remains a matter of debate why the distribution of ionized gas along bars and in the circumnuclear regions varies among individuals.

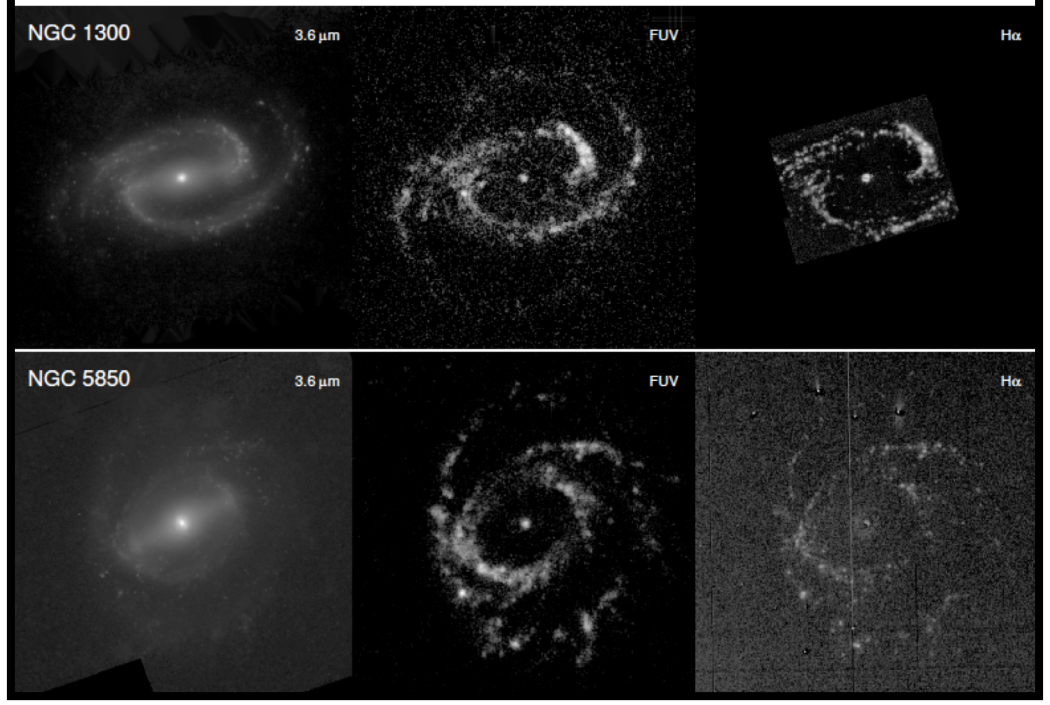
Class A: Only circumnuclear SF





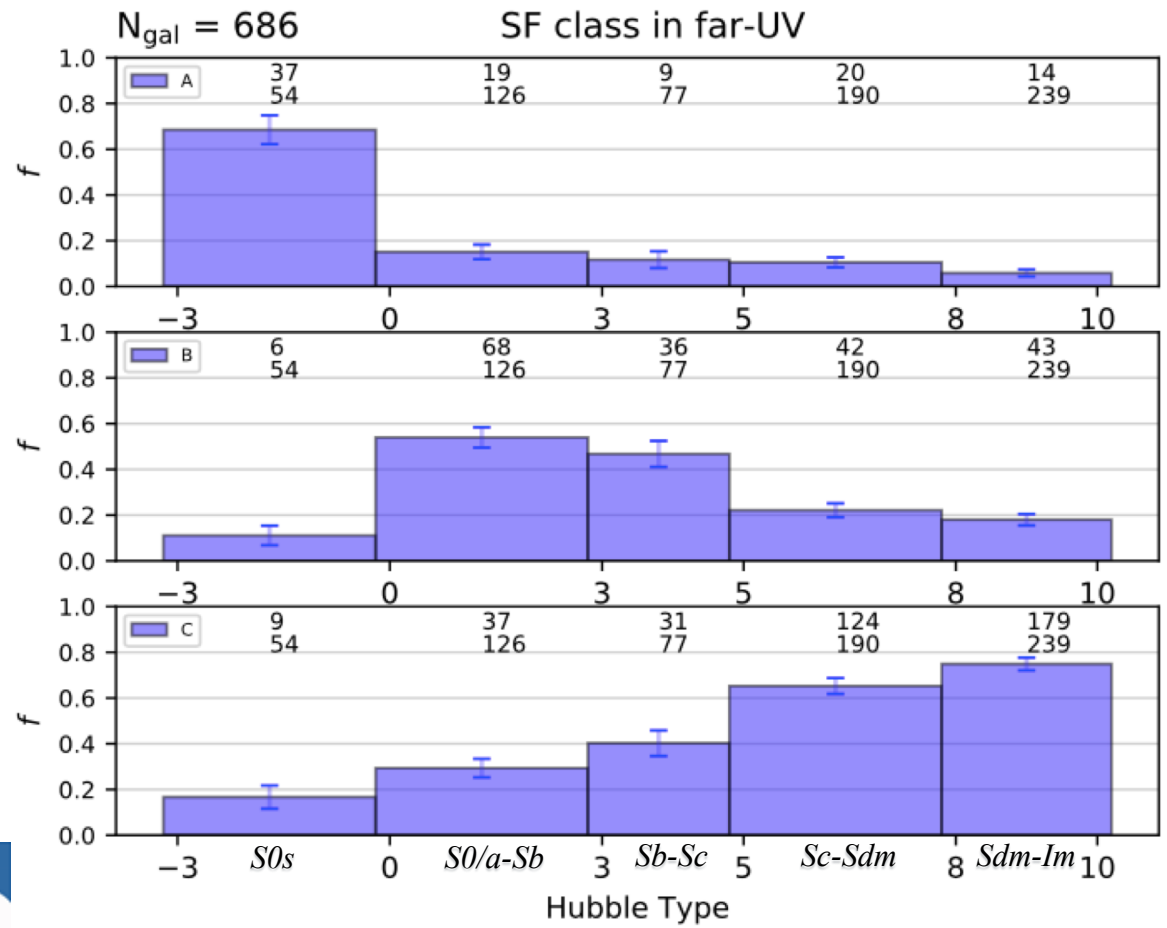
Class C: SF along the bar

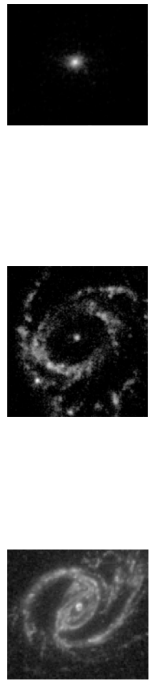
Class B: SF at bar ends, but not along the bar

