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On the uncertainties of the sunspot area measurements

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Sunspot areas are important quantities that can be obtained from the analysis of the images of the solar photosphere. In particular, sunspot areas extracted from historical solar drawings are very useful due to its strong correlation with other solar activity indices as the Group Number or the Sunspot Number (related to the solar irradiance too). Usually, sunspot areas corrected from foreshortening (in millionths of solar hemisphere, or msh) are determined using the well-known equation

$$A_M = \frac{10^6 A_S}{2\pi R^2 \cos \rho}$$

where A_S is the sunspot area measured directly on the image, R , the radius of the solar disk and ρ the angle between the direction of the centre of the solar disk and the direction of the sunspot.

We have analysed the uncertainties in the measurement of A_M due to the different factors included in above equation, with special interest in the influence of the binarization threshold in the measure of A_S . Moreover, as the equation is an approximation valid for relatively small sunspots where the angle ρ is the same for all the sunspot surface, we have analysed its validity for unrestricted size sunspots of circular and elliptical shapes.

Student poster?

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