

Star-Forming Regions and Young Star Clusters in M31

Yongbeom Kang^{1,2}, Luciana Bianchi², and Soo-Chang Rey¹

¹ Department of Astronomy and Space Science, Chungnam National University, Daejeon, 305-764, Korea (ybkang@cnu.ac.kr)

² Department of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218, USA (bianchi@pha.jhu.edu)

Abstract We present a study of star-forming regions and young star clusters in M31. We use *GALEX* far-UV and near-UV imaging to detect the radiation from young massive stars and trace the recent star formation across the galaxy. The *GALEX* imaging, combining deep sensitivity and entire coverage of the galaxy, provides a complete picture of recent star formation in M31 and its variation with environment throughout the galaxy. The young clusters distribution exhibit a distinct peak in the M31 disk around 10 – 12 kpc from the center and follow a spatial distribution similar to other tracers of disk structure such as OB stars, star-forming regions. The existence of young star clusters in the outskirts of M31 disk suggests the occurrence of a significant recent star formation in the disk of M31. We studied the recent evolution of M31 from the ensemble of star-forming regions and young star clusters.

Spatial Distribution The spatial distributions of star-forming (SF) regions and young star clusters follow the disk structure of M31.

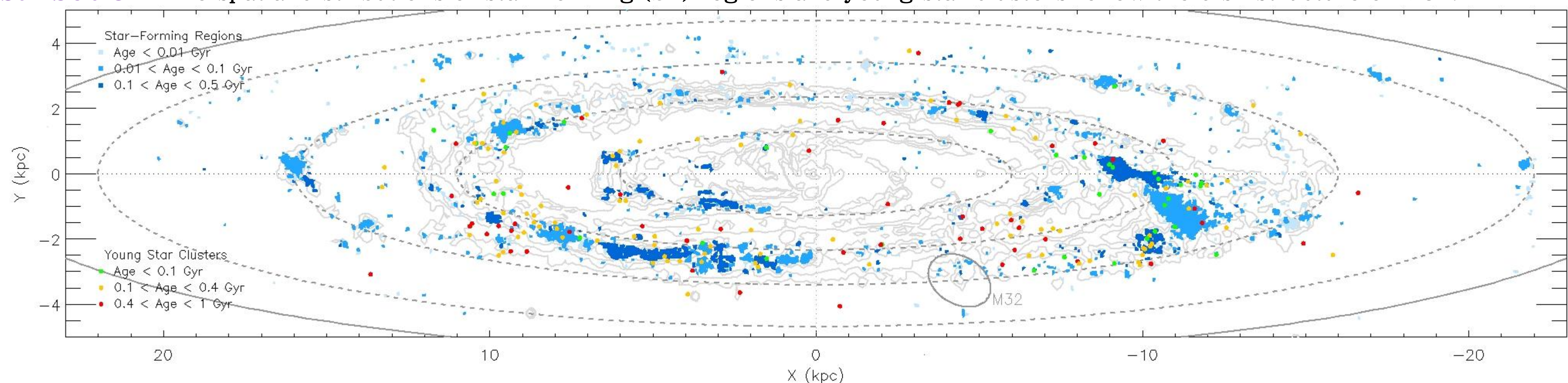


Fig. 1. The spatial distributions of SF regions (blue colored contours) and young star clusters (filled circles) are over-plotted on the Spitzer *IRAC* 8.0 μ m (gray solid-line contour) flux map (Barmby et al. 2006). The dashed ellipses indicate 6, 11, 16, and 22 kpc from the center of M31. The solid ellipse is the disk of M31 (26 kpc radius).

Age Distribution We estimated ages of SF regions and young star clusters by comparing the measured FUV-NUV colors and UV & optical magnitudes with simple stellar population synthesis models (Kang et al. 2009 & 2012).

