Understanding Starbursting Protoclusters: Follow-up of Herschel-Planck Selected Sources
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Abstract:
Crossmatching between Planck and Herschel data has uncovered a total of 30 high-z candidate starbursting protoclusters in HerMES & H-ATLAS. These protoclusters might be in their formation period so their study is important in characterising cluster formation and galaxy formation in dense environments. In this poster we present follow-up observations of these candidate protoclusters, using far-IR, sub-mm, optical/near-IR, and radio observations. Photometric redshift estimates and differential number counts suggest these candidate protoclusters are overdensities of sources in multi-wavelength data. On-going spectroscopy observations will confirm their protocluster membership and also gas & dust contents.

I. Selection of 30 candidate protoclusters
30 candidate starbursting protoclusters were selected by crossmatching between Planck and Herschel data in HerMES & H-ATLAS [1,2,3,4]. These candidate protoclusters are overdensities of far-IR sources and red, suggesting they are high-z clusters during their formation. Fig.1 shows how we go from low-resolution Planck, high-resolution Herschel, and to even higher-resolution SCUBA-2 follow-up.

II. Follow-up observations
Follow-up observations are taking place to confirm and characterise these candidate protoclusters. Current follow-up observations:

1. Sub-mm: SCUBA-2 850 µm. A number of candidate protoclusters, data being analysed now.
2. Optical/Near-IR: William Herschel Telescope (WHT). Fig.2.
3. Radio: Very Large Array (VLA), Australia Telescope Compact Array (ATCA). Fig.4, Fig.5.
4. Sub-mm (SMA) and mm (IRAM 30-m Telescope) spectroscopy: observations taking place.

III. Optical/Near-IR using WHT & Photometric-z
Fig.2 shows WHT RGB (red: Ks, green: H, blue: J) image of candidate protocluster Bootes1, with Herschel 250 µm (white) and SCUBA-2 (red) contours, and VLA detections (yellow circles). Photometric-z distribution of this field shows a peak at z~2.27, consistent with [2] (Fig.3).

IV. Radio using VLA & Cross-identifications
10 Candidate protoclusters were observed with VLA 6cm. Fig.4 shows candidate protocluster H12-00, with Herschel 250 µm (white), SCUBA-2 (red), LABOCA (magenta) contours, and VLA detections (blue numbers). Inlets are zoom-ins of central lensed region (top right) and VLA source #30 (lower right), with WHT background and VLA contours (green).

V. Radio using ATCA & Differential Number Counts
Fig.5 shows candidate protocluster G018 with ATCA 5GHz background, Herschel 250 µm contours (white), and ATCA detections (black squares & numbers). Inset is zoom-in of #3. Fig.6 shows the differential number counts, compared with [5]. A bump can be seen suggesting a candidate radio overdensity.