Barred galaxies offer a perfect bench-tool for investigating recent star formation (SF) in galaxies. Bars and their surroundings host extreme physical conditions and a variety of ISM environments. We have a rather good understanding of the gas behavior under a potential, and this knowledge can be used to understand conditions triggering SF. This makes bars perfect places to study the galaxy dynamical features which trigger and inhibit star formation. We present a detailed study of the photometric properties of the HII regions of the bars of NGC 1530 and NGC 2903 and their links to their respective bar dynamical features. For NGC 2903 we also present a multi-wavelength study revealing the recent star formation history (SFH) of the bar.

NGC 1530

NGC 1530 is a strong barred, close-by-isolated galaxy with regions of current SF along the bar. The Ha equivalent width (EW) of the HII regions located furthest away from the bar dust lane at the leading side are lower by a factor ~ 4 - 5 than the other HII regions (Fig. 2). After detailed investigation we have concluded that only age can account for this measured difference, which implies that the regions with lower EW located at the leading side of the bar dust lane are 1.5 - 2.5 Myr older on average than the ‘young’ regions located close to the bar dust lane [2].

UV color distribution

We derived the FUV - NUV color of bright UV regions in the bar and surrounding zone of NGC 2903. Dust extinction correction was applied to the regions using 24 μm and Hα emission. We found several bright UV complexes with colors ~0.4 mag redder than the rest of the galaxy (Fig. 3). These red complexes are located at the end of the bar and at the Northwest and South-east of the galaxy nucleus, perpendicular to the bar (Fig 7). They show 24 μm and Hα emission counterparts, and especially the UV complex perpendicular to the bar close to the nucleus have no such emission in their vicinity. Stellar population synthesis models (StellarModelling) have been used to estimate the ages of the SF complexes. The blue complexes have ages of tens of Myr, whereas the red regions have ages in the range ~150-300 Myr. Their ages, combined with the lack of HI emission suggests that these locations are currently not favored by the bar potential to form stars. An ongoing kinematic study of NGC 2903 will shed some light on the origin of these complexes.

Star formation vs. dynamics

The lack of HI regions at the trailing side of the bar dust lane (Fig 5), combined with no trend in HII region age, indicates that the location of star formation is not well defined as in NGC 1530, or at least is not as clearly driven by star bar dynamics. This is emphasized by the broken wide structure of the bar dust lanes (Fig 5), complex morphology [1] and velocity gradients by far not as strong as in NGC 1530. These features suggest a less strong bar as compared to NGC 1530, which leads to a completely different SF distribution and SFH, although both galaxies have recent SF along their bars (3). It shows how essential the dynamics of a galaxy is to understand where and when SF was triggered.

Conclusions

- The dynamics of a galaxy is essential to understand where and when star formation was triggered.
- We found a spatial correlation in NGC 1530 between HI regions location, age, dust spurts and velocity gradient parallel to the bar.
- This correlation supports the star formation on the trailing side of the bar dust lane and cross the bar as they age.
- Lack of correlation between young regions, age and dust spurts in NGC 2903 may suggest the bar is not as defined as in NGC 1530.
- The FUV-NUV colours are distributed in the red regions and their colors range from ~1.8 to 0.15 implying an age of ~3 to 10 Myr. The redder regions have colours ranging between 0.4 to 0.85 which imply ages ranging from 150 to 400 Myr. The latter corresponds to regions with no significant Ha nor 24 μm emission.
- Both NGC 1530 and NGC 2903 show a clear offset between regions of massive star formation and high residual velocity and residual velocity gradients. Star formation in NGC 1530 is inhibited by shear, whereas shocks enhance the star formation.

References:
[3] Popping et al., submitted

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