HerM33es : Herschel M33 extended survey

SPIRE Data Products Delivery User's Guide

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1. Introduction

This document describes the delivery of the high level data products of the Herschel Open Time Key Project HerM33es (Herschel M33 extended survey; P.I.: C. Kramer) to the Herschel Science Center.

In the framework of HerM33es we use all three instruments onboard the ESA Herschel Space Observatory (Pilbratt, G. L., et al. 2010, A&A, 518, L1) to study the dusty and gaseous ISM in M33. One focus of HerM33es is on maps of the FIR continuum observed with PACS (Poglitsch, A., et al. 2010, A&A, 518, L2) and SPIRE (Griffin, M. J., et al. 2010, A&A, 518, L3), covering the entire galaxy. A second focus lies on observing diagnostic FIR and submillimeter cooling lines [C II], [O I], [N II], and H_2O, toward a 2'x40' strip along the major axis with PACS and HIFI (de Graauw, Th., et al. 2010, A&A, 518, L6). This delivery includes the SPIRE imaging of M33.

More details on the project can be found in the paper by C. Kramer et al. (2010, A&A, 518, 67).

2. SPIRE Observations, Data Reduction, and the final Maps

2.1 SPIRE Observations

M33 was mapped with PACS & SPIRE in parallel mode in two orthogonal directions, in 6.3 h on January 7, 2010. Observations were executed with slow scan speed of 20''/s, covering a region of about 70'x70'. Data were taken simultaneously with the PACS green and red channel, centered on 100 and 160 μm. SPIRE observations were taken simultaneously at 250, 350, and 500 μm.

2.2 SPIRE Data Reduction

SPIRE data were reduced using HIPE 7.0 with the updated calibration scheme (spire_cal_7_0). Standard detector timeline pipeline was used to remove cosmic rays, flux calibrate the data, and apply temperature drift and response corrections. Then we applied an iterative process to remove residual baseline signals that appear as stripes in the maps (described in detail in Bendo, G. J., et al. 2010, A&A, 518, L65). A ''naive'' mapping projection was applied to the data and maps with pixel size of 6'', 10'', and 14'' were created for the 250, 350, and 500 μm data, respectively. Finally, we subtracted median background signals from the images. The factors K4E/K4P (0.9828, 0.9834, 0.9710 for 250, 350 and 500 μm respectively) have been applied to the data to convert to extended source calibration (see Spire Observer's Manual, version 2.4, page 52). No colour correction has been applied to the data. For the colour correction the user is referred to Table 5.3 of the manual (page 52).

2.3 SPIRE Maps

The three maps for each of the SPIRE bands (250, 350, 500 μm) are delivered as single-extension FITS files. The pixel scale of the SPIRE maps is wavelength-dependent: 6'' at 250 μm, 10'' at 350 μm, and 14'' at 500 μm. The flux units are Jy/beam. The reported resolutions are 18.3''x17.0'', 24.7''x23.2'' and 37.0''x33.4'' for the 250, 350 and 500 μm bands respectively while the average beam area is 423, 751 and 1587 $arcsec^2$ for the 250, 350 and 500 μm bands respectively (see Spire Observer's Manual, version 2.4, page 50, Table 5.2). Current flux calibration accuracy (October 2011) is estimated conservatively at ~7%, dominated by the 5% absolute uncertainty in the Neptune model. For extended emission, like in the case of M33, the SPIRE flux calibration is now in the regime of ~10-15% (Spire Observer's Manual, version 2.4, page 55).