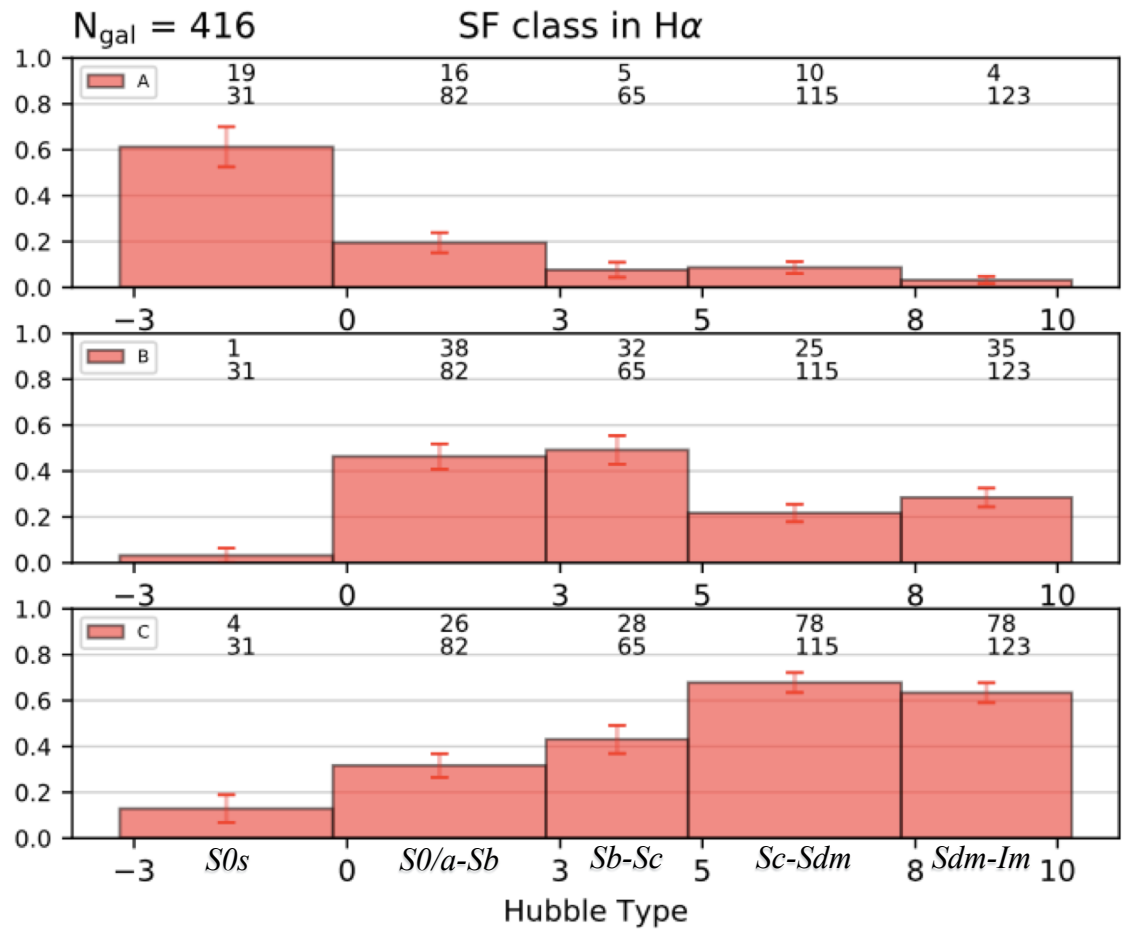


Visual classification of the distribution of SF within bars *by Facundo D. Moyano*. *See also Verley et al. 2007, Neumann et al. 2020, Fraser-McKelvie et al. 2020*

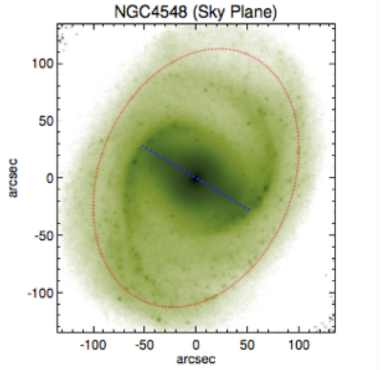
Lenticulars host SF exclusively in the circumnuclear regions.
SF only at the bar ends is typical of early- and intermediate-type spirals.
