of the data. Stigler (1977) has shown that modest trimming works better than extreme trimming. Although the eigenvalues of the moment matrix indicate little concentration towards the Galactic plane, 129.7, 94.0, and 80.9 pc^2, the normalized eigenvector associated with the z-axis points towards $b_g = 55.^\circ671$, a significant tilt with respect to the Galactic plane. This tilt, however, seems to be a selection effect associated with the giants rather than a tilt associated with the Gould belt. Look at the G stars as a whole without discrimination as to luminosity class. There are 82 supergiants, 184 bright giants, 3,075 giants, 1,152 subgiants, 4,656 main sequence, and 9,332 unspecified luminosity class G stars. With this heterogeneous group the tilt becomes $79.^\circ494$. Further evidence that the tilt seems not associated with the Gould belt arises from an attempt to fit a plane to the G giants. Branham (2003) outlines the procedure for doing this. 1,389 stars are classified as "Gould belt", but the tilt of the plane of the remaining, supposedly "Galactic belt", stars becomes even worse, $35.^\circ58$, and with high correlations, up to 40%, among the x, y, z coordinates.. Thus, the procedure that works so well with the O-B5 stars to discriminate between Gould belt and Galactic belt stars fails completely for the G giants.

That the tilt should not unduly bias the solution can be inferred from a look at the randomness of the rectangular coordinates. The correlation between x and y is -10.1%, between x and z -12.9%, and between y and z 11.3%. Regarding the randomness in distance a runs test yields, after elimination of discordant distances, 1,487 runs out of an expected 1531 implying an 11.3% chance that the distances are random. The statistics for the G giants, therefore, indicate *relative* randomness.

4. EQUATION OF CONDITION FOR KINEMATICS AND THE VELOCITY ELLIPSOID

The equations of condition, given in detail in Branham (2009a) and which come from Ogordnikov (1965, pp. 74–75), involve twelve unknowns for the kinematical parameters: the components of the reflex solar motion X, Y, Z and the components of the displacement tensor $u_x, u_y, u_z, v_x, v_y, v_z, w_x, w_y, w_z$. All of these quantities are referred to Galactic latitude and longitude, l and b, rather than right ascension α and declination δ. Proper motions in α and δ are converted to proper motions in l and b expressed in milli-arc-seconds (mas) per year; radial velocity is expressed in km s^{-1}. Parallax ϖ is also expressed in mas. These kinematical parameters are calculated from the least squares criterion because there are fewer discordant observations, handled by a 2.5% trim of the data, than with the velocity ellipsoid calculation, for which the robust L_1 criterion is indicated. As with linear programming, one does this by minimization of an objective function. If r_i is one of m residuals from a solution for the kinematical parameters and r is the m-vector of the residuals, then we impose the condition $r^T \cdot r - \tau = 0$, where τ is an arbitrary parameter, and minimize τ in the objective function.

A sparse trim of the data seems indicated not only by what Stigler (1977) has found, light trimming or even no trimming works better than extreme trimming, but by what a General Colby reported to the Astronomer Royal, Sir George Airy (Airy 1854). In a geodetic adjustment for the determination of the scale of longitudes for England, inclusion of all data rather than just the most concordant data gave results that went from, to use Airy's words, "considerably in error" to "perfectly good."

The equations as derived by Ogorodnikov actually use the distance $1/\varpi$ rather than the parallax ϖ itself, but it is important to recast the equations to remove the parallax error from the denominator and thus ameliorate any possible Lutz-Kelker bias. The equations, therefore, are multiplied by ϖ, which places the parallax in the numerator.

To calculate the velocity ellipsoid use $\dot{x}, \dot{y}, \dot{z}$, the space velocities of a star, found from the proper motions and radial velocity and expressed in km s^{-1} are:

$$\begin{pmatrix} \dot{x} \\ \dot{y} \\ \dot{z} \end{pmatrix} = \begin{pmatrix} -\sin l & -\cos l \sin b & \cos l \cos b \\ \cos l & -\sin l \sin b & \sin l \cos b \\ 0 & \cos b & \sin b \end{pmatrix} \cdot \begin{pmatrix} \kappa \mu_l \cos b / \varpi \\ \kappa \mu_b / \varpi \\ \dot{r} \end{pmatrix}. \tag{3}$$

If radial velocities are unavailable, then we seem unable to calculate the space velocities. This, however, can be done if we use the SVD to employ only the tangential velocities. See Branham (2010) for details. There are other possibilities. Fuchs et al. (2009) use a deprojection formulation for the proper motions that assumes the lines of sight towards the stars are statistically uncorrelated with the velocities of the stars. The Section 7 shows that the SVD approach satisfies the assumption of statistical randomness and seems, therefore, satisfactory.