Large-scale extraplanar PAH emission in the Galactic center region found by AKARI mid-infrared all-sky survey

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AKARI carried out all-sky surveys in the 9, 18, 65, 90, 140 and 160 μm bands. Among them, the 9 μm band map efficiently traces the emission features of polycyclic aromatic hydrocarbons (PAHs) at wavelengths of 6.2, 7.7, 8.6, and 11.3 μm. Utilizing this unique all-sky PAH map, we investigate the distribution of PAH emission for the whole Galactic plane. In particular, the Galactic center regions suffer severe foreground contamination by the Zodiacal emission, and therefore we have carefully removed the Zodiacal emission component, modifying the Kelsall's model.

As a result, we find that the PAH emission is extended very widely (~30 degrees) toward the north direction from the Galactic center region. Since the Ophiuchus cloud is known to be located very nearby (~150 pc) toward similar directions, we subtracted the foreground component associated with the Ophiuchus cloud using the HI data in the corresponding velocity range. Then we confirm that there still remains a significant fraction of the widely-extended PAH emission. This residual PAH emission is likely to come from the Galactic center region.

We compare the distribution of PAHs with that of far-IR dust to find that PAH/far-IR ratios significantly enhances in the regions where the residual PAH component is relatively strong. This PAH-rich large-scale extraplanar component has a spatial correspondence with the Fermi bubble, a well-known gamma-ray structure, which is thought to be created by a past activity of the Galactic center. We discuss the origin of this PAH component and possible relationship with the Fermi bubble.