Star-forming bars are common among late-type galaxies.

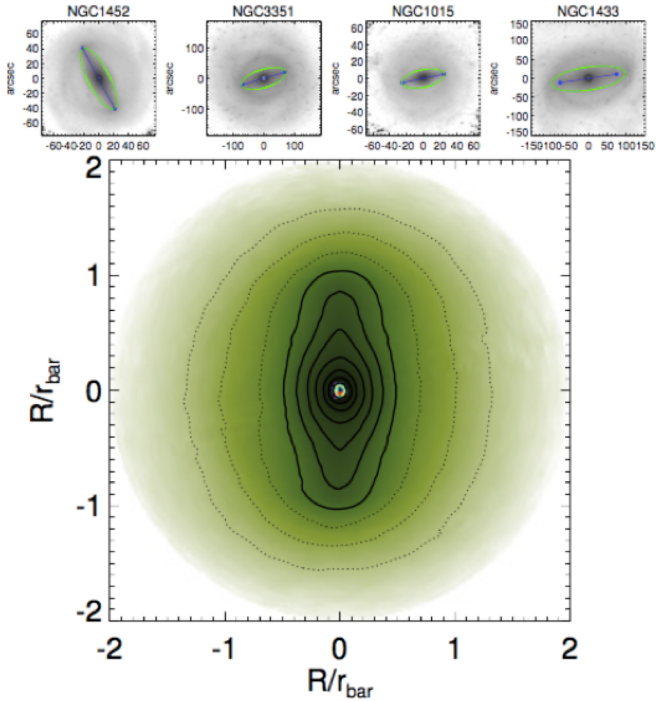






Díaz-García et al. (2016, A&A, 596, A84) click here





E.g. SB galaxies with -1<T<1

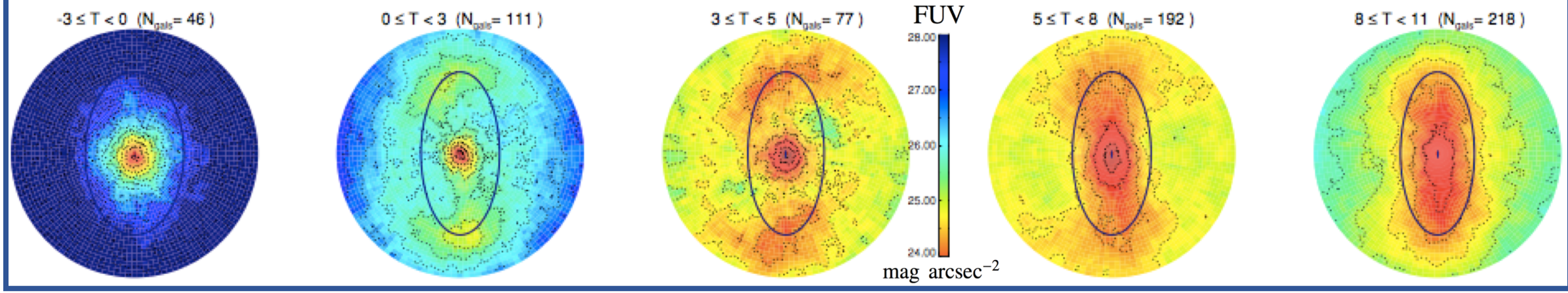
SF distribution studied via bar stacks: built from co-added images, oriented and re-scaled with respect to the stellar bars, of 100s of galaxies that are binned based on their morphological type (T)

