

THE MACHINE-READABLE DURCHMUSTERUNGEN: CLASSICAL CATALOGS IN CONTEMPORARY FORM

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ABSTRACT. The entire series of *Durchmusterung* (DM) catalogs (*Bonner, Southern, Córdoba, Cape Photographic*) has been computerized through a collaborative effort among institutions and individuals in France and the United States of America. Complete verification of the data, both manually and by computer, the inclusion of all supplemental stars (represented by lower case letters), complete representation of all numerical data, and a consistent format for all catalogs, should make this collection of machine-readable data a valuable addition to digitized astronomical archives.

1. Introduction

The *Durchmusterung* catalogs need little introduction to most astronomers, particularly those working in the area of positional astronomy and the identification of stars. The *Bonner DM* (BD) and its southern extension, the *Southern DM* (SD) were completed and published by Argelander (1859-62) and his assistant Schönfeld (1886) following many years of painstaking observations. The visual techniques used for these surveys were identical, except that the SD observations were made with a larger telescope and, thus, the resulting catalog extends to fainter magnitudes. The *Córdoba DM* (CD, Thome 1892-1932) extends the German visual survey to the south celestial pole, while the *Cape Photographic DM* (CPD, Gill and Kapteyn 1895-1900) repeats the southern zones using photographic techniques.

The present paper briefly outlines the procedures used for the computerization of the entire set of DM catalogs. This work has been accomplished over the last 15 years and results in the availability of all DM catalogs in a uniformly-formatted, machine-readable edition.

2. The Machine-Readable Catalogs

2.1. PROCEDURE

All data were keyed directly from the published catalogs to disk storage, but the procedures differed somewhat depending upon local circumstances and available software to partially automate the work. The following sections briefly describe the procedures used for the four catalogs.

2.1.1. *Córdoba Durchmusterung*. All data were keyed at the NSSDC with the help of a preprocessing program to automatically insert data that remained the same throughout each zone. A computer program was written to process individual zones and to create hard copy in the exact format and structure as in the published catalog. This allowed the matching of last stars on each page to detect missing records. Individual zones were then supplied to a number of volunteers for proofreading. Many zones were also proofread at the ADC, where all error correction, incorporation of errata and corrigenda, and final assembly of the catalog were done by WHW.

2.1.2. *Cape Photographic Durchmusterung*. The northern zones (-18° to -32° and -35°) were keyed and partially verified at Case Western Reserve University under the supervision of BNR. Unverified northern and the remaining zones were keyed and verified by a commercial firm with funding by the NSSDC and supervision and checking by BNR. Final checking, incorporation of errata, and final assembly were done at the ADC by WHW.

2.1.3. *Bonner Durchmusterung*. The edition of Küstner (1903) was used, the keying of the data being divided according to the following table:

Zones	Location
+ 89° to + 60°	Centre de Données Astronomiques de Strasbourg (CDS)
+ 59° to + 26°	Observatoire de Nice
+ 25° to + 24°	National Space Science Data Center (also CDS)
+ 23° to + 20°	B. N. Rappaport (+ 23° also done at CDS)
+ 19° to -01°	National Space Science Data Center (+ 14° also done at Nice)

Zones + 89° to + 60° were also verified at the CDS and zones + 59° to + 26° were proofread there. Software for data entry was written by FO, who also supervised the work. The remaining zones were proofread at the ADC. Redundant zones were compared by computer at the ADC, where final checking, incorporation of supplemental stars and errata, analysis and flagging of "missing" stars, and final assembly were done by WHW.

2.1.4. *Southern Durchmusterung*. Zones -02° to -21° were done at the CDS under the supervision of FO. The remaining zones were keyed and proofread at the ADC by WHW. All zones were carefully examined, checked for sequencing and record counts, and assembled into the final catalog by WHW.

2.2. FINAL CATALOGS

The zone coverages and final catalog statistics are given in the following table. Record counts are greater than star counts because stars that have been deleted from the catalog are flagged in the machine version, while their records and data have been left in the catalog so that zone counts and sequencing agree with the published catalogs.

DM	Zones	Number of Records	Number of Stars
BD	+ 89° to - 01°	325037	324948
SD	- 01° to - 23°	134834	134832
CD	- 22° to - 89°	613959	613953
CPD	- 18° to - 89°	454877	454875

3. Summary

The entire set of DM catalogs has been computerized in a uniform format. All known corrigenda and errata, including changes made in various reprinted editions of the BD and SD, have been incorporated into the catalogs. The machine-readable catalogs will allow all DM stars not already in the SIMBAD data bank to be entered. The full catalogs are being disseminated through the worldwide network of astronomical data centers. More detailed information on each catalog, including individual zone statistics, can be found in documentation distributed with the machine-readable catalogs.

4. Acknowledgments

The authors gratefully acknowledge the efforts contributed by numerous staff members of the collaborating institutes and by volunteers who proofread DM data. This immense project would not have been possible without their help.

5. References

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