5.8 The Analyzed Science Data Sets

The Analyzed Science Data Sets (ASDS) are high–level products derived from reductions of the lower–level *DIRBE* data. Some of these data sets are by–products of the processing pipeline. As of this writing only one ASDS exists.

5.8.1 Photometric Standard Values Table

Photometric data obtained on 92 standard objects which were judged not to vary in brightness at a particular wavelength over the course of the cold mission were used to stabilize the *DIRBE* photometric system in the celestial calibration stage of the *DIRBE* data reduction pipeline (see Chapter 4). The Photometric Standard Values Table lists mission–averaged flux densities (in Jy) for the selected objects. The quoted flux densities assume a source spectrum characterized by νF_ν = constant (see § 5.5); a color correction (see Appendix B) must be applied to determine the true flux density if the source spectrum differs from the assumed energy distribution. Nominal wavelengths for the 10 *DIRBE* bands are 1.25, 2.2, 3.5, 4.9, 12, 25, 60, 100, 140 and 240 μm. The bandwidths and system responses at each wavelength are described in § 2.2.2, and the response functions are tabulated in Appendix A and provided as a data product (see § 5.9).

Like the other calibrated *DIRBE* products, the Photometric Standard Values Table quotes flux densities whose absolute calibration at each wavelength is based upon measurements of a single source (see § 4.5.3). The *DIRBE* point source photometry agrees with that of Engelke (1992) and Cohen *et al.* (1992, 1995) at 2.2 μm and (*IRAS*) 12 μm within the absolute calibration uncertainties of the different systems.

The quoted flux densities are derived as follows. For individual sightings of the standard objects in the time–ordered data, a local background intensity and a background–subtracted flux density are calculated using the algorithm described in § 4.5.3.2. At each wavelength, the background–subtracted flux densities are then averaged over the cold mission. The quoted error, which ***does not include the uncertainty in the absolute calibration level***, is the standard deviation of the mean flux density value. When values of 0.0 are given for the flux density and error at a particular wavelength, they indicate that the object was not an approved calibrator at that wavelength.

To have been selected as an approved calibration object at a given wavelength, a source had to satisfy the following criteria: little ($\lesssim$ 2%) or no variability was seen in the photometry over the course of the cold mission; and the signal–to–noise ratio for a typical sighting was $\geq$ 20 for 1.25 - 4.9 μm, or $\geq$ 10 for 12 - 240 μm. The histograms in Figure 5.8-1 show the calibrator flux density ranges at the 10 *DIRBE* wavelengths; the labels tell how many sources qualified as calibrators. Few sources qualified at the longer wavelengths.

A background intensity value, in MJy/sr, is provided in the Photometric Standard Values Table at each wavelength for which the object was approved as a calibrator. The background values can be used to assess the source–to–background contrast if the beam solid angles given in Table 4.2-1 are used to convert the intensity units from MJy/sr to Jy/beam. Note that the listed background intensity is an average over individual sightings within the mission; the intensity actually detected varied as a function of time as the source was seen along different lines of sight through the interplanetary dust.

The coordinates of the objects are given in the equatorial (epoch 1950), Galactic, and geocentric ecliptic (epoch 2000) systems, and the objects are tabulated in order of increasing Right Ascension. Figures 5.8-2 and 5.8-3 show the locations of the calibration sources in Galactic and ecliptic coordinates, respectively. Objects at ecliptic latitudes $|\beta| \gtrsim 65°$ are visible throughout the entire mission; the visibility decreases at lower latitudes. Most of the source positions provided for 1.25 – 25 μm calibrators are taken from the SAO Bright Star Catalog (available from the Astronomical Data Center at `ftp://adc.gsfc.nasa.gov/pub/adc/archives/catalogs/5/5050/`). *IRAS* Point Source Catalog (PSC; see `http://ssdoo.gsfc.nasa.gov/astro/iras/psc.html`) positions were used for some circumstellar dust sources that did not appear in the SAO catalog. At the longer wavelengths (60 – 240 μm), source positions were taken from (in order of preference) the *IRAS* PSC, the *IRAS* Small Scale Structure Catalog (see `http://ssdoo.gsfc.nasa.gov/astro/iras/sss.html`), or the *DIRBE* time–ordered data themselves. In the latter cases, positional errors may be as great as a few arcminutes.

