ESO Science Archive Facility - Phase 3 Data Release Description
ESO public survey programme VMC - VISTA Magellanic Survey, Data Release DR5
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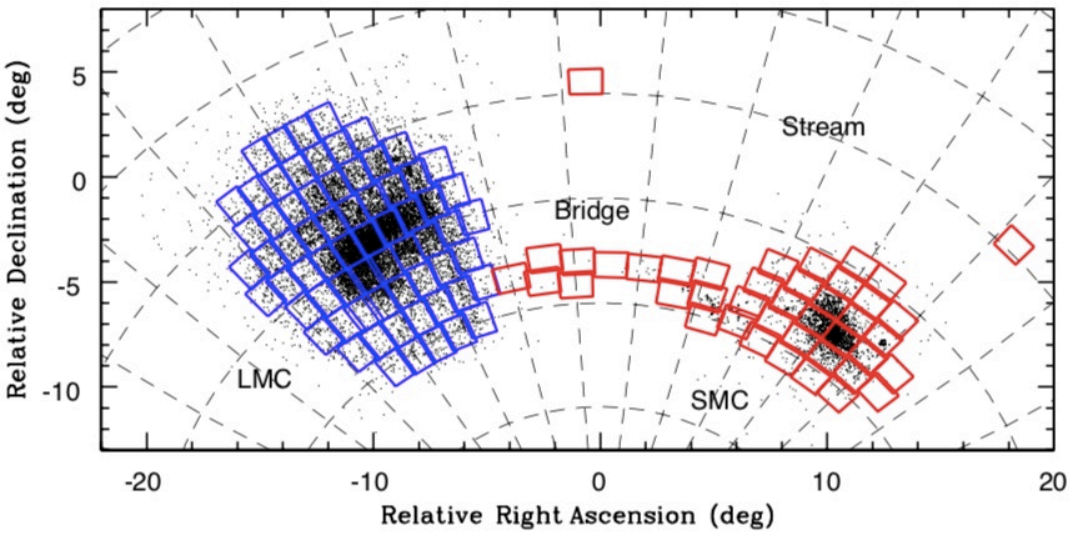
VISTA survey of the Magellanic Clouds system

Abstract

Observations were obtained with the VISTA telescope as part of the VISTA survey of the Magellanic Cloud system (VMC; ESO program 179.B-2003) in three filters: Y, J and K_s. The main goals of the VMC survey are the determination of the spatially resolved star formation history and the three-dimensional geometry of the Magellanic system. The sensitivity of the data is designed to reach sources below the oldest main-sequence turn off point of the stellar population and the multi-epochs to measure accurate K_s mean magnitudes for pulsating variable stars, e.g. RR Lyrae stars and Cepheids.

This data release is based on the observations of 42 VMC survey tiles encompassing the Small Magellanic Clouds (SMC), the Magellanic Bridge and Stream components of the survey. Observations were acquired between February 2010 and November 2016. This release provides reduced and calibrated tile images belonging to individual observations ('single OBs'), in addition to the corresponding pawprints (6 per tile), deep co-added images, and source lists (separately for each filter). This release replaces the previous releases because all images and source lists have been created with version 1.5 of the pipeline. At the same time, it is complementary to previous releases because there are images and source lists of different tiles. There are at least 4 tiles in Y and J filters and 13 tiles in K_s filter per field. The total sky coverage of this release is ~40 deg^2 in the SMC, ~ 20 deg^2 in the Bridge and ~3 deg^2 in the Stream.



Overview of Observations

The figure above shows the Magellanic system as tiled by the VMC survey (blue) and tiles for which data are released (red). Underlying small dots indicate the distribution of carbon stars, stellar clusters and associations.

Tile numbering begins from the bottom right corner, increasing from right to left and from bottom to top. The first SMC tile is 2_2, the first Bridge tile is 1_2 and Stream tile 1_1 is right above the Bridge while 2_1 is to the right of the SMC.

Each survey tile has at least 2 OBs in Y and J filters, respectively (providing 800 s exposure time per pixel each) and 11 OBs in K_s with 750 s exposure time per pixel each. There are also pairs (YJ, JK_s, and YK_s) of shallow observations corresponding to half the exposure time.

