Star-formation driven galactic winds in UGC 10043

CALIFA Survey

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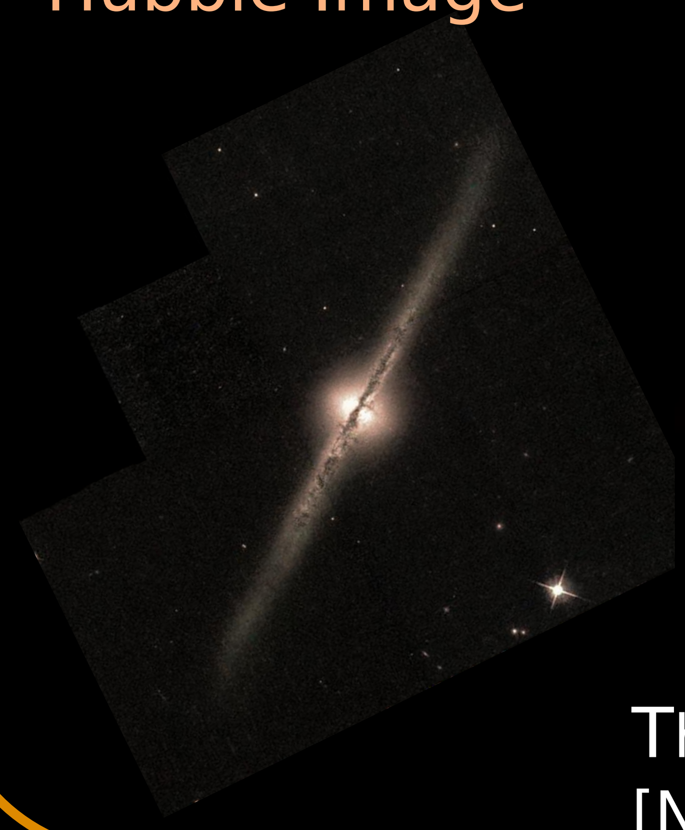
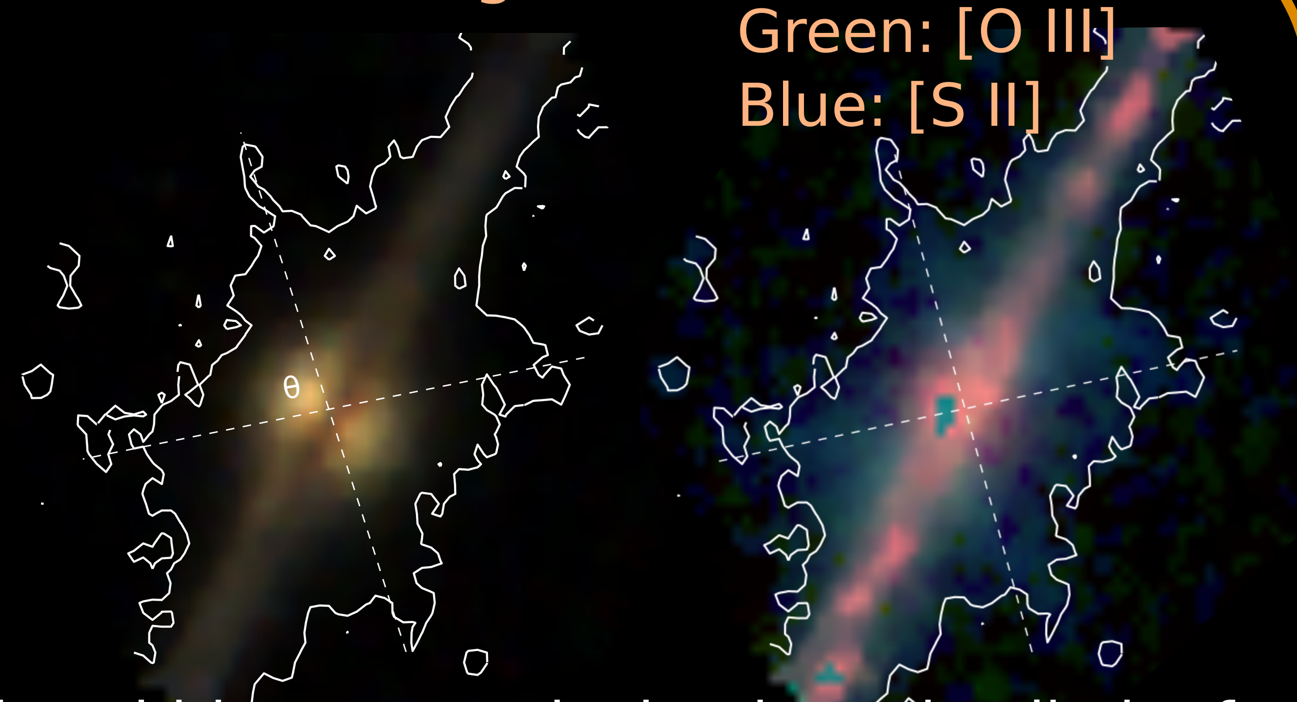
Hubble Image



