Modeling the Infrared Emission of High-Latitude Molecular Cirrus Clouds

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The exact amount and nature of interstellar matter at high Galactic latitudes is a subject of ongoing scrutiny. The IRAS observations at 60 and 100 micrometer first revealed the prevalence of large-scale, extended filamentary emission (known as ``infrared cirrus'', see Low et al. 1984) at high Galactic latitudes. The presence of significant quantities of CO gas at high Galactic latitudes (|b|>25 degree) was first reported by Blitz et al. (1984) and Magnani et al. (1985). These high latitude molecular clouds can be identified with the cores of the IRAS infrared cirrus (Weiland et al. 1986).

Little is known about the dust properties of these high latitude molecular cirrus clouds. We model the infrared emission of nine representative clouds (Verter et al. 2000) for which the visual extinction (A_V) was known from star counts (Magnani & de Vries 1986). All the selected clouds, with A_V <1 mag, are "translucent" to the interstellar radiation. They represent a class of objects intermediate between the properties of diffuse clouds and dark molecular clouds (van Dishoeck & Black 1988). They exhibit notable cloud-to-cloud variations in the mid-infrared, with the ratio of the IRAS 12 micrometer intensity to the IRAS 25 micrometer intensity varying by up to one order of magnitude.

The silicate-graphite-PAH model successfully reproduces the infrared emission of all the selected clouds observed by IRAS. We find that all clouds are rich in PAHs as traced by the IRAS 12 micrometer data. They are heated by the local interstellar radiation field, but with the radiation intensity reduced by a factor of about 2 to 3.