

Data Collection	VMC_CEPHEID
Release Number	1
Data Provider	Maria-Rosa Cioni
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Abstract

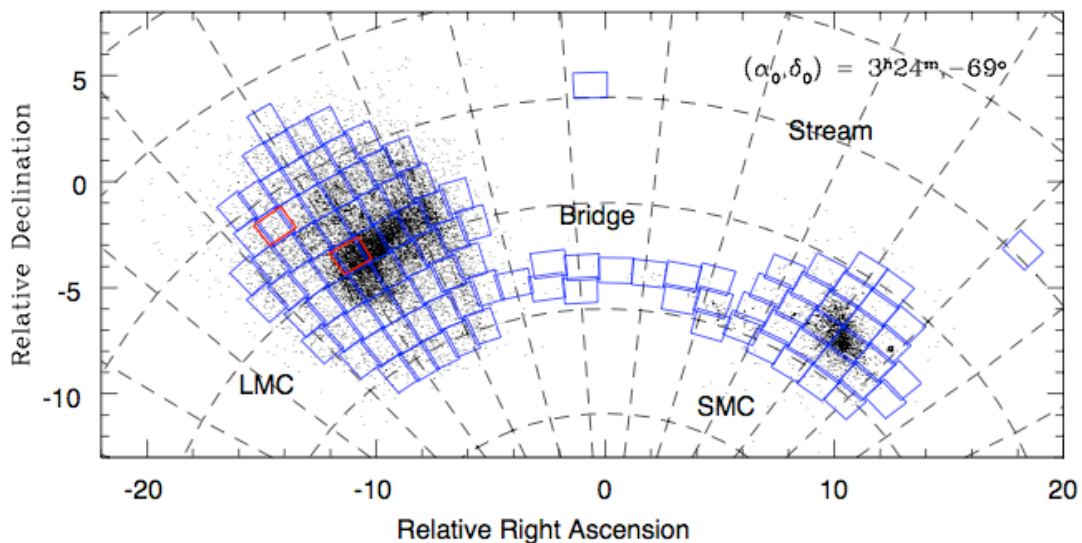
Observations were obtained with the VISTA telescope as part of the VISTA survey of the Magellanic Cloud system (VMC; ESO program 179.B-2003) in three filters: Y, J and Ks. The main goals of the VMC survey are the determination of the spatially resolved star formation history and the three-dimensional 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 Ks mean magnitudes for pulsating variable stars, e.g. RR Lyrae stars and Cepheids.

This catalogue data release refers to known classical Cepheid stars in VMC tiles completed by end of September 2011 (Ripepi et al. 2012). These are tiles LMC 6_6 (including the 30 Doradus star forming region) and LMC 8_8 (including the South Ecliptic Pole region). VMC Ks magnitudes are listed together with V and I magnitudes from OGLE-III (tile LMC 6_6) and V magnitudes from EROS-2 (tile LMC 8_8) for each Cepheid star. Periods and modes of pulsation are also from the optical-band data. Reddening values were derived from Haschke, Grebel & Duffau 2011 (A), 141, 158). The total sky coverage of this release is $<3.5 \text{ deg}^2$ in the LMC, corresponding to the sum of the areas of the two tiles, because tile LMC 8_8 is only partly covered by the EROS-2 survey.

Overview of Observations

The figure below shows the Magellanic system as tiled by the VMC survey (blue) and tiles for which catalogues 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 right. The first LMC tile is 2_3, 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.



Release Content

This catalogue release covers two tiles in the Large Magellanic Cloud: LMC 6_6 and LMC 8_8.

LMC tiles were oriented with the Y axis more or less along the declination direction and cover about 1.771 deg² each where the central (1.475 x 1.017)=1.501 deg² corresponds to the nominal depth of the survey and the remaining area to half the exposure time in each band.

The classical Cepheid stars included in this release are initially extracted from the OGLE-III (tile LMC 6_6) and EROS-2 (tile LMC 8_8) surveys. Only 70% of tile LMC 8_8 is covered by the EROS-2 and the variable stars in the remaining area of the tile have yet to be discovered.

Tile centres, number of records and the size in Mby are listed below.

Tile	RA	Dec	Records	Mby
LMC 6_6	05:37:40.008	-69:22:18.120	11	0.08
LMC 8_8	05:59:23.136	-66:20:28.680	321	0.12

Release Notes

The data for this release were prepared by the Cambridge Astronomy Survey Unit (CASU), the Wide Field Astronomy Unit (WFAU) and the VMC team.

The main processing steps are described in Hambly et al. 2008 (MNRAS 384, 637) and Cross et al. 2009 (MNRAS 399, 1730). Variability catalogues were extracted from the VISTA Science Archive by WFAU using data in the VMCv20120126 release. Full details are given in Ripepi et al. 2012 (MNRAS, 424, 1807).

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>.

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

The magnitudes were not corrected for reddening.

Data Quality

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

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.

Note that in Ripepi et al. (2012) IAUNAMEs may differ slightly from those included in this release. The right ascension components may differ by 0.01 s and the declination components are rounded to one decimal point.

Data Format

Files Types

Two known Cepheid catalogues, one per tile, are released:

```
vmc_er2_05h37-069d22_yjks_cepheidCat_558345748491.fits  
vmc_er2_05h59-066d20_yjks_cepheidCat_558345748486.fits
```

where the name is constructed as `project_release_ra/dec_bands_typeofCat_framesetID.fits` and `framesetID` uniquely identifies the tile as follows:

```
558345748486 LMC 8_8  
558345748491 LMC 6_6.
```

A MetaData file, `vmc_er1_yjks_cepheidCatMetaData.fits`, accompanies the release. Its name refers to `project_release_bands_typeofCat.fits`.

Catalogue Columns

Each known Cepheid catalogue contains the following columns.

```
# Number; name; format; description  
1; IAUNAME; 29A; Unique identifier in IAU naming convention  
2; SOURCEID; K; UID of this merged detection as assigned by merged algorithm  
3; VARID; K; UID of VMC variables  
4; FIELDID; 8A; ID of field  
5; CUEVENTID; J; UID of curation event giving rise to this record  
6; RA2000; D; Celestial Right Ascension  
7; DEC2000; D; Celestial Declination  
8; CEPHMODE; 5A; Type of Cepheid  
9; IMEANMAG; E; Mean I band magnitude  
10; VMEANMAG; E; Mean V band magnitude  
11; PERIOD; E; Period of first mode of oscillation  
12; KSMEANMAG; E; Mean Ks band magnitude  
13; KSAMPL; E; Amplitude of Ks band magnitude variation  
14; KSMAGERR; E; Error in mean Ks band magnitude  
15; EVI; E; The dust extinction value E(V-I)  
16; NOTES; 8A; Additional information
```

The format refers to the fits notation as follows:

A - string 32 characters; D - double floating point (8 bytes); E - real floating point (4 bytes); I - short integer (2 bytes); J - integer (4 bytes); K - long integer (8 bytes).

Acknowledgements

Please reference Ripepi et al. 2012, MNRAS, 424, 1807 and use the following statement in your articles when using these data: Based on data products from observations made with ESO Telescopes at the La Silla Paranal Observatory under programme ID 179.B-2003.