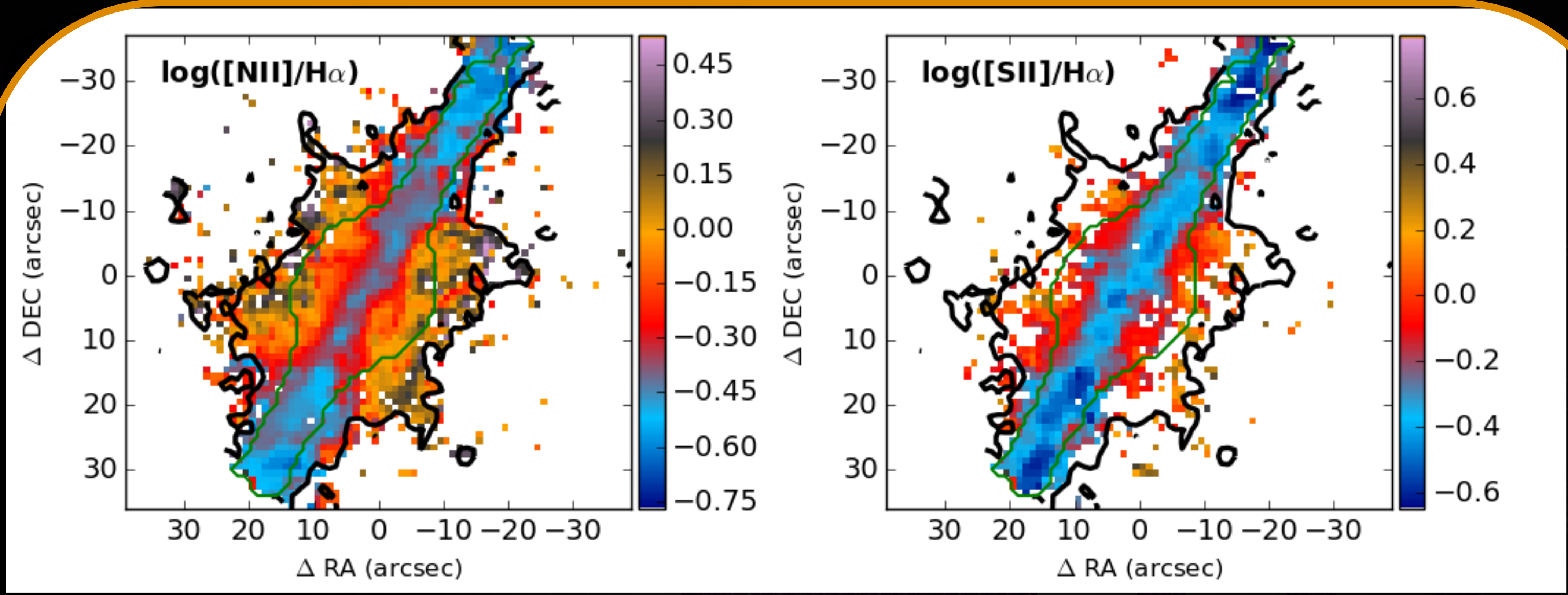
CALIFA Image

Red: Ha
Green: [O III]
Blue: [S II]