Release Content

Tile	RA	DEC	TL_OFFAN
STR 1_1	03:30:03.936	-64:25:23.880	+0.0005
STR 2_1	00:11:59.424	-64:39:30.960	+0.0004
BRI 1_2	01:49:51.432	-74:43:25.320	-16.8805
BRI 1_3	02:11:34.464	-75:05:00.960	-11.6212
BRI 2_3	02:14:46.584	-74:00:47.520	-10.8627
BRI 2_4	02:35:28.440	-74:56:20.400	-5.8932
BRI 2_7	03:39:50.712	-74:04:51.240	+9.5439
BRI 2_8	04:00:21.072	-73:46:37.560	+14.4905
BRI 2_9	04:19:21.528	-73:22:10.560	+19.0897
BRI 3_3	02:17:36.600	-72:56:20.400	-10.2104
BRI 3_4	02:37:26.016	-73:08:16.080	-5.4372
BRI 3_5	02:57:33.288	-73:12:52.200	-0.5877
BRI 3_6	03:17:45.000	-73:10:02.640	+4.2769
BRI 3_7	03:37:39.240	-72:59:54.600	+9.0465
BRI 3_8	03:57:04.968	-72:42:31.680	+13.7448
SMC 2_2	00:21:43.920	-75:12:04.320	-6.7623
SMC 2_3	00:44:35.904	-75:18:13.320	-1.2924
SMC 2_4	01:07:33.864	-75:15:59.760	+4.2022
SMC 2_5	01:30:12.624	-75:05:27.600	+9.6169
SMC 3_1	00:02:39.912	-73:53:31.920	-11.3123
SMC 3_2	00:23:35.544	-74:06:57.240	-6.3137
SMC 3_3	00:44:55.896	-74:12:42.120	-1.2120
SMC 3_4	01:06:21.120	-74:10:38.640	+3.9099
SMC 3_5	01:27:30.816	-74:00:49.320	+8.9671
SMC 3_6	01:48:06.120	-73:43:28.200	+13.8809
SMC 4_1	00:05:33.864	-72:49:12.000	-10.6178
SMC 4_2	00:25:14.088	-73:01:47.640	-5.9198
SMC 4_3	00:45:14.688	-73:07:11.280	-1.1369
SMC 4_4	01:05:19.272	-73:05:15.360	+3.6627
SMC 4_5	01:25:11.016	-72:56:02.040	+8.4087
SMC 4_6	01:44:34.512	-72:39:44.640	+13.0368
SMC 5_2	00:26:41.688	-71:56:35.880	-5.5717
SMC 5_3	00:44:49.032	-72:01:36.120	-1.2392
SMC 5_4	01:04:26.112	-71:59:51.000	+3.4514
SMC 5_5	01:23:04.944	-71:51:47.880	+7.6718
SMC 5_6	01:41:28.800	-71:35:47.040	+12.3004
SMC 6_2	00:27:39.960	-70:51:12.600	-5.3423
SMC 6_3	00:45:48.768	-70:56:08.160	-1.0016
SMC 6_4	01:03:49.944	-70:53:34.440	+3.1075
SMC 6_5	01:21:22.488	-70:46:10.920	+7.5039
SMC 7_3	00:46:04.728	-69:50:38.040	-0.9389
SMC 7_4	01:03:00.480	-69:48:58.320	+3.1144

This release comprises of first data for 22 tiles in the SMC and 11 tiles in the Bridge, as well as new data for the 5 tiles in the SMC, 2 tiles in the Bridge and 2 tiles in the Stream, previously released, reprocessed with v1.5 of the pipeline.

SMC, BRI, and STR tiles were oriented with the Y axis along the right ascension direction. Each tile covers about 1.771 deg^2 where the central (1.475 x 1.017)=1.501 deg^2 corresponds to the nominal

depth of the survey and the remaining area to half the exposure time in each band. Tile centres given in Right Ascension (RA), Declination (DEC) and the telescope position angle (TL_OFFAN) are listed in the table above.

Individual tile images and co-added tile images, with associated confidence maps and source lists, are released per band per field. Preview images in JPEG format are associated to each FITS image. They comprise observations obtained from February 2010 to November 2016 included.

