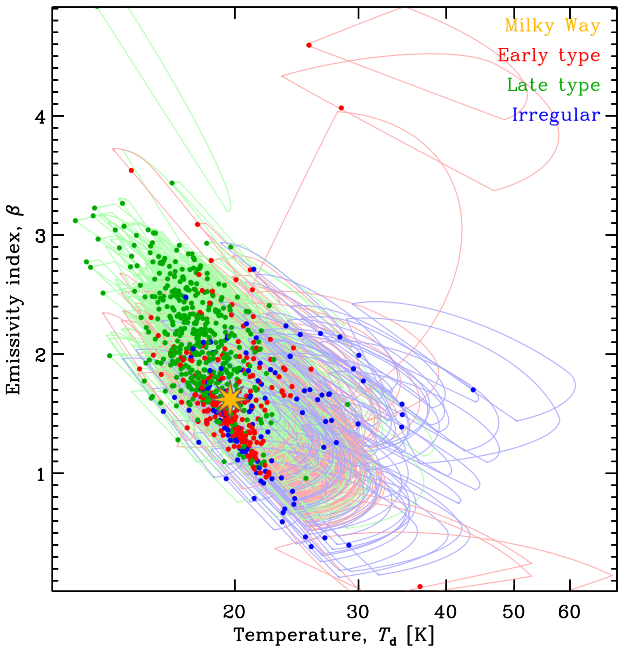

Fig. E.1. Modified black body results. The SUEs show the relation between the temperature, T_d, and the emissivity index, β, derived from the β-free MBB run presented in Sect. 3.3.2. Galaxies are color-coded according to their type (cf. Sect. 3.3.2). The diffuse ISM of the Milky Way ($T_d^{MW} = 20$ K, $\beta_{MW} = 1.6$; Planck Collaboration XI 2014) is displayed as a yellow star.

Appendix F: Uncertainty representation

We detail here the way we display uncertainties in correlation plots throughout this article.

F.1. Skewed uncertainty ellipses

Our HB model computes the full posterior distribution of the parameters of each source. Such a distribution is usually asymmetric and correlations between parameters can be strong. Displaying this marginalized posterior distribution as density contours, for several hundreds of sources, is visually ineffective. In 2D correlation plots, uncertainty ellipses are a widely-used device to display the extent of the posterior and show the correlation between parameters. However, it does not account for its skewness. To address this issue, we display each posterior as a skewed uncertainty ellipse (SUE), which is the 1σ contour of a bivariate split-normal distribution (BSN; Villani & Larsson 2006), having the same means, variances, skewnesses, and correlation coefficient as the posterior. We add a central dot corresponding to the mode of this BSN. Figure F.1 demonstrates the different ways of displaying uncertainties, for a typical PDF (orange density). Panel c shows the corresponding SUE. It has the advantage of retaining a lot of information from the posterior, with only one dot and one contour.

Displaying a SUE is not straightforward. Indeed, a BSN is parametrized by its position vector, $\boldsymbol{X}_0 = (x_0, y_0)$, its scale vector, $\boldsymbol{\Lambda} = (\lambda_x, \lambda_y)$, its shape vector, $\boldsymbol{T} = (\tau_x, \tau_y)$, and its rotation angle, $-\pi/2 < \theta < \pi/2$. If we call $\boldsymbol{X} = (x, y)$ our original coordinates and $\boldsymbol{X}' = (x', y')$ the coordinates in the centered, rotated, reference frame ($\mathbf{R}$ being the rotation matrix):

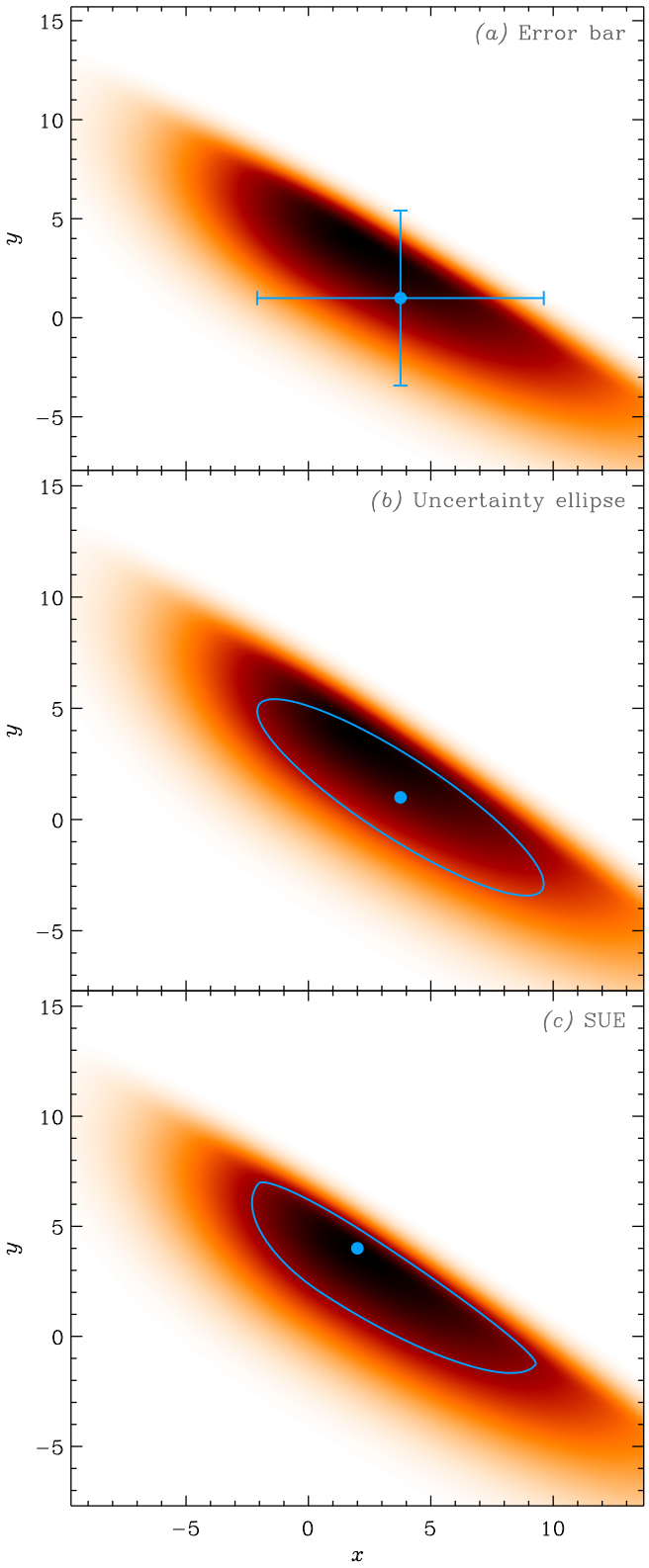

Fig. F.1. Uncertainty display. The orange density contours in the three panels represent an arbitrary bivariate PDF of two variables x and y. *Panel a*: corresponding traditional error bar: the dot is the mean and the bars show the $\pm 1\sigma$ extent along both axes. *Panel b*: widely-used uncertainty ellipse, which can be viewed as the mode and 1σ contour of a bivariate normal distribution having the same means, standard-deviations and correlation coefficient as the PDF. *Panel c*: concept of SUE introduced in Appendix F.1.