Three-dimensional Coherent Radar Imaging: Lessons from the Jicamarca MST Experiments.

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Abstract. We have implemented seven- and eight-module configurations at Jicamarca (see, Figure 1 for details of the eight-module configuration). Such configurations allow ~80% and ~84% sample, respectively, of the total visibility plane that can be obtained using one quarter (= 16 modules) of the Jicamarca antenna. Measurements are made in the lower atmosphere (3-22 km) and upper atmosphere (65-80 km). We follow closely the theoretical development presented by Woodman, 1997 (*Radio Sci., 32*, 2373-2391). Different practical considerations are applied to both cases; for example, near-field effects are removed linearly in the lower-atmospheric measurements in order to get a focus image. In addition, we have implemented different algorithms to solve for the inverse problem, i.e., to obtained the atmospheric brightness distribution. As a first approach to the inverse problem, we have assumed a brightness distribution characterized by two Gaussian blobs. Each Gaussian blob consists of six parameters: angular positions (2), major and minor axis, angle of rotation, and relative intensity. Finally, we evaluate the gain obtained using our scheme as compared to the classical three non-collinear spaced antenna configuration.

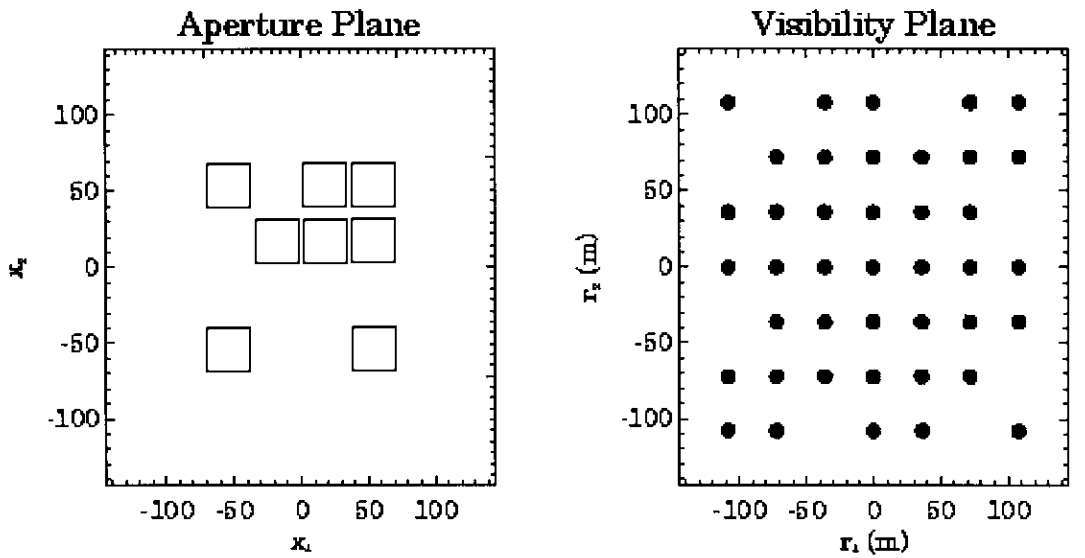

Figure 1. Visibility and aperture planes obtained with an eight-module configuration.