

Spitzer Survey of the Large Magellanic Cloud: Surveying the Agents of a Galaxy's Evolution (SAGE)

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1. Summary

We are performing a uniform and unbiased imaging survey of the Large Magellanic Cloud (LMC), using the IRAC and MIPS instruments on board the *Spitzer* Space Telescope (*Spitzer*). Meixner *et al.* (2006) provides an overview of the project and initial results and their Table 1 (repeated here) outlines the survey's salient characteristics. In this project, we are surveying the agents of a galaxy's evolution (SAGE), i.e. the interstellar medium (ISM) and stars, and their interaction on the galaxy wide scale of the LMC. *Spitzer* IRAC and MIPS images provide key insights into the life cycle of matter in a galaxy because the infrared emission from dust grains is an effective tracer of the ISM, star formation, and stellar mass-loss. Three key science goals determined the coverage and depth of the survey. The detection of diffuse ISM with column densities $> 1.2 \times 10^{21}$ H cm⁻² permits detailed studies of dust processes in the ISM. SAGE's point source sensitivity enables a complete census of newly formed stars with masses $> 3 M_{\odot}$ that will determine the current star formation rate in the LMC. SAGE's detection of evolved stars with mass loss rates $> 10^{-8} M_{\odot} \text{ yr}^{-1}$ will quantify the rate at which evolved stars inject mass into the ISM of the LMC (Blum *et al.* 2006). The SAGE data are nonproprietary. The preliminary SAGE catalog of epoch 1 photometry, prepared by the SAGE Team and released to the public on January 3, 2006, contains over 4 million IRAC sources, band merged with 2MASS photometry and over 60,000 MIPS 24 micron sources. Preliminary estimates indicate that foreground Milky Way stars and background galaxies may comprise as much as 18% and 12%, respectively, of these catalogs. To learn more about the SAGE project: <http://sage.stsci.edu/> .

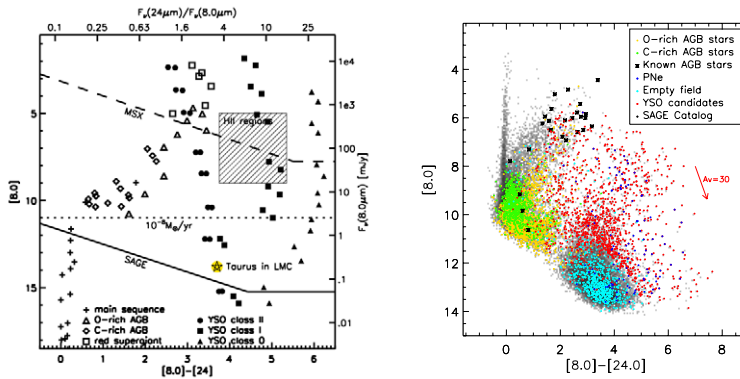


Figure 1. Left: The SAGE discovery space for LMC objects where [8.0] and [24] are the Vega magnitudes at 8 and 24 μm , respectively (Meixner *et al.* 2006). Right: Preliminary results on source classification based on the SAGE Epoch 1 catalogs. All SAGE sources in grey and classes overlaid in color as indicated in the legend.

Table 1. Principal Characteristics for SAGE Survey (Meixner *et al.* 2006)

Characteristic	IRAC Value	MIPS Value
Nominal Center point		
RA(2000)	5h 18m 48s	5h 18m 48s
Dec(2000)	-68°34'12"	-68°34'12"
survey area	7.1° × 7.1°	7.8° × 7.8°
AOR size, grid size	1.1° × 1.1°, 7 × 7	25' × 4', 19 × 2
Total time (hrs)	290.65	216.84
λ (μm)	3.6, 4.5, 5.8 and 8	24, 70 and 160
pixel size at λ	1.2'', 1.2'', 1.2'', 1.2''	1.2'', 4.8'', 15.6''
angular resolution at λ	1.7'', 1.7'', 1.9'', 2''	5.8'', 17'', 38''
Exposure time/ pixel at λ (s)	48, 48, 48, 48	60, 30, 9
Predicted point source sensitivity, 5 σ at λ (mJy)	0.0051, 0.0072, 0.041, 0.044	0.31, 10, 60
Predicted point source sensitivity, 5 σ at λ (mag.)	19.3, 18.5, 16.1, 15.4	10.9, 3.5, -0.6
Saturation limits (Jy) at λ	1.1, 1.1, 7.4, 4.0	4.1, 23, 3
Saturation limits (mag) at λ	6, 5.5, 3.0, 3.0	0.61, -3.7, -3.2
Surface brightness limits (MJy/sr) at λ	... , ... , 0.5, 1	1, 5, 10
Epoch 1	July 15 – 26, 2005	July 27 – Aug. 3, 2005
Epoch 2	Oct. 26 – Nov. 2, 2005	Nov. 2–9, 2005

Acknowledgements

SAGE is supported by NASA/Spitzer grant 1275598 and NASA NAG5-12595.

References

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 Blum, B., Mould, J.R., Olsen, K.A. *et al.* 2006, *AJ* 132, 2034