Old stars

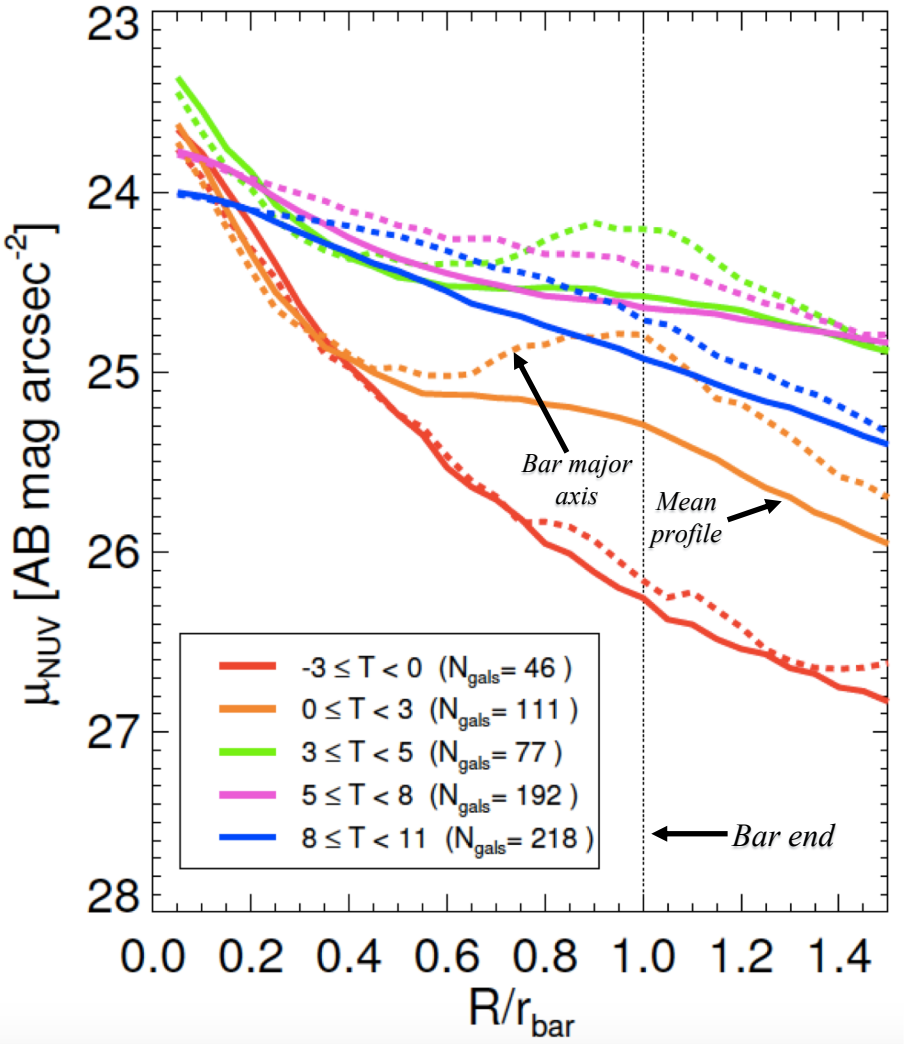
Spitzer
3.6 microns

Star formation

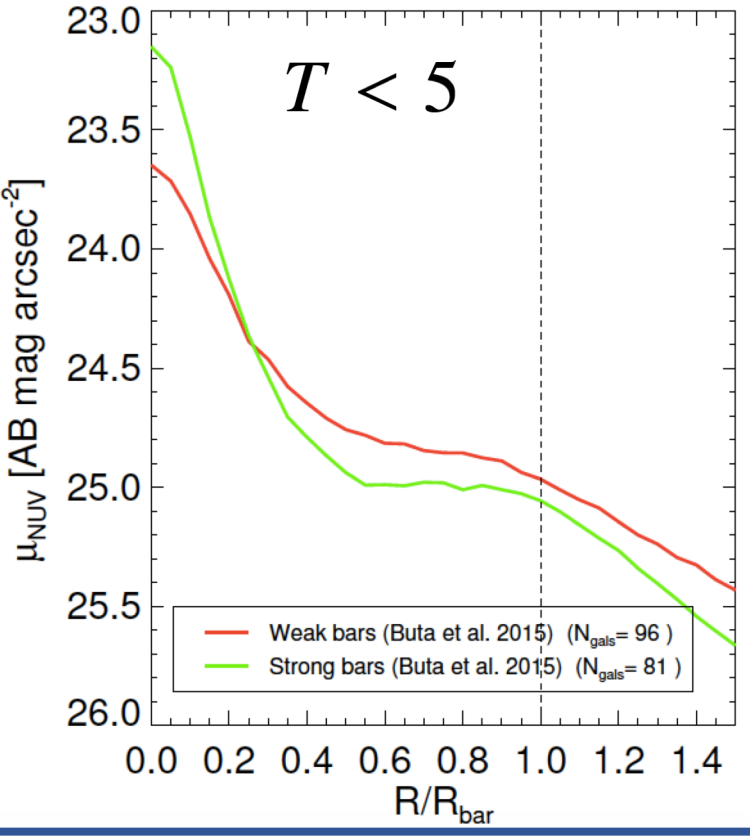
GALEX far-UV
Bouquin et al. 2018



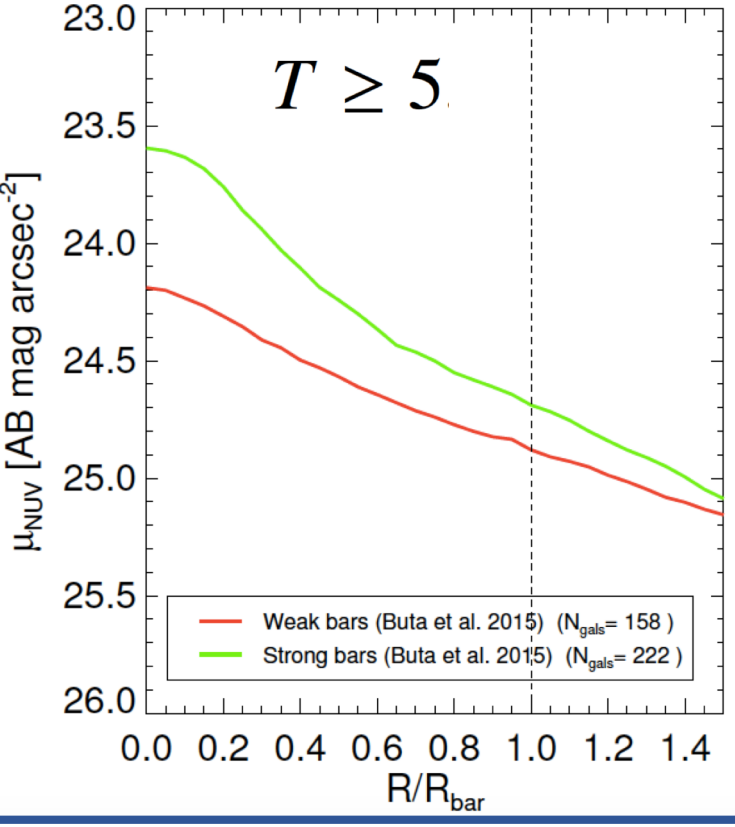
Azimuthally averaged UV profiles extracted from bar stacks



Among early-types, strongly barred galaxies have 1/2 magnitude brighter central UV emission wrt weakly barred counterparts (that show a larger emission in the bar middle/end parts).



The SF in Sc-Im galaxies is evenly distributed along the bar major axis, and the UV emission is on average larger at all radii among strong bars.



Some concluding remarks

Trimodal behaviour of the distribution of star formation (SF) in galactic bars:

A) Lenticulars: circumnuclear SF (*bar-induced quenching?)*

B) Early- and intermediate-type spirals: SF at bar ends, but not within the bar (*interplay of gas flow, shocks, and shear?)*

A) Late-type galaxies: star formation along bars (*lower shear?*)

Our observations for early-type galaxies are consistent with the effect of bar-induced gravitational torques sweeping the gas in the disk, that eventually fuels starbursts in the central regions (e.g. Sellwood & Wilkinson 1993)

Díaz-García et al. (in prep)

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