Spectral Energy Distribution of the Zodiacal Emission

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A spectral energy distribution (SED) is constructed of the zodiacal emission by combining the IRTS observations in near and mid infrared wavelengths and the IRAS and COBE/DIRBE datum sets in far infrared. This is an attempt to decipher the resulting SED in terms of interplanetary dust models.
The SED observed in mid to far infrared was known to closely resemble that of a black body, whose temperature is in a rather narrow range of 250~270 degrees Kelvin. It is interesting then to check whether this holds true in near infrared as well. To extend wavelength coverage of the SED well into the near infrared, one has to correct the IRTS observations for possible contamination made by the scattered sunlight, particularly in the range 1~3 micrometers. For a long time the zodiacal light in the visual is known to be exactly of the solar color. We have shown that the grayness nature of the zodiacal light holds all the way down to the near infrared wavelengths. This facilitated the required correction to the IRTS observations. It turns out that the resulting SED can no longer be fitted by a single temperature black body. This requires an existence of dust particles whose temperature is well above the 250~270 K level. Since small particles are generally hotter than large ones, the SED of zodiacal emission in the near infrared is sensitive to the minimum radius of the interplanetary dust particles in the size distribution function (Grun et al. 1985), if they are of absorbing material. Even if sizes are smaller than 0.1 micrometers, temperature of silicate particles may not get elevated to such a high level, because silicates are basically dielectric material. Along this line of reasoning we argue that the currently available SED demands an existence of such small carbonaceous particles that could have been blown away from the solar system by radiation pressure. We will briefly discuss implications of this dilemma in terms of the particle dynamics and the modification to the far IR part of the SED by the small carbonaceous interplanetary dusts.