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Spatio-temporal random fields with discrete ARMA temporal margins

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Examining the most general form of spatio-temporal functions whose temporal margins are covariances of discrete first-order moving average time series, we obtain necessary and sufficient conditions for them to be covariance functions of spatio-temporal Gaussian random fields over the space-time index domain $R^d \times Z$, and derive some parametric and semiparametric models. More generally, spatio-temporal covariance models with discrete ARMA temporal margins are considered and used to fit spatio-temporal data on climate change in Kansas.