MM-VLBI MEMO #019

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Subject: Bispectral averages and the loss of triangle redundancy

When $(N(N-1)(N-2)/6)$ closure phases are calculated from $(N(N-1)/2)$ baseline phases there are

$$\left((N-1)(N-2)(N-3)/6\right)$$

redundant triangles. The redundancy is the result of the closure being a linear combination of $(N(N-1)/2)$ baseline phases, and the linear combination being such that the $(N-1)$ station phases always cancel leaving

$$\left(N(N-1)/2\right) - (N-1) = (N-1)(N-2)/2$$

unknowns to be determined from the closure phases. However, when bispectral averages are taken, the triangles lose their redundancy and for a large number of segments in the bispectral average the noise in each triangle becomes independent at low SNR (see Figure 1) and all triangles contribute to the estimate of "equivalent baseline" phases which are input to the image processing software. Thus the conversion from bispectral averages to these baseline phases is done by a least squares determination using all available bispectral triangles. Figure 1 shows the loss of correlation between the phases determined on one triangle with the phase determined from an equivalent combination of triangles. Only at high SNR do the "redundant" triangles fail to contribute additional information.

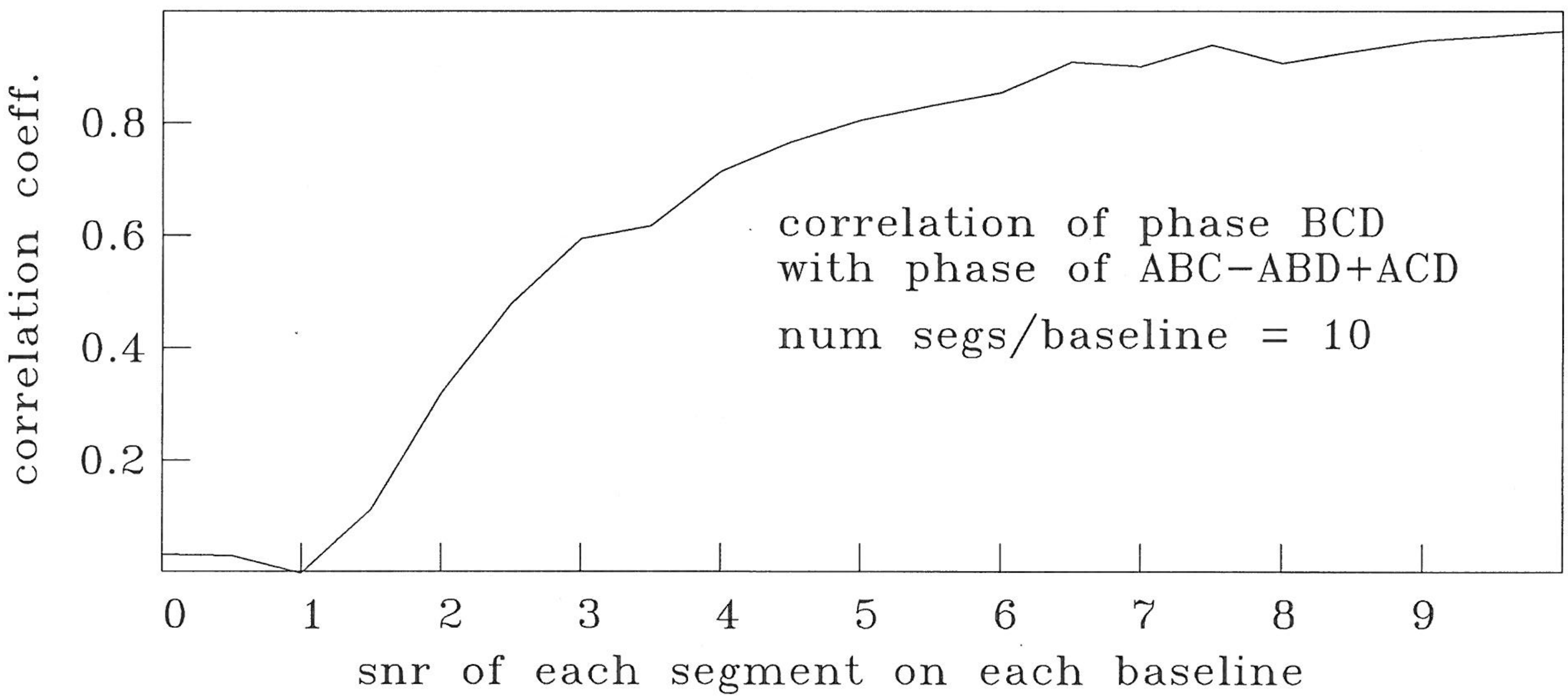

Figure 1 Loss of correlation of bispectral phases