

# Absolute value circulant preconditioners for non-symmetric Toeplitz-related systems

Sean Hon<sup>1</sup>, Andrew Wathen<sup>1</sup>

<sup>1</sup>*Mathematical Institute, University of Oxford, Radcliffe Observatory Quarter, Oxford, OX2 6GG, United Kingdom*

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## Abstract

Circulant preconditioning for symmetric Toeplitz systems has been well developed over the past few decades. For a large class of such systems, descriptive bounds on the convergence of the conjugate gradient method can be obtained. For nonsymmetric Toeplitz systems, most work had been focused on normalising the original systems until [J. Pestana and A. J. Wathen. *SIAM J. MATRIX ANAL. APPL.* Vol. 36, No. 1, pp. 273-288, 2015] recently showed that theoretic guarantees on the convergence of the minimal residual method can be established via a simple use of reordering. The authors further proved that a suitable absolute value circulant preconditioner can be used to ensure rapid convergence rate. In this talk, we show that the related ideas can also be applied to systems defined by functions of Toeplitz matrices. Numerical examples are given to support our results.

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