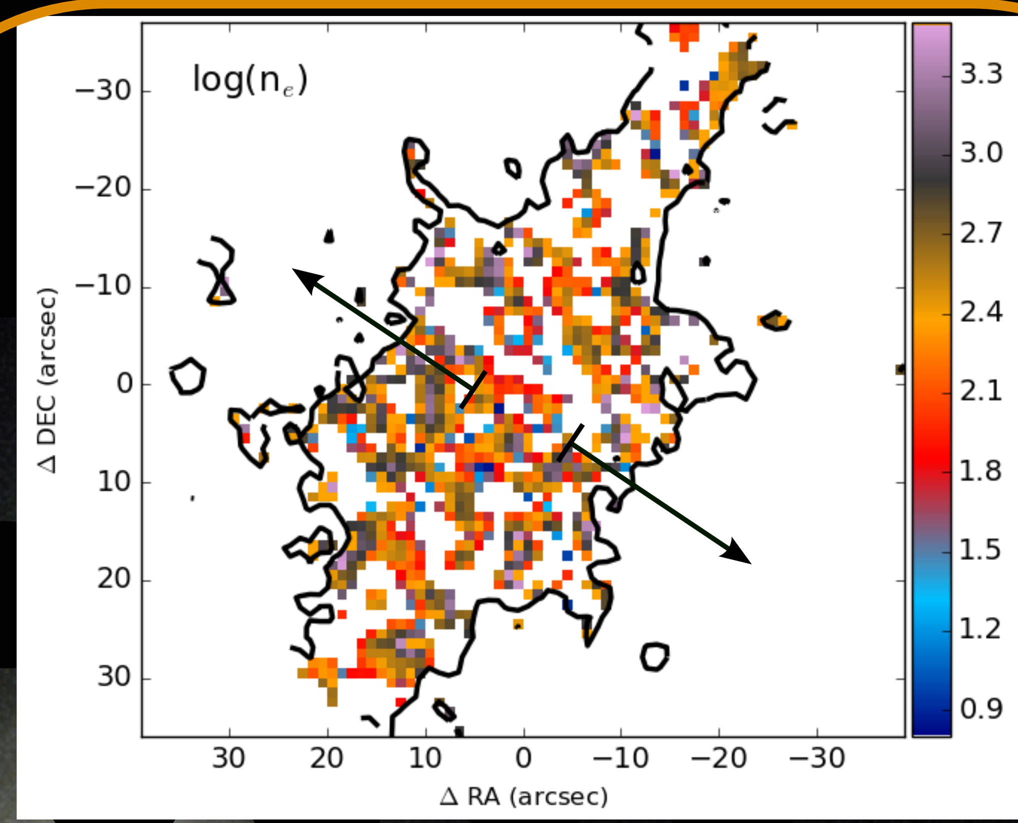


The whithe contour is the detection limit of [NII]

We have discovered a galactic wind driven by a recent star formation in the nucleus of UGC 10043. This wind is described by a slow shock velocity model and a gradient in the electron density. The wind is detected up to 3 ~ kpc above the galactic disk. Due to the effect of inclination (~90°) we observe an apparent discrepancy between the star-formation and the energy supplied by the wind.