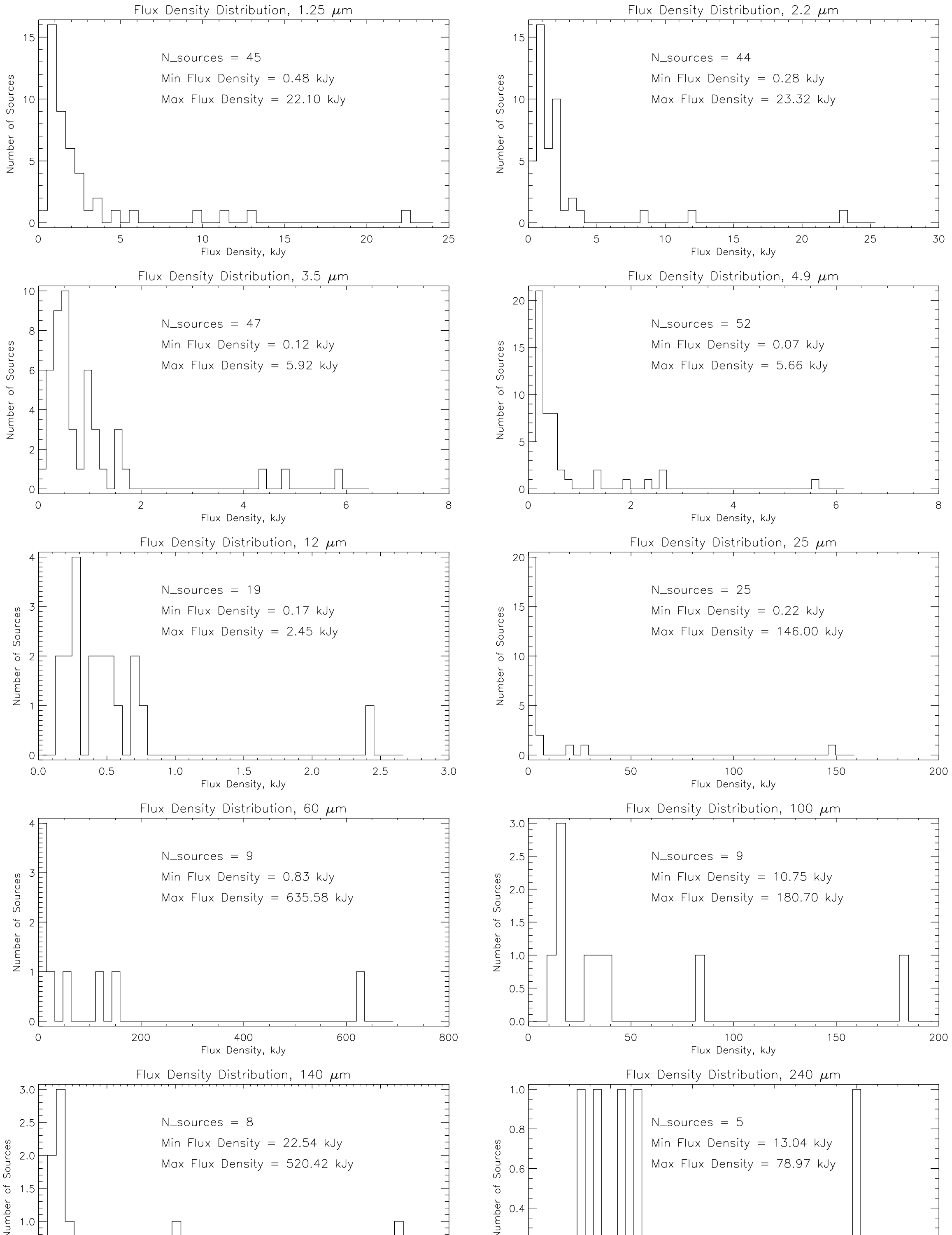

Figure 5.8-1: Histograms of the flux densities of sources used as relative calibrators for each of the ten *DIRBE* bands.

