1. Introduction: Star clusters play a crucial role as the fundamental components of the stellar populations within our galaxy. While around 4000 objects are recognized as Galactic star clusters in the literature, roughly half lack detailed astrophysical parameters. This paper outlines the Milky Way Star Clusters (MWSC) project, initiated to create a comprehensive sample of Galactic star clusters with well-determined parameters, enabling an unbiased study of their content and evolution. The MWSC survey employs uniform kinematic and precise near-infrared (NIR) photometric data from the PPMXL catalogue. The initial phase (Paper I) provided preliminary results for the second Galactic quadrant. This paper presents the full survey results covering the entire sky, including a catalogue of 3006 clusters, stellar data with membership probabilities, and supplementary material. The MWSC project not only focuses on named clusters but also aims to extend the sample by identifying unknown clusters based on the PPMXL catalogue, with ongoing work to be detailed in a subsequent paper.

Survey Methodology: In Section 2, the paper briefly outlines the basic input data set and the pipeline for determining cluster parameters, emphasizing the use of PPMXL data. Current statistics on the outcomes are provided, highlighting the survey's progress and comprehensiveness.

Characterization of Cluster Parameters: Section 3 delves into characterizing the derived cluster parameters, shedding light on the precision and reliability of the data obtained through the MWSC survey.

General Properties of MWSC Sample: Section 4 discusses the overarching properties of the MWSC sample of star clusters, providing insights into their distribution and characteristics.

Summary of Results: Section 5 concludes the paper by summarizing the achieved results to date, serving as a comprehensive overview of the MWSC project's findings.

The MWSC project contributes a valuable resource for researchers interested in Galactic star clusters, offering a substantial dataset with well-defined parameters for named clusters and an ongoing effort to uncover new clusters in the Milky Way.

2.1 Observational Basis:

- Stellar data for the study were sourced from the PPMXL and 2MASS catalogues.
- PPMXL provided coordinates and proper motion components, along with low-accuracy photometry.
- 2MASS contributed accurate J, H, Ks magnitudes for about 400 million entries.
- A merged version of these catalogues, named 2MAst, was used for the survey, ensuring homogeneity across the sky.
- The survey's depth increased by at least 3 magnitudes compared to previous work, incorporating NIR data.

2.2 Pipeline:

- The pipeline aims to identify clusters based on kinematic, photometric, and spatial criteria, construct a list of cluster members, and determine basic cluster parameters.

- The theoretical basis used recent Padova stellar models, and the pipeline involved various diagrams of kinematic and photometric data.
- An iterative approach improved cluster membership and parameters successively.
- The pipeline provided spatial, kinematic, and photometric membership probabilities for approximately 64 million stars.

2.3 Object Statistics:

- The input list comprised 3784 entries, but 21% did not have real counterparts in 2MAst.
- The pipeline confirmed 79% of the objects as real clusters, totaling 3006 confirmed clusters.
- The survey included different types of clusters: 147 globular clusters, 51 associations, 2808 open clusters, 389 cluster remnants, 132 clusters with nebulosity, and 19 moving groups.

2.4 Survey Output Statistics:

- Cluster parameters were determined for the confirmed clusters, including coordinates, membership, apparent radius, proper motions, distance, reddening, age, tidal parameters, radial velocity, and metallicity.
- Among these, membership information was provided for 40%, proper motions for 70%, and age for 53% of the clusters.
- The survey covered various cluster types and sub-groups, offering a comprehensive dataset for further analysis.

These detailed statistics and the comprehensive nature of the survey provide a rich resource for understanding the properties and distribution of star clusters in the Milky Way.

3.1 Main Goals:

- The main goal is to establish a uniform and homogeneous set of astrophysical parameters for all named clusters.

3.2 Cluster Parameter Set:

- The set includes positions (convertible to 3D coordinates), structure data (apparent sizes, tidal parameters), kinematic information (proper motions, radial velocities related to 3D velocity components), and astrophysical parameters (age, reddening, and sometimes metallicity).
- Table 4 provides a breakdown of the number of clusters for which each parameter was determined or estimated within the MWSC project.

3.3 Basic and Additional Parameters:

- Basic parameters, determined for all confirmed clusters via the MWSC pipeline, include coordinates, membership, apparent radius, proper motions, distance, reddening, and age.
- Additional parameters, obtained for a fraction of clusters, include tidal parameters, radial velocity, and metallicity.

3.4 Data Comparison:

- RVs were updated using information on membership, with additional measurements from CRVAD-2, SIMBAD, and SDSS DR9.
- Metallicities were taken from DAML02 and Conrad et al. (2013).
- Table 5 compares basic MWSC parameters with corresponding literature data, showing a close match in scale coefficients, with slight zero-point differences.

