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Using neural networks to describe tracer correlations

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Abstract. Neural networks are ideally suited to describe the spatial and temporal dependence of tracer-tracer correlations. The neural network performs well even in regions where the correlations are less compact and normally a family of correlation curves would be required. For example, the CH_4-N_2O correlation can be well described using a neural network trained with the latitude, pressure, time of year, and \methane\ volume mixing ratio (v.m.r.). In this study a neural network using Quickprop learning and one hidden layer with eight nodes was able to reproduce the CH_4-N_2O correlation with a correlation coefficient between simulated and training values of 0.9995. Such an accurate representation of tracer-tracer correlations allows more use to be made of long-term datasets to constrain chemical models. Such as the dataset from the Halogen Occultation Experiment (HALOE) which has continuously observed CH_4 (but not N_2O) from 1991 till the present. The neural network Fortran code used is available for download.

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