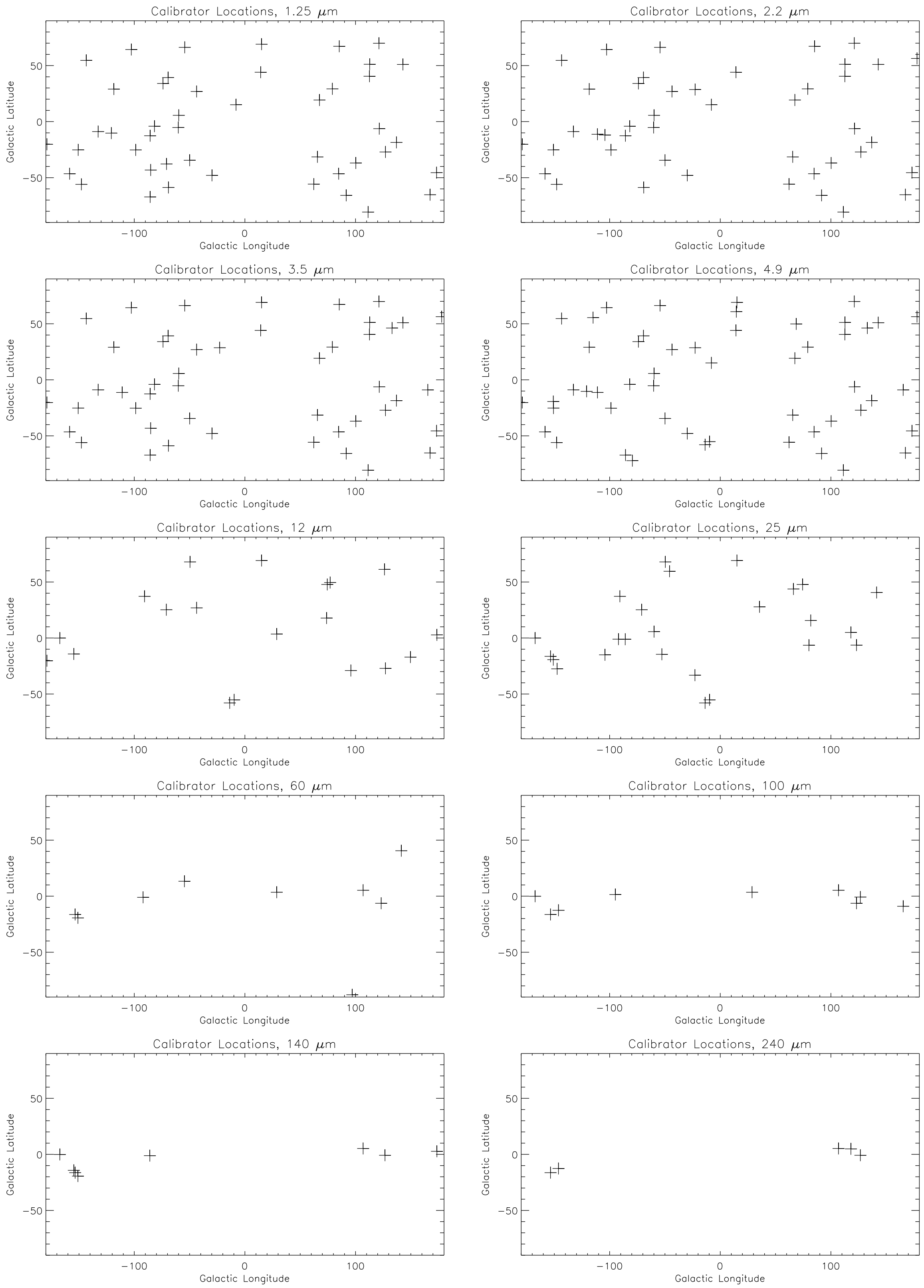

Figure 5.8-2: Locations of the relative calibration sources in Galactic coordinates.

