

EGU21-1495

<https://doi.org/10.5194/egusphere-egu21-1495>

EGU General Assembly 2021

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## A unified and automated approach to attractor reconstruction

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Since acquisition costs for sensors and data collection decrease rapidly especially in the geoscientific fields, researchers often have to deal with a large amount of multivariable data, which they would need to automatically analyze in an appropriate way. In nonlinear time series analysis, phase space reconstruction often makes the very first step of any sophisticated analysis, but the established methods are either unable to reliably automate the process or they can not handle multivariate time series input. Here we present a fully automated method for the optimal state space reconstruction from univariate and multivariate time series. The proposed methodology generalizes the time delay embedding procedure by unifying two promising ideas in a symbiotic fashion. Using non-uniform delays allows the successful reconstruction of systems inheriting different time scales. In contrast to the established methods, the minimization of an appropriate cost function determines the embedding dimension without using a threshold parameter. Moreover, the method is capable of detecting stochastic time series and, thus, can handle noise contaminated input without adjusting parameters. The superiority of the proposed method is shown on some paradigmatic models and experimental data.