

### 11.3.5: Optical Distortion

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I refer here to pincushion or barrel distortion introduced by the optical system. This results in a displacement of the stellar images towards or away from the plate centre. Unlike differential refraction or aberration of light, the stellar displacements are symmetric with respect to inversion through the plate centre. This is also true of the optical aberration known as coma. A comatic stellar image results in a displacement of the centre of the stellar image away from the plate centre. Thus we can deal with distortion and coma in a similar manner.

This can be best dealt with by assuming a quadratic relation for the difference between true and measured coordinates:

$$\xi - x = ax^2 + 2hxy + by^2 + 2gx + 2fy + c, \quad (11.3.20)$$

$$\eta - y = a'x^2 + 2h'xy + b'y^2 + 2g'x + f'y + c'. \quad (11.3.21)$$

There are six plate constants in each coordinate, and therefore a minimum of six comparison stars are necessary to solve for them. If more than six are used (which is highly desirable) a least squares solution can be obtained for the plate constants. One then follows the same procedure as in the linear case.

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