Star Forming Region In Different Isolated Dwarf Galaxy

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There are lots of galaxies in our universe. To facilitate people's research, galaxies are classified according to their morphologies, which called Hubble sequence. In the original Hubble classification, only elliptical spiral and irregular galaxies. However, with the development of observation tech, we discovered more and more galaxies, hence the Hubble classification is gradually expended to include more types, such as dwarf elliptical galaxy, dwarf spheroidal galaxy, dwarf irregular galaxy and so on. The star formation history of dwarf galaxies is highly diverse. They are heavily influenced by interactions with other galaxies, they are usually different in physical properties from normal galaxies. Dwarf galaxies often have a low mass, metal-poor environment, and no density waves. Therefore, we can study the star formation in extreme conditions, the low metallicity offer us a way to know how star formation proceeded in the earlier epochs, and the absence of density waves make it possible to study the nature of star-forming clumps in a different environment than the massive spiral galaxies.

Now, star formation is thought to be a hierarchical process from smaller cores to larger complexes. The factors that sustain the growth of small star forming regions to a complex structure can be divided into external and internal perturbation. Studying young star-formation regions in isolated dwarf galaxies can help us to understand the internal perturbation including the stochastic self-propagating mode and the internal stellar feedback, especially the stellar feedback. As young and massive OB type stars emit mostly in the far-ultra-violet (UV) wavelength, observations in Far-UV (FUV) band can directly trace young star-forming regions in a galaxy. The purpose of this paper is to understand the properties of young star-forming clumps in two nearby dwarf irregular galaxy: WLM and IC 2574(Figure 1 and Figure 2).

Both WLM and IC 2574 are nearby dwarf irregular galaxy, however their physical characteristics are quite different. The galaxy WLM is a relatively smaller, lower mass, gas-rich and metal-poor system, while the IC 2574 is relatively large, massive, and metal-rich than WLM. This work used FUV and NUV imaging observations from the Ultra-Violet Imaging Telescope (UVIT). They detected 180 and 782 young star-forming clumps in WLM and IC 2574. By comparing the different physical properties including size, shape,

orientation, FUV magnitude and UV color. They found:

1. The average size of the clumps is larger in the galaxy IC 2574, which is bigger and massive than WLM.
2. The shape of the clumps in both WLM and IC 2574 are mostly elongated.
3. There is no specific orientation of the clumps in IC 2574, whereas in WLM the majority of the clumps are oriented along south-west to north-east direction.
4. The youngest star-forming clumps in WLM are detected between radii 0.4 kpc to 0.8 kpc. Both the central and outer parts of the galaxy are relatively less active in recent times.
5. The hierarchical splitting of star-forming regions is more prominent in IC 2574 than WLM.

These results indicated that the star-forming clumps is lager in massive, metal-rich galaxy than less massive, metal-poor galaxy. And the shape of the star-forming region is almost same in both dwarf irregular galaxy. The specific orientation of clumps in WLM may be connected to the unique gas structure around the center in WLM.

Contribution:

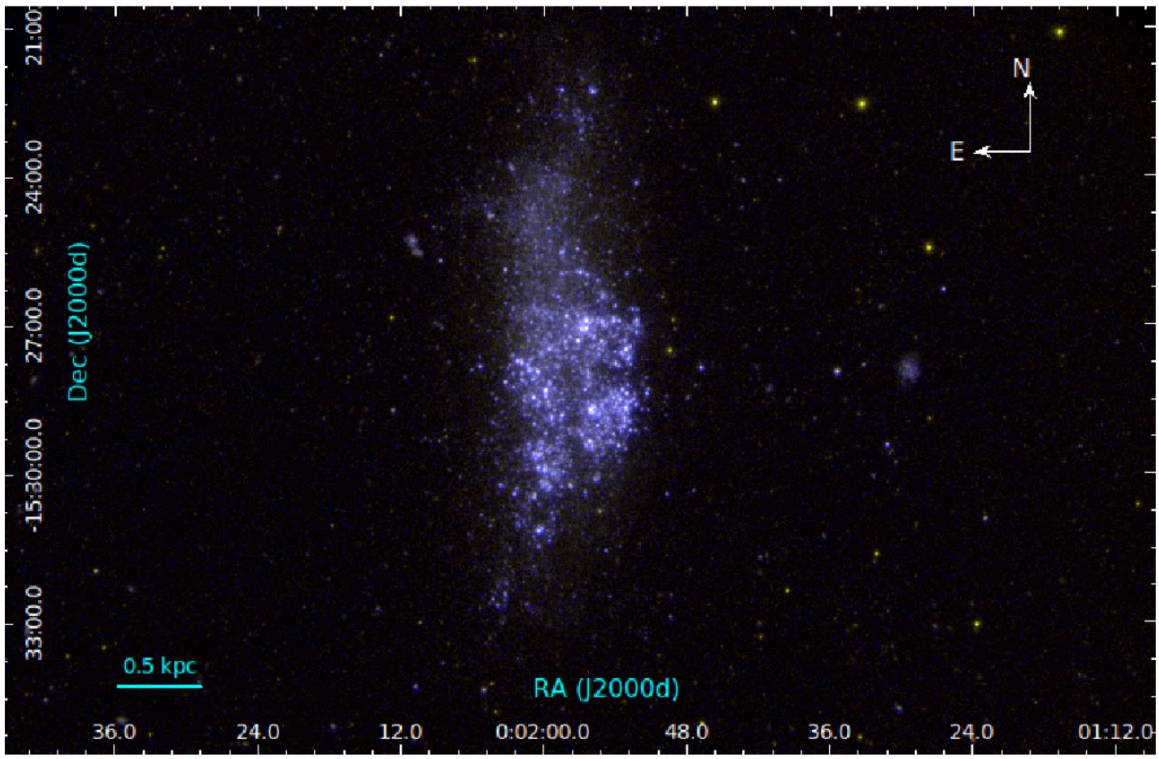

Figure 1. UVIT color composite image of the galaxy WLM. The FUV F148W and the NUV N242W bands are shown in blue and yellow color respectively.

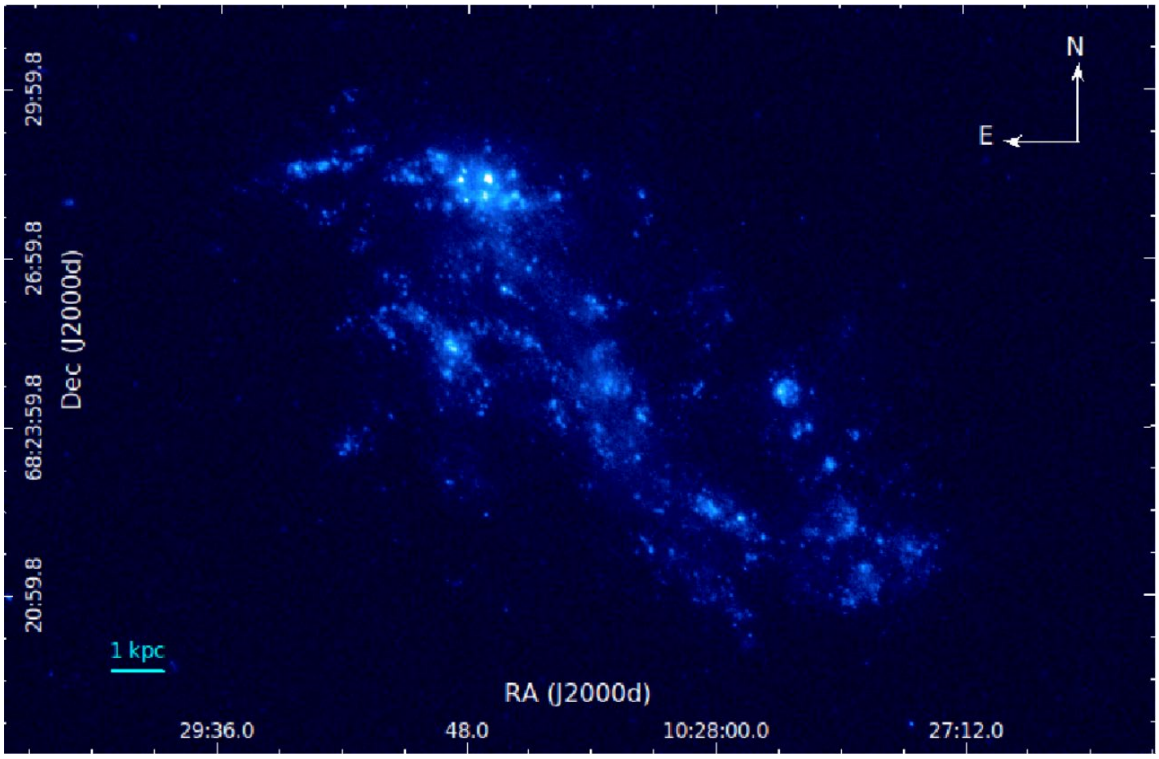

Figure 2. UVIT F148W band image of the galaxy IC 2574.