3.5 Accuracy Estimates:

- Internal errors, representing lower limits, were estimated for parameters like proper motion, distance, reddening, age, tidal radius, and radial velocity.
- External errors, representing upper limits, were derived from comparing MWSC values with those in the literature.
- Mean cluster proper motions are accurate within 1 mas/yr.
- Ages and distances show good quality, with internal errors smaller than external errors.
- Tidal radii are accurate within 25%.
- Most radial velocities have errors better than ±5 km/s.

3.6 Parameter Distribution:

- Histograms in Fig. 1 illustrate the distribution of cluster parameters in the MWSC survey.
- Typical angular radius (r2) is 3-12 arcmin, with tidal radii (rt) between 5-10 pc.
- Most proper motions lie within ±10 mas/yr, and radial velocities within ±100 km/s.
- The survey is dominated by older clusters, with more than 45% having ages between 400 Myr and 2 Gyr.

This section outlines the extensive scope of cluster parameters considered, provides insights into data accuracy, and visualizes the distribution of parameters across the surveyed clusters.

4.1 Spatial Distribution:

- Fig. 2 displays the spatial distribution of clusters in the Galactic XY-plane, including open and globular clusters.
- Open clusters cover a wide range of galactocentric distances, reaching the central region and extending to about 20 kpc from the Galactic center.

4.2 Kinematic Properties:

- Fig. 3 illustrates kinematic properties of open clusters within 4 kpc from the Sun.
- Proper motions closely match predicted distributions, and observed velocities follow expected behaviors, confirming reliability for Galactic disk kinematics studies.
- Deviations from simple rotation models are observed for proper motions and tangential velocities at larger distances, possibly indicating limitations in the adopted rotation law.

4.3 Completeness:

- Fig. 4 depicts the surface density of open clusters in the MWSC survey as a function of distance in the Galactic plane.
- Completeness is examined for young, moderately young, moderately old, and old clusters, showing a decline in surface density beyond 1.8 kpc.
- Youngest clusters show excess near 400 pc due to the Orion star formation complex.
- Oldest clusters exhibit an increase in surface density at distances up to 1.1 kpc, possibly indicating incompleteness in input data.

4.4 Vertical Distribution:

- Fig. 5 presents the cluster distribution along the Galactic Z-axis as a function of cluster age.
- A smooth transition is observed from the oldest open clusters to the youngest globular clusters at ≈6 Gyr.
- Within the age range of ≈3-7 Gyr, open and globular clusters exhibit a similar vertical distribution.
- The vertical scattering of older globular clusters increases steadily with age.

This section provides a comprehensive overview of the spatial distribution, kinematic properties, completeness, and vertical distribution of the clusters in the MWSC survey, offering valuable insights for further studies on Galactic structure and dynamics.

5.1 Project Goals and Catalogue Content:

- The MWSC project aimed to complete a comprehensive survey of star clusters in the wider solar neighborhood.
- The provided catalogue includes fundamental astrophysical data for all clusters, derived from PPMXL and 2MASS surveys.
- The data encompass exact positions of cluster centers, proper motions, apparent radii, distances, reddenings, and ages.

5.2 Homogeneous Nature of Derived Parameters:

- The astrophysical quantities derived in the study have a uniform and homogeneous nature due to the use of homogeneous data sets and a uniform pipeline for analysis.
- Reliable membership determination is crucial, forming the basis for all derived astrophysical parameters.

5.3 Confirmation of Named Clusters:

- The input list consisted of 3784 named clusters. Analysis based on PPMXL and 2MASS data confirmed 79% (3006) of these as real objects.
- The majority of confirmed objects are open clusters, but stellar associations and globular clusters were also identified.

5.4 Parameter Determination and Comparison:

- Tidal parameters were determined for 98% of the clusters, and mean RVs were estimated for over 30% of clusters using literature data.
- Basic astrophysical parameters were presented for the first time for about 50% of the confirmed clusters.
- Comparison with literature data showed no severe systematic differences, highlighting the unprecedented nature of the MWSC survey.

5.5 Spatial Coverage and Completeness:

- The MWSC cluster sample covers a large section of the Galactic disk, reaching the central and outer regions of the Milky Way.
- Data completeness extends to neighboring spiral arms, allowing comparative studies in inter- and intra-arm regions.
- The sample of open clusters is nearly complete up to a distance of 1.8 kpc from the Sun, except for the subset of the oldest open clusters ($\log t \gtrsim 9$), indicating possible incompleteness in the input list.

5.6 Ongoing Work:

- Ongoing work includes a search for clusters missing in the literature, aiming to address the identified incompleteness.
- A soon-to-be-published list will complete the current data, enhancing the overall completeness of the MWSC survey.

This section summarizes the achievements of the MWSC project, emphasizing the completeness, reliability, and unprecedented nature of the derived cluster parameters. Ongoing efforts to address identified incompleteness indicate the dynamic nature of the project.