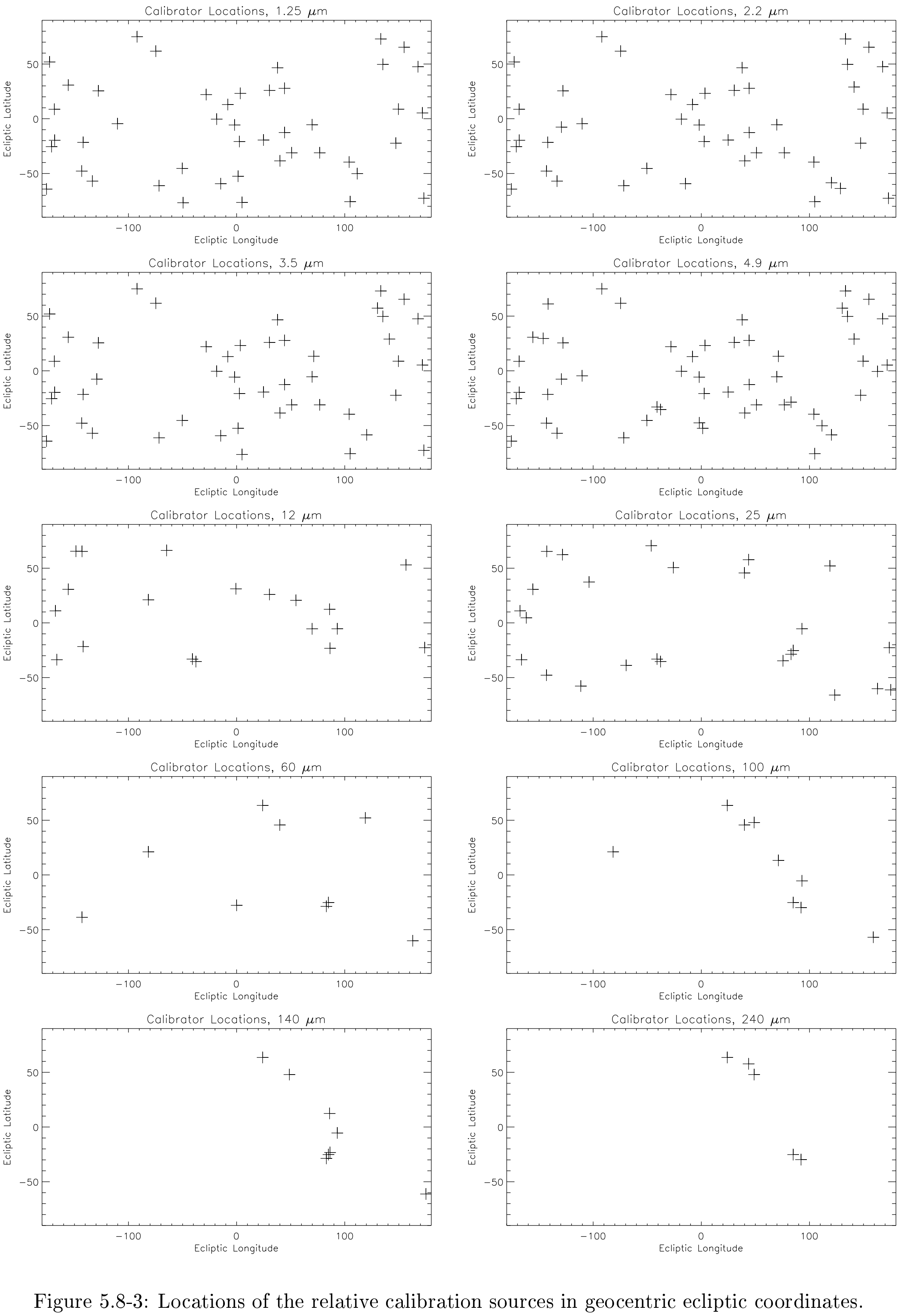

Figure 5.8-3: Locations of the relative calibration sources in geocentric ecliptic coordinates.

As a rule, but with some exceptions, stellar objects are referred to by a constellation designation (*e.g.,* YY Psc); Sharpless numbers are used for H II regions (*e.g.,* S 140); and NGC or Messier numbers are used for galaxies (*e.g.,* NGC 253).

Table 5.8-1 describes the format of the Photometric Standard Values Table.

Table 5.8-1: Columns in the Photometric Standard Values Table

n	TTYPEn[a]	Description
1	`Name`	*Object name* (32–bit character) Name of the calibration object.
2	`ObjIndex`	*Object index* (signed 16–bit integer) DIRBE object index number.
3	`Pixel_No`	*DIRBE pixel number* (signed 32–bit integer) DIRBE pixel in which the object is located.
4	`RA1950`	*Right Ascension* (32–bit floating point) Right Ascension of the object, epoch 1950, in decimal hours.
5	`DEC1950`	*Declination* (32–bit floating point) Declination of the object, epoch 1950, in decimal degrees.
6	`GalLon`	*Galactic longitude* (32–bit floating point) Galactic longitude, ℓ_{II}, of the object, in decimal degrees.
7	`GalLat`	*Galactic latitude* (32–bit floating point) Galactic latitude, b_{II}, of the object, in decimal degrees.
8	`EclLon`	*Ecliptic longitude* (32–bit floating point) Ecliptic longitude of the object, epoch 2000, in decimal degrees.
9	`EclLat`	*Ecliptic latitude* (32–bit floating point) Ecliptic latitude of the object, epoch 2000, in decimal degrees.
10	`Photomet`	*Average photometry* (10 32–bit floating point) Mission–averaged background–subtracted flux densities, in units of Jy, listed in order of increasing wavelength from 1.25 to 240 μm. Flux densities are quoted at the nominal wavelength for a source with νF_ν = constant (a color correction is required if the true source spectrum differs from the assumed shape).
11	`StdDev`	*Standard deviation* (10 32–bit floating point) Standard deviation of the mean flux density quoted in the corresponding *Average photometry* field, in Jy (*i.e.,* one value per wavelength band, listed in order of increasing wavelength).
12	`NumObs`	*Total number of observations* (10 32–bit integer) The total number of individual observations used to derive the flux density quoted in the corresponding *Average photometry* field (*i.e.,* one value per wavelength band, listed in order of increasing wavelength).
13	`AvgBkgd`	*Average background* (10 32–bit floating point) Average background intensity, in MJy/sr, at each wavelength, listed in order of increasing wavelength.

[a] FITS keyword giving the label or heading for field (*i.e.*, table column) `n`.

5.9 Ancillary Data Sets

Machine–readable files containing important calibration information given in the *Explanatory Supplement* are included among the *DIRBE* data products.