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The *Planck* Compact Source Catalogues: present and future

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Abstract. The *Planck* Collaboration has produced catalogues of radio and sub-millimeter compact sources at the nine *Planck* frequencies in total intensity and polarization. In particular, the 2015 Second *Planck* Catalogue of Compact Sources (PCCS2) contains over 45.000 sources detected in the *Planck* full mission maps. Since the *Planck* instruments have polarization capabilities in seven of its nine detectors, we were able to measure the polarized flux density of over 600 sources between 30 and 353 GHz. But we are searching not only for compact sources in single frequency maps, and we take advantage of the large frequency coverage of *Planck* to search for objects with specific emission laws. This is the case of the SZ catalogue of cluster of galaxies (PSZ2), that lists 1653 clusters, 1203 of which are confirmed clusters with clear associations in external data-sets, and the Galactic cold clump catalogue (PGCC) with 13188 objects. The *Planck* Collaboration has also published a list of high-redshift source candidates (see the report by Ludovic Montier here). These objects are rare bright sub-millimeter sources with an spectral energy distribution peaking between 353 and 857 GHz, and have been detected combining *Planck* and IRAS data. The colours of most of these objects are consistent with redshifts $z > 2$, a fraction of which could be lensed objects with redshifts between 2 and 4.

But new catalogues are foreseen. A multi-frequency compact source catalogue is being produced selecting sources at radio frequencies and studying them across all *Planck* bands. Multi-frequency catalogues can be difficult to produce in experiments like *Planck* that have a large frequency coverage and very different resolutions across bands. In some cases, a source can be very bright across the whole *Planck* frequency range and it is easy to do the associations across channels. However, it frequent to find unrelated sub-millimeter sources within the half-degree beam of the 30 GHz low frequency detector, and the association work must be done with great care. For this purpose, we are combining a multi-frequency detection procedure with a principal component analysis to produce the catalogue. In addition, for those sources where a clear identification can be made, we will attempt to include flux density information from Herschel and other experiments, in particular for those blazars that are bright in radio, sub-mm and even in gamma-ray frequencies, as seen by Fermi. Moreover, Planck has made available to the community the single survey frequency maps that allow astronomers to study the long-term variability of their favourite sources. New functionalities will be also added to the *Planck* Legacy Archive †, for example a timeline-cutting tool that will allow one to produce full-sky maps from the *Planck* timelines for specific periods of time allowing for short-term variability studies of compact sources (e.g., flares). The unique frequency coverage of *Planck* make these catalogues very valuable for other experiments using the *Planck* compact source catalogues. For example, experiments like QUIJOTE use *Planck* selected sources to study the impact of polarized radio source emission on their cosmological fields and other CMB experiments will use *Planck* polarized compact source information for calibration.

Keywords. cosmic microwave background, radio continuum: galaxies, submillimeter, infrared: galaxies.

† http://www.cosmos.esa.int/web/planck/pla/