A study on the properties of dust in clouds extended in the halo of the radio galaxy Centaurus A

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Centaurus A (Cen A) is the nearest galaxy hosting an active galactic nucleus (AGN), which produces powerful radio and X-ray jets extending to hundreds kpc from the center. At 15 kpc northeast (NE) and 12 kpc southwest (SW) in the halo along the jet from the nucleus of Cen A, dust clouds are detected in the far-infrared (IR) with Herschel, which are accompanied by the Hα emission. The far-ultraviolet (UV) emission extended along the jet, which is apparently associated with the halo clouds, is also detected with GALEX. For both clouds, since the Hα emission is detected, it is suggested that star formation may have been induced through interactions between the AGN jet and the clouds in the halo of Cen A.

In this study, we aim to investigate the properties of the dust in the NE and SW halo clouds and the possibility of jet-induced star formation in those clouds. In order to obtain the emission properties, we have performed dust model fitting to the near- to far-IR spectral energy distributions of Cen A created from the archival data of WISE, Spitzer and Herschel. We have also compared the IR emission properties of the dust clouds with the far-UV emission extended along the jet using the archival data of GALEX/FUV. Moreover, we have performed Paβ narrow-band imaging of the Hα-emitting regions in the halo clouds with the IRSF telescope in South Africa.

As a result, we find that the NE cloud shows significantly higher dust temperature than the SW cloud. We also find that the local far-UV intensities in the NE cloud are significantly higher than those calculated from the far-UV flux originating from the central region of Cen A. These results consistently support that the jet-induced star formation have indeed occurred in the NE halo cloud. On the other hand, for the SW cloud, there is no evidence supporting for the star formation therein; the local far-UV intensities detected in the SW cloud can be explained by scattering of the far-UV flux from the central region by the dust in the SW cloud. The Paβ emission is not detected from either the NE or SW clouds. Based on the dust-scattered far-UV intensities and the upper limits of Paβ/Hα, we derive the constraint on the dust size distribution, which indicates that the dust in the halo cloud may be abundant in the very small grains. Finally, we have found that the PAH emission is associated with both NE and SW halo clouds. The mass abundance ratios of the PAH to the dust for both clouds are significantly lower than that in the central region of Cen A.

In this presentation, we summarize the properties of the halo dust in Cen A obtained in the IR and far-UV observations. We discuss the origins of the halo clouds and their relationship with the jet-induced star formation.