Dynamical Temporal Modeling of Spatial Fields

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Abstract. *Processing massive amounts of spatio-temporal data to provide estimates of