where

$$s_{20} = \left[\sum_{i=1}^{N_R} \sin^2 L_i(t)\right] \Big/ N_R,$$

$$c_{20} = \left[\sum_{i=1}^{N_R} \cos^2 L_i(t)\right] \Big/ N_R,$$

$$d_0 = \left[\sum_{i=1}^{N_R} \sin L_i(t) \cos L_i(t)\right] \Big/ N_R.$$

(2) *The estimate* $\hat{\varphi}_R$ *is asymptotically (when* $N_R \to \infty$*) unbiased for the value* φ_R*, and its distribution function can be calculated in terms of a normal distribution (we do not need a concrete formula here).*

(3) *The value* $\delta_R^{\min}(t^*)$ *is an asymptotically nonbiased estimate for the real mean-square error*

$$d^{1/2} = \left(E\xi_i^2\right)^{1/2}$$

of the measurements.

We shall call the parameters φ_R and γ_R systematic errors in the group R. The value $\delta_R^{\min}$ characterizes the accuracy of the measurements in the region R. Thus, in order to discover groups of well-measured star groups, we can use the following algorithm.

Algorithm of the choice of well-measured star groups

(1) Calculate the values $\hat{\gamma}_R$, $\hat{\varphi}_R$, $\delta_R^{\min}$ for each "large" group R of stars;

(2) choose the group $R_0 = \arg\min \delta_R^{\min}$;

(3) test that the calculated values $\hat{\gamma}_{R_0}$ and $\hat{\varphi}_{R_0}$ are really parameters of the group error for all individual constellations in R_0. Consequently, Theorem 1 is valid. All such constellations G form a set of well-measured stars. Of course, this set can be empty;

(4) delete the set R_0 from the initial catalogue and repeat the algorithm beginning with step (1), etc.

As a result we obtain the hierarchy of well-measured collections of stars corresponding to the accuracy of the latitude measurements.

Step (3) in the above algorithm will be discussed more fully in some comments which we shall give below.

Let us note that the epoch t of real observations is unknown to us. Hence, all conclusions made above have a conventional character (given that the catalogue was compiled in the epoch t). Consequently, we need to test all values t from our a priori time interval. Because we know the trajectory of the real ecliptic pole from Newcomb's theory, it is sufficient to obtain $\hat{\gamma}_R$ and $\hat{\varphi}_R$ only for some fixed $t = t_0$. These two parameters determine the location of the "catalogue ecliptic" and then give us the possibility of calculating $\hat{\gamma}_R$ and $\hat{\varphi}_R$ for all t.