# EXPERIMENTAL VALIDATION OF PHASED ARRAY DESIGN FOR BIOLOGICAL CLUTTER REJECTION

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This paper highlights recent results obtained with the Turbulent Eddy Profiler (TEP) which was developed by the University of Massachusetts (Mead et al., *J. Atmos. Oceanic Technol.*, **15**, 849-859, 1998). This unique 915-MHz radar has up to 64 spatially separated receive elements, each with an independent receiver. The calibrated data provided by this array can be processed using sophisticated imaging algorithms. TEP is capable of producing three-dimensional images of echo power, radial velocity and spectral width. From these, it is possible to estimate the three-dimensional wind above the radar with high horizontal and vertical resolution. Given the flexibility of the TEP system, various array configurations are possible. In the present work we attempt to exploit the flexibility of TEP to enhance the rejection of clutter from unwanted biological targets. Most cases of biological clutter occur from targets in the sidelobes or grating lobes of the receive antenna array. Since the TEP array minimum receiver separation exceeds the spatial Nyquist sampling requirement, substantial possibilities for grating lobe clutter exist and are observed in actual array data. When imaging over the transmit beam volume, the receive array main lobe is scanned over a $\pm 12.5$ degree region. This scanning also sweeps the grating lobes over a wide angular region, greatly increasing the likelihood that a biological scatterer appears somewhere in the imaged volume. With a subtle change to the standard TEP array configuration, it is shown via both simulations and actual experimental observations (collected in June 2003) that *adaptive* beamforming methods can be used to significantly suppress the effects of biological targets on the wind field estimates. It should be noted that this same array configuration does not have this beneficial effect using standard Fourier beamforming.

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: cheong19591

Date Received: September 22, 2004

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5. No special instructions