

Study of the Large-Scale Structure of Ionized Gas and the Star-Gas Cosmic Cycle in our Galaxy

Yuzuru Yoshii

(Institute of Astronomy , School of Science, University of Tokyo, Professor)

【Outline of survey】

The study of the star-gas cosmic cycle over the galactic scale is essential for the quantitative understanding of the galaxy evolution. Large-scale distribution of stars and interstellar gas have to be clarified for this purpose. While the spatial distribution of stars has been widely studied, there is not enough data for the large scale distribution of interstellar gas. Since most interstellar gas is ionized by the interstellar UV radiation field, it is essential to find out the large-scale distribution of the ionized gas in the Galaxy. However, because of the heavy extinction by interstellar dust particles, it was difficult to see through the Galactic disk with the UV and optical hydrogen lines emitted from ionized gas. Therefore, we propose to survey the Galactic plane with another powerful diagnostic line or the Paschen alpha hydrogen line in the infrared. Because this line can penetrate the densest part of the Galactic disk, it is possible to clearly reveal the large-scale distribution of the ionized gas. We use a dedicated small telescope located at Atacama dessert in Chile which is known to be the best site for infrared observation.

【Expected results】

The Paschen alpha hydrogen line has been known to be the most effective infrared emission line for the study of the distribution of ionized gas in the Galaxy, because of its natural strength after the famous Balmer H alpha hydrogen line and nearly ten times better transmittance through interstellar dust than the H alpha line. However, because of the strong atmospheric absorption, it has been difficult to obtain the data in the Paschen alpha line from the well-known ground-based astronomical observatories. Because the atmospheric transmittance in this wavelength range at Atacama dessert is far better than at any other astronomical sites in the world, the exploration of this new wavelength range will be the most important achievement of this study. Also, the astronomical significance of this study is to reveal the large-scale distribution of the ionized gas in the Galaxy for the first time.

【References by the principal researcher】

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Saio, H. and Yoshii, Y., "Viscous Evolution of Self-Gravitating Galactic Disks within a Dark Halo", 1990, ApJ 363 (1 November), 40-49

【Term of project】 FY 2005 - 2009

【Budget allocation】 76,100,000 yen

【Homepage address】 none