Data Quality

Source lists were created from images that were filtered for nebulosity with size of the order of 30 arcsec, but to the images released here the filtering process was not applied. See Irwin (2010, UKIRT Newsletter 26, 14).

The VMC constraints for the tiles in this release correspond to ellipticity <0.1 arcsec and seeing of 0.8-0.9 arcsec at K_s, 0.9-1.0 arcsec at J and 1.0-1.1 arcsec at Y, but good quality observations have a tolerance of ~10% on top of these values. The two values specified for seeing indicate constraints for crowded and uncrowded regions, respectively. The tiles that refer to tighter seeing constraints are: SMC 3_5, SMC 3_6, SMC 4_3, SMC 4_4, SMC 4_5, SMC 5_3, SMC 5_4, and SMC 5_5.

Tiles observed outside VMC constraints are also released and their quality parameters are included in headers, they refer to observations with higher seeing and/or ellipticity then those listed above. In total 174 tile images and their corresponding pawprints are affected. Note that the sensitivity of tile images is by construction higher than that of pawprint images. For co-added tiles they are usually equal to the sum of the times indicated for single tiles, but times may be larger in case of extra good quality images (those that meet the VMC observing constraints) and in the regions with >2 detector overlaps. They can also be smaller due to the exclusion of problematic images.

Observed pawprints that are not associated to any tile, because they refer to interrupted observations due to bad weather or technical reasons, are also released. There are 92 in total.

Release Notes

The data for this release were prepared by the Cambridge Astronomy Survey Unit (CASU) and the VMC team. Images were reduced and source lists extracted from individual tile images using the software suite provided by CASU (v1.5). Sources are unique within each tile.

Data Reduction and Calibration

The procedures to reduce and calibrate the data are described in detail at:
http://casu.ast.cam.ac.uk/surveys-projects/vista/technical/data-processing.

The astrometric and photometric quality of the data is described in detail at
http://casu.ast.cam.ac.uk/surveys-projects/vista/technical.

Source lists were created from images that were filtered for nebulosity with size of the order of 30 arcsec (Irwin 2010, UKIRT Newsletter 26, 14).

Magnitudes are given in the Vega system and are not corrected for reddening.

Known issues

These VISTA data may present the following issues, for which a full description is given in http://casu.ast.cam.ac.uk/surveys-projects/vista/technical/known-issues. A variable depth due to bad pixels in detectors #1, #4 and #16 as well as some bad rows. Point-like objects residuals of flatfielding, variable vignetting and spurious detections around bright stars. Some of these issues

are recorded in the quality error bits flags assigned during post processing. Note also that 15% of each tile, corresponding to two edges, has only half the total effective exposure time.

Previous Releases

This data release consists of 42 VMC survey tiles and it replaces CASU products previously released in VMC Data Release 4 and earlier. This data was reduced with the version of CASU software 1.5. The photometric calibration of VISTA was improved by using new colour equations for the transformation of 2MASS calibrators into the VISTA system. A new prescription to account for interstellar reddening is also incorporated. This release also fixes bugs in the tile photometry, addressing a 0.05 mag pattern remaining in these due to a faulty distortion correction when transforming from ZPN to TAN projections. All these changes are detailed in Gonzalez-Fernandez et al. (2018).

Data Format

Files Types

There are 1075 individual tile images, each with six corresponding pawprints, and associated confidence maps and source lists with the adopted naming convention:

Pawprint images: v????????_?????_st.fits.fz
Associated confidence map: v????????_?????_st_conf.fits.fz
Source list per pawprint: v????????_?????_st_cat.fits
where the name is constructed as observing-date_number_type.fits(.fz)

Tile images: v????????_?????_st_tl.fits.fz
Associated confidence map: v????????_?????_st_tl_conf.fits.fz
Source list per tile: v????????_?????_st_tl_cat.fits
where the name is constructed as observing-date_number_type.fits(.fz)

Acknowledgements

Any publication making use of this data, whether obtained from the ESO archive or via third parties, must include the following acknowledgement:

- "Based on data products created from observations collected at the European Organisation for Astronomical Research in the Southern Hemisphere under ESO programme 179.B-2003"

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- "This research has made use of the services of the ESO Science Archive Facility."

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