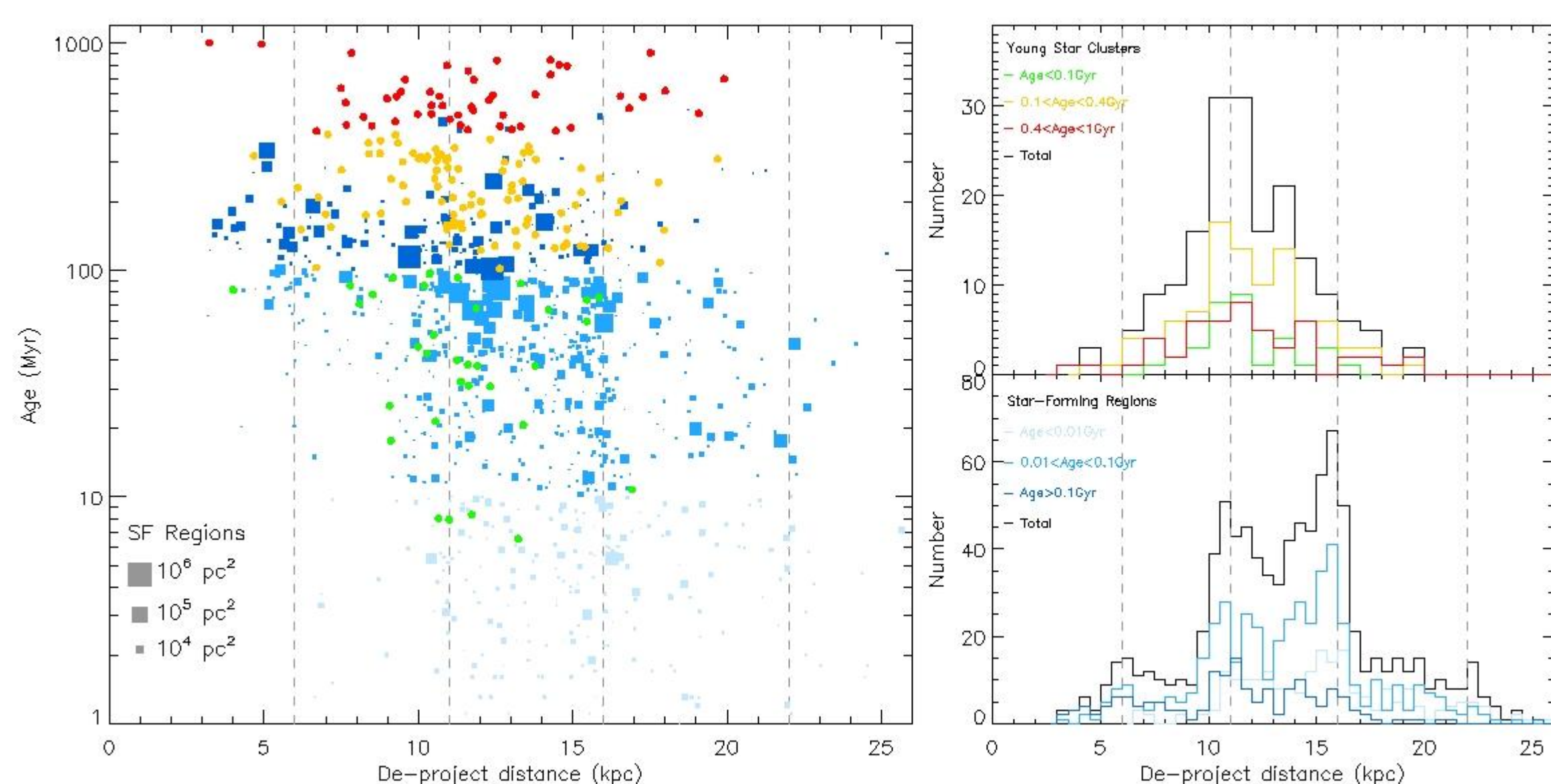


Fig. 2. Age distribution of SF regions (filled boxes) and young star clusters (filled circles) show with the deprojected distance from the center of M31.

