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ANGULAR CLUSTERING OF FIR-SELECTED GALAXIES IN THE AKARI ALL-SKY SURVEY

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ABSTRACT

We present the first measurement of the angular two-point correlation function for AKARI 90 μm point sources, detected outside of the Milky Way plane and selected as candidates for extragalactic sources. This is the first measurement of the large-scale angular clustering of galaxies selected in the far-infrared after IRAS. We find a positive clustering signal in both hemispheres extending up to $\sim$ 40 degrees, without any significant fluctuations at larger scales. The observed correlation function is well fitted by a power law function. However, southern galaxies seem to be more strongly clustered than northern ones and the difference is statistically significant. The reason for this difference - technical or physical - is still to be found.

Key words: infrared: surveys; galaxies: clustering

1. INTRODUCTION

An all-sky survey at mid- and far infrared (MIR and FIR) wavelengths is one of the most significant observations done by AKARI (Murakami et al., 2007). Referred to as the AKARI All-Sky Survey, it is the second ever performed all-sky survey at FIR, after IRAS. The AKARI/FIS Bright Source Catalogue v.1.0 contains in total 427,071 point sources measured at 65, 90, 140, 160 μm (Yamamura et al., 2010).

In order to select extragalactic sources, we restricted ourselves to the area of low Galactic extinction $I_{100\mu} \leq 5$ MJy sr^{-1}, measured from the Schlegel maps (Schlegel et al., 1998). Additionally, we masked the data, selecting only the parts of the sky which were scanned by AKARI at least three times. Finally, we have chosen only sources with the full four-band FIS color information and applied the color-based method (Pollo et al., 2010) to select candidates for extragalactic sources. This procedure left us with 18,087 credible candidates for extragalactic sources in all the sky.

2. ANGULAR CLUSTERING OF AKARI ALL-SKY SURVEY GALAXIES

One of the most widely used statistical measures of clustering is the two-point angular correlation function, $\omega(\theta)$, defined as the excess probability above random that a pair of galaxies is observed at a given angular separation θ. In this work, we adopt the angular version of the Landy-Szalay estimator (Landy & Szalay, 1993).

As shown in Fig. 1, in both Galactic hemispheres we measure a positive clustering signal up to $\theta \sim 40^o$. For separations larger than $\sim 40^o$, the signal remains negative without significant fluctuations. This roughly agrees with the first clustering measurement for the IRAS sources (Rowan-Robinson & Needham, 1986). However, in contrast to what was seen in the fist IRAS data, we do not observe any strong difference in the shape of the correlation function between northern and southern sky, in particular between 10 and 40 degrees. In the same time, our data, too, display a difference between both Galactic hemispheres. The most notable

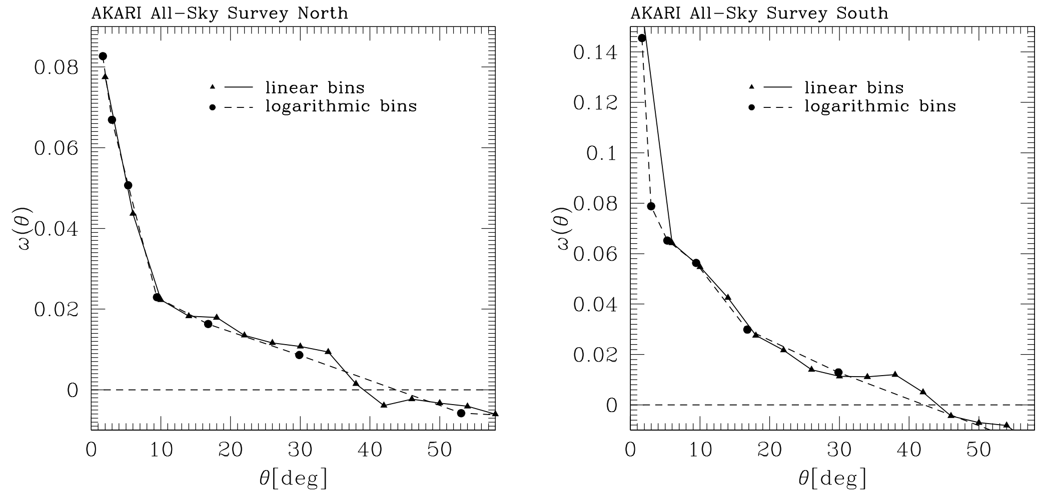

Fig. 1. Angular correlation function, in linear (full triangles, connected by a solid line) and logarithmic (full circles, connected by a dashed line) bins, in the northern (left panel) and southern (right panel) Galactic hemisphere of the AKARI All-Sky Survey. Note a difference in scale in both panels.

difference is that the sources in the southern sky seem to be, at all scales, more strongly clustered than those observed in the northern sky. In both hemispheres the clustering signal is reasonably well fitted by a single power-law function $\omega(\theta) = A_w \theta^{1-\gamma}$, with $\gamma \sim 1.8$, and the amplitude A_w equal to $0\overset{\circ}{.}16 \pm 0.02$ for the northern and $0\overset{\circ}{.}24 \pm 0.05$ for the southern hemisphere.

On average, this result agrees with the expected clustering properties of a nearby population of star forming galaxies. However, the origin of the difference between both Galactic hemispheres - whether it is technical or physical - still remains to be clarified (see Pollo et al., 2012).

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