ASTROMETRY WITH CARTE DU CIEL PLATES

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ABSTRACT. Because of their early epochs, Carte du Ciel plates are ideal first epoch plates for the study of proper motions. We have tested the astrometric precision of some plates from different epochs using the accurate astrometric star catalogues of Praesepe and Pleiades.

1. INTRODUCTION

The plates of the Carte du Ciel, which are still kept in different plate vaults, are ideal first epoch plates for proper motion work. A possible use of these plates depends on their astrometric precision, which can be tested in fields of stars with well known positions and proper motions. The star catalogues by Vasilevskis et al. (1979) for the Pleiades and by Russell (1986) for Praesepe are suited catalogues for astrometric tests, therefore, we used plates of these clusters from the telescope of the Greenwich Zone to get an idea about the astrometric precision of plates from the Carte du Ciel.

2. MEASURING OF THE PLATES

Three plates of each cluster were measured on the PDS 2020GM measuring engine at University of Münster (Tucholke 1983). According to an earlier analysis (Geffert 1986) of this machine, precisions of 0.0013mm could be achieved for plates of the Pleiades from the double refractor of Bonn. The star positions were determined by fitting Gaussian profiles to the marginal distributions in x and y. We measured about 80 stars in a central field of 1.3 x 1.3 square degree of the Pleiades (Plate Nos. 218, 230 and 6619) and about 130 stars in a field of 2 x 2 square degree of Praesepe (Plate Nos. 1999, 2001 and 9277). In order to test the instrumental magnitude equation and drift of the PDS, we measured two plates in two opposite directions and compared the positions by an affine transformation. The mean deviation for one star for one plate was 0.0006mm and therefore the other plates could be measured in only one direction. A comparison of plates, taken at the same epoch, is given in

S. Débarbat et al. (eds.), Mapping the Sky, 403–405.

table 1.

Table 1. Mean Deviations For One Star From The Comparison Of Same Epoch Plates

Plate I	Plate II	Epoch	DX(0.001mm)	DY(0.001mm)
218	230	1890	2.0	2.1
9277I	9277II	1922	1.1	1.1 a)
C1999	C2001	1963	1.6	1.6

a) Only one plate with two exposures.

3. RESULTS AND DISCUSSION

In a first step, all plates were reduced with a reduction model with terms up to second order of the rectangular coordinates in x and y. After the first reduction, additional plate constants were included in the reduction. For the final reduction, only those plate constants were included with values higher than 3σ. For all plates, only magnitude and coma terms have been taken into account for the final reduction. The results of the mean deviations of our measurements from the catalogue positions are given in table 2 for the first reduction and in table 3 for the final reduction.
(0.001mm corresponds to 0".06)

Table 2. Mean Deviations For One Star Of Our Measurements From The Catalogue Positions Using A Reduction Model With Terms Up To Second Order Of The Coordinates X And Y.

Plate	Epoch	DX(0.001mm)	DY(0.001mm)
218	1890	2.3	3.5
230	1890	3.5	2.0
6619	1974	3.1	1.9
9277I	1922	1.7	1.8
9277II	1922	2.3	2.3
C1999	1963	2.2	2.0
C2001	1963	2.0	2.0

The comparison with completely independant positions is the most 'external' check. As one may see, a 0".1 precision is obtainable with Carte du Ciel plates. Therefore, this plate material deserves any effort for its preservation and for its scientific work.

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Table 3. Mean Deviations For One Star Of Our Measurements From The Catalogue Positions For The Final Reduction.

Plate	Epoch	DX(0.001mm)	DY(0.001mm)
218	1890	1.8	2.7
230	1890	1.8	1.3
6619	1974	1.2	1.0
9277I	1922	1.4	1.5
9277II	1922	1.9	1.8
C1999	1963	1.9	1.8
C2001	1963	1.8	1.9

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