HST treasury fields

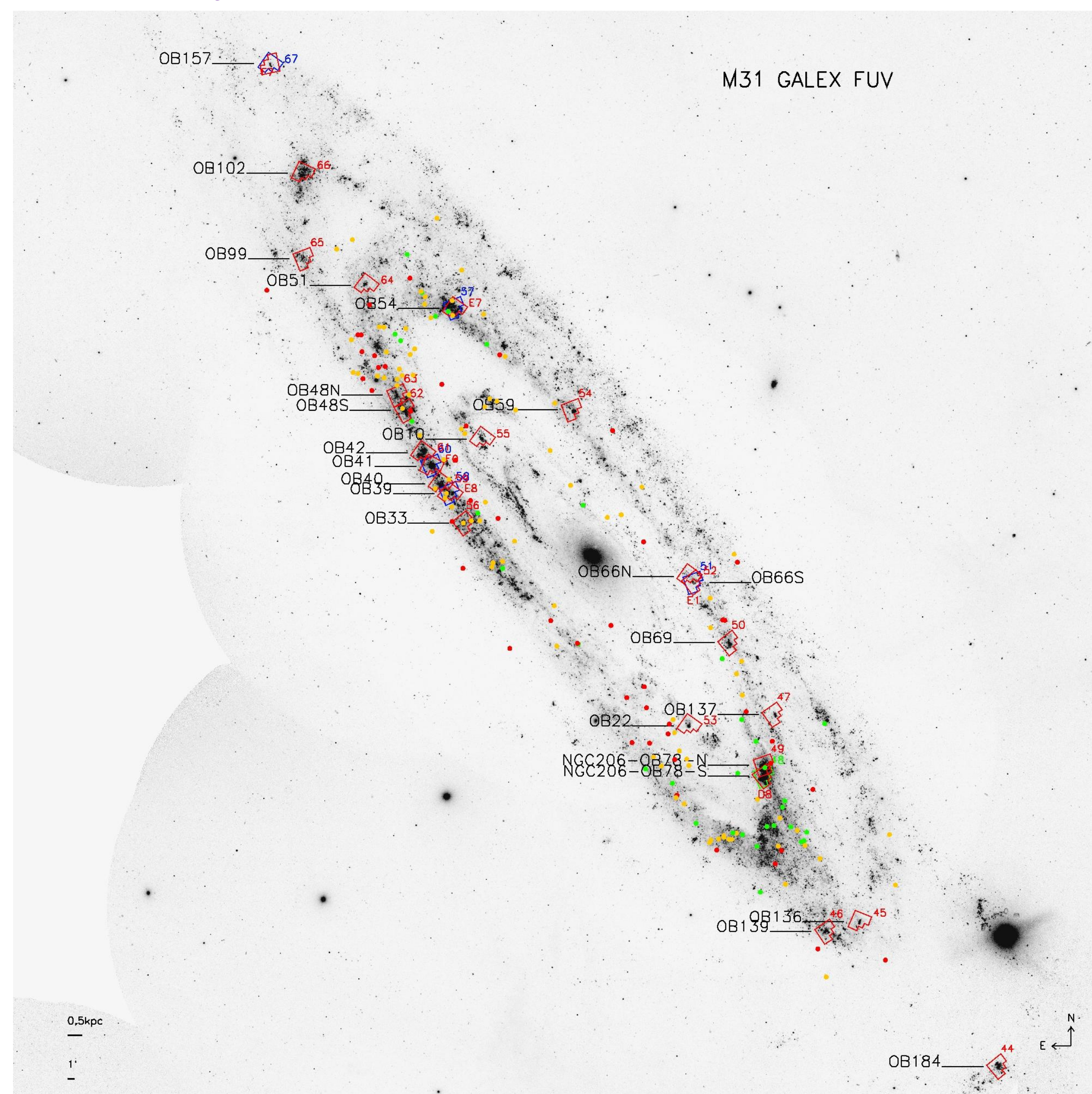


Fig. 3. Young clusters and HST treasury fields (Bianchi et al. 2012a, HST GO-11079) are over-plotted on the *GALEX* FUV image.

SF regions and OB associations We estimated the effective temperature of stars from HST treasury program and defined OB associations from hot ($T_{\text{eff}} > 18\text{ k K}$) stars with different link-distances (Bianchi et al. 2012b).

