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THE STEREO MISSION

The STEREO mission is flying two spacecraft, one that leads Earth in its orbit round the Sun and one that lags behind. These spacecraft produce simultaneous views of the Sun and inner solar system using identical instruments.

The effect is like a pair of human eyes. Each eye sends an image simultaneously to the brain which automatically puts them together to produce a single, 3-D picture.

For the images produced to be viewed by people in stereo the spacecraft must not be too far apart; when they are, it is as if they have gone 'cross-eyed'.

So the researchers had to calculate for what period of the mission the technique would work. A bit of simple **geometry** and **trigonometry** gives the answer.

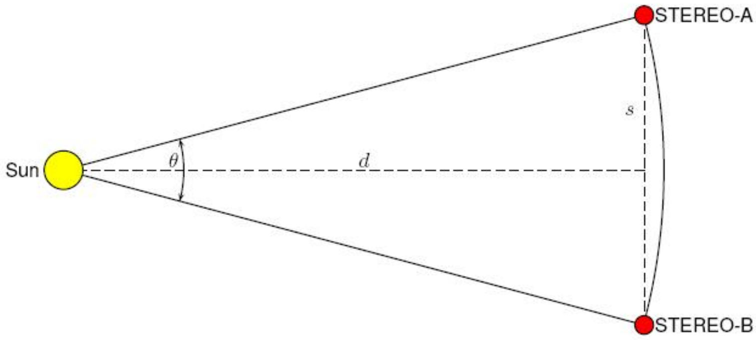

Figure 1: Geometry of the STEREO mission

In Figure 1, the relationship between the distance between the two spacecraft, *s*, and the distance from the spacecraft pair to the Sun, *d*, is given by the formula:

$$\frac{s}{2d} = \tan \theta/2$$

During the mission the two spacecraft gradually move further apart with the angle θ increasing by 45° each year, distance *s* increasing and distance *d* decreasing. This makes the view of the Sun increasingly cross-eyed. To determine the maximum value for θ that makes viewing possible, the research team considered how human eyes work.

Human eyes are about 8cm apart and are unable to focus on objects closer than 10cm. This angle will be exactly the same for the real mission since the same ratios apply. So entering these values into our formula we have:

$$\frac{8}{20} = \tan \theta/2$$

which in turn gives us a maximum value for θ of about 44°.

And this told the researchers that they need to concentrate on data from the first year of the mission because after that the angle of separation would be greater than 45°.

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