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## INTERACTIVE NONPARAMETRIC ANALYSIS OF NONLINEAR SYSTEMS

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**ABSTRACT.** In this paper we outline an interactive nonparametric methodology designed to facilitate the statistical analysis of nonlinear systems. The approach exploits an ensemble of nonparametric techniques including conditional density function estimation, conditional distribution function estimation, conditional mean estimation (regression) and conditional quantile estimation (quantile regression). By exploiting recent developments in nonparametric methodology and also in open source interactive platforms for data visualization and statistical analysis, we are able to provide an approach that facilitates enhanced understanding of complex empirical phenomenon. We illustrate this approach by exploring the inherent complexity of the Southern Ocean system as a carbon sink, measured in terms of fugacity of carbon dioxide at sea surface temperature ( $f\text{CO}_2$ ), in relation to a number of oceanic state variables, all measured *in situ* during the annual South African National Antarctic Expedition (SANAE) austral summer trips from Cape Town to the Antarctic, and back, between 2010 and 2015.

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