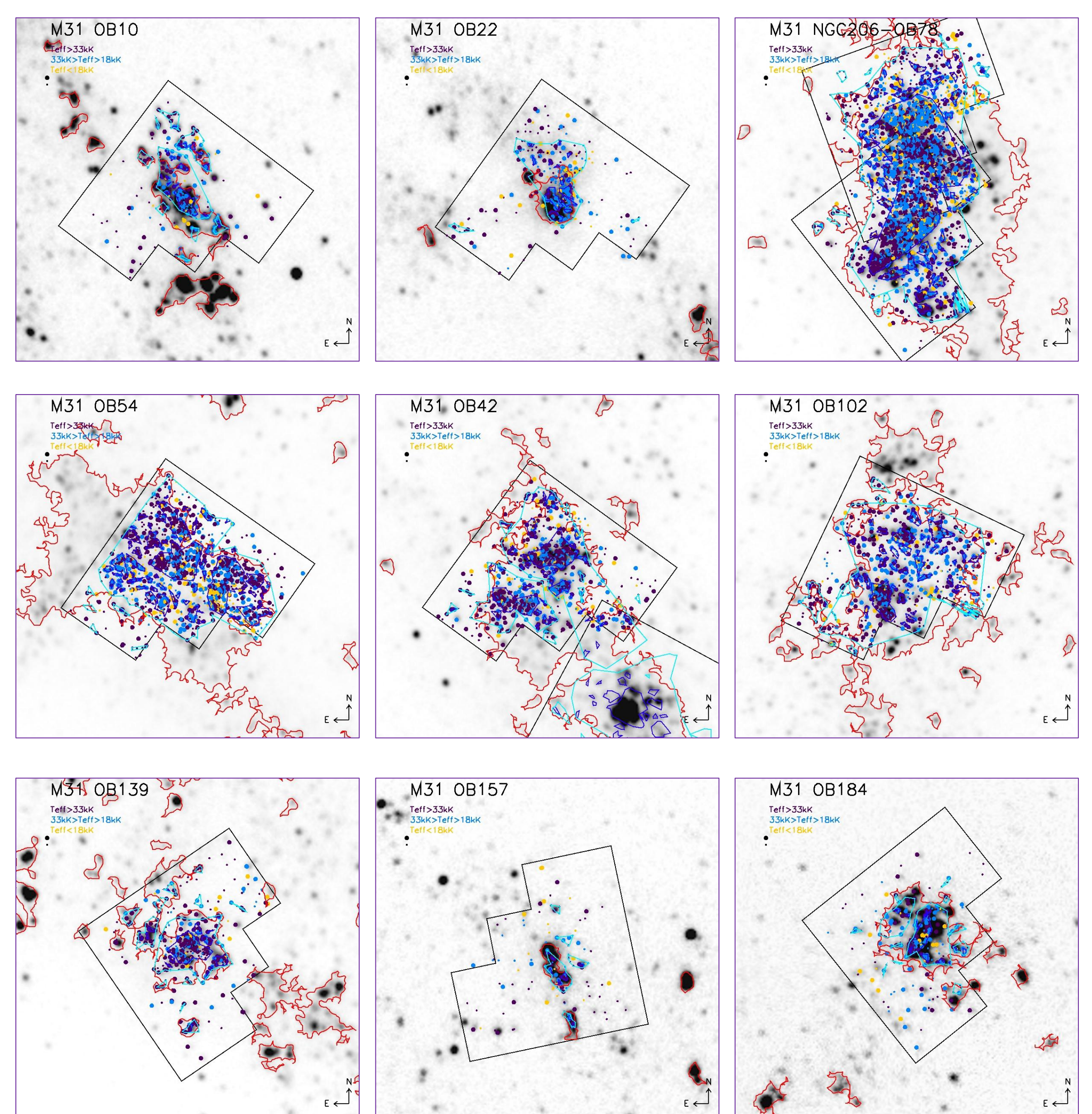


Fig. 4. The distributions of SF regions (red contours), HST stars (filled circles), and OB associations (blue and cyan contours from link-distances 3 and 6 arcsec) are over-plotted on the *GALEX* FUV image.

Conclusion We compared ages of SF regions and young star clusters against the deprojected distance from the center of M31. The overall young cluster distribution shows a single peak around 11 kpc. On the contrary, SF regions show two distinct peaks: the highest peak at ~ 16 kpc and a secondary peak around 11 kpc. The OB associations defined from HST hot stars are well represented the SF regions.

Reference

Barmby, P., & et al. 2006, ApJ, 650, L45 Kang, Y. B., & et al. 2009, ApJ, 703, 614
Bianchi, L., & et al. 2012a, AJ, 143, 74 Kang, Y. B., & et al. 2012, ApJS, 199, 37
Bianchi, L., & et al. 2012b, AJ, in press