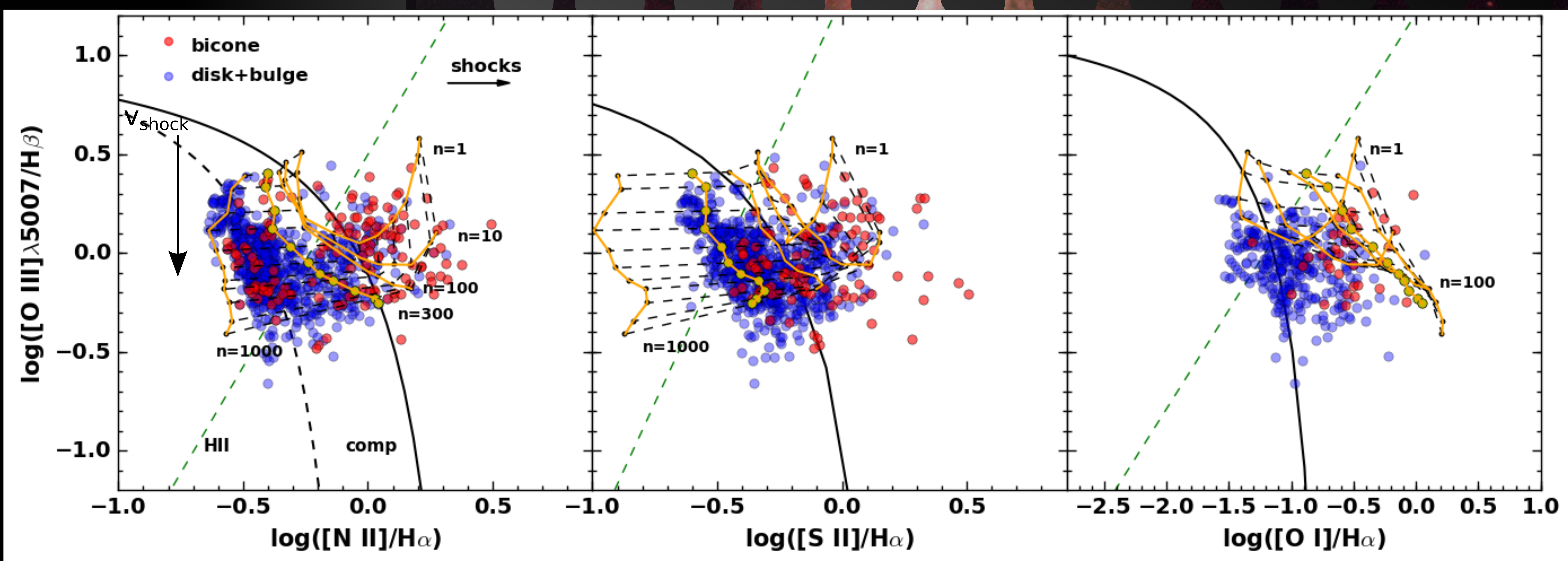


Emission line ratio maps showing a change in the ionization conditions from the galactic plane towards the biconical structure. The emission in the disk is consistent with starformartion, while the extraplanar emission could be produced by either shocks or DIGs. The green and black contours separates the disk from the outflow region.



Electron density map determined with the [SII] line ratio. Due to the high density toward the cones, we discard the source of the extraplanar emission as DIG emission. At the disk n_e ~ 200 cm^{-3}

Diganostic diagrams for some line rations sensitve to ionizations sources together the shock models from MAPPINGS in orange. The extraplanar region is described for a wind with a velocity shock ranging in ~ 100 - 400 km s^{-1} and electron density increasing toward the cones. The diagonal dotted line is the demarcation from shocks and AGN ionization according to Sharp & Bland-Hawthorn, 2010. The red dots are spatially located at the bicones while the blue dots are those located at the disk and bulge region.



The energy carried out by the outflow was estimated from the typical superwind models velocities in the range v_w ~ 1000 - 3000 km s^{-1} (Hopkins, 2013) and a distance 3 kpc in : E_{wind} = [9.2 - 27.7] x 10^{41} erg s^{-1}. If we compare the injection rate predicted by SN and stellar winds due to star-formation (Veilleux et al 2005):
E= 7x10^{41} SFR/(M_{sun}yr^{-1} for the SFR_{Halpa} = 0.34 M_{sun}yr^{-1} we obtain an energy rate at E = 2.5x10^{41} erg s^{-1} which is 3 - 11 times lower than the energy required to produce the outflow if we use the SFR derived with Halpha, meanwhile if we use the SFR derived with IR (SFR ~ 1.56 M_{sun} yr $^{-1}$) we obtain E = 11 x 1041 erg s^{-1}which is the required to support the outflow.