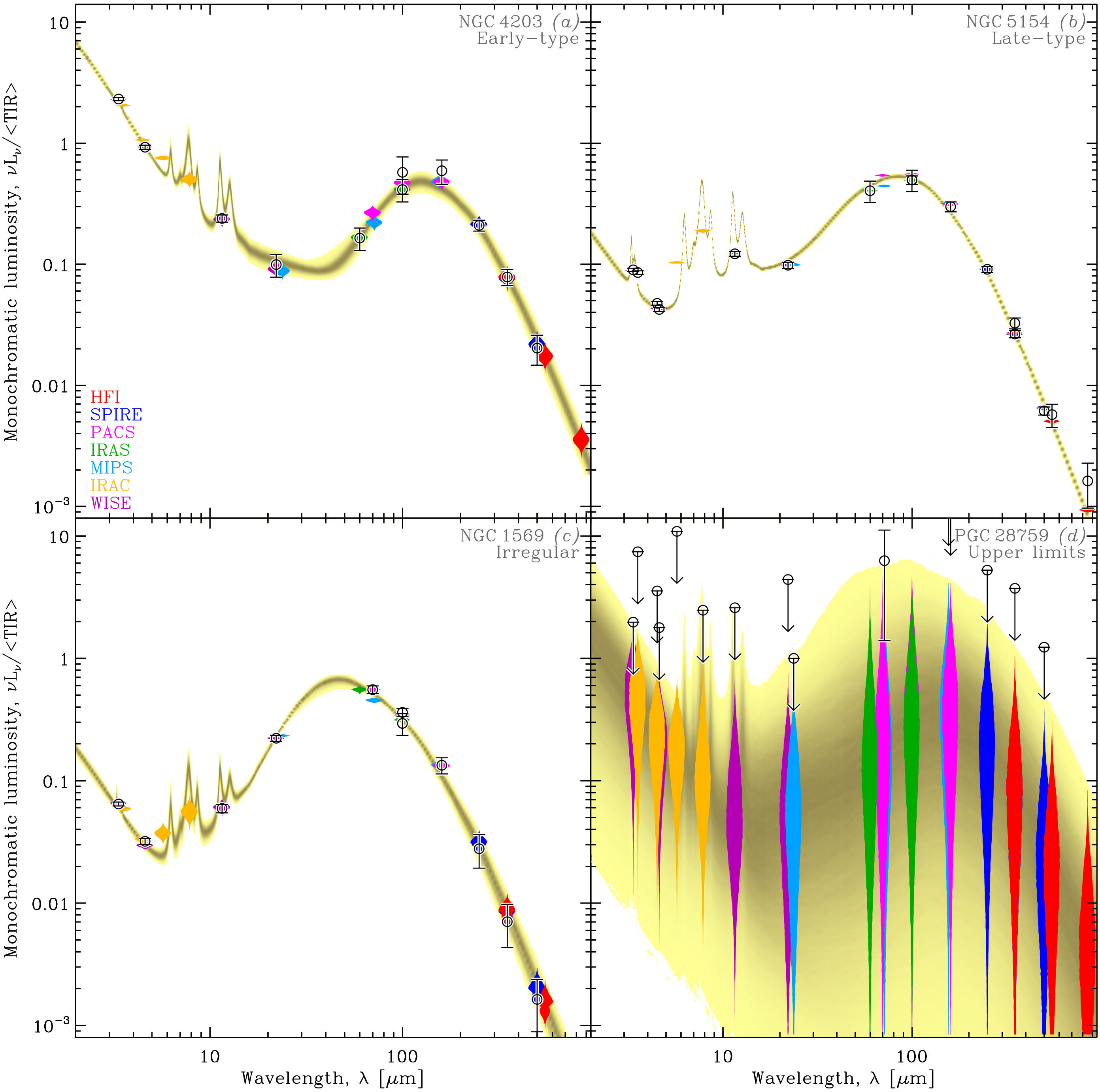

Fig. 2. Select SED fits. Each panel shows the inferred SED PDF, in yellow intensity scale, normalized by the MCMC-averaged TIR. The color violin plots represent the synthetic photometry PDF, for each waveband. The black error bars are the observations. *Panels a–c*: arbitrary chosen galaxies, representative of their classes (early-type, late-type, and irregulars, respectively). *Panel d*: case, where most constraints are only upper limits.

submm excess is model-dependent. THEMIS has a flatter submm opacity than models based on the DL07 optical properties (e.g., Fig. 4 of Galliano et al. 2018). It is therefore more emissive in the submm regime and minimizes the contribution of the excess. Secondly, this excess is observed in dwarf galaxies, but is rarely detected in higher metallicity systems (e.g., Galliano et al. 2003, 2005; Galametz et al. 2009; Rémy-Ruyer et al. 2015; Dale et al. 2017). Yet, data longward 500 μm, in our sample, are available only for large objects, due to the large *Planck*/HFI beam. Finally, residuals of our model run (Sect. 3.2) do not show significant excesses in the submm bands.

Residual stellar emission could contaminate the shortest wavelength bands. Improper stellar subtraction could lead to positive or negative offsets, independently in the different bands.

3.2. The reference run

The results we present in Sect. 4 were obtained with the model described in Sect. 3.1. We call it our reference run. Figure 2 shows the SED fit of four representative objects, obtained with this run. In panels a–c, SEDs of three arbitrarily chosen galaxies, representative of early-type galaxies (ETG), late-type