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Herschel/PEP resolves the far-IR background

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Launched in May 2009, Herschel is providing stunning results: the first PACS extragalactic surveys are giving an unprecedented view of the Infra-Red sky, unveiling the far-IR emission of many galaxies, up to redshifts z~2 and beyond.

The PACS Evolutionary Probe extragalactic survey (PEP, P.I. Lutz) samples four different layers in the cosmological "wedding cake", from shallow wide fields (e.g. COSMOS, 2 deg2) to intermediate areas (e.g. Lockman Hole, ~400 arcmin2), to deep, confusion-limited, pencil-beam observations (e.g. GOODS-N and GOODS-S) and even beyond through lensing galaxy clusters (e.g. Abell 2218).

Using the PEP data, we have established 70, 100 and 160 micron source counts, extending between a few mJy (in GOODS-S/N) and ~200 mJy (in COSMOS). The integral of galaxy number counts resolves 70% (55%) of the CIB at 160 micron (100 micron) (see Berta et al. 2010). Including the Abell 2218 lensing cluster, number counts dig down to ~1 mJy, thus breaking the confusion limit in the PACS bands (Altieri et al. 2010).
By exploiting stacking of 24 micron sources and statistical analyses such as P(d), we push the knowledge of number counts slopes to sub-mJy regimes.

Thanks to the huge ancillary database available in our fields, especially in GOODS-N/S, we attached a detailed shorter wavelength SED and a redshift estimate to each FIR source. In this way, we are able to split number counts and CIB into the contribution from different redshift slices.

At z<=0.5 we isolate a class of luminous sources L(IR)~1e11 Lsun), whose SEDs resemble late-spiral galaxies, peaking at ~130 micron restframe and significantly colder than what is expected on the basis of pre-Herschel models. Most of the 100 and 160 microns CIB arises at redshifts z<1, with red sources peaking at higher redshift than blue ones. At the PEP GOODS-N depth, the resolved CIB is mainly due to luminous and ultra-luminous IR galaxies (LIRGs 1e11<= L(IR) <1e12 Lsun, ULIRGs L(IR)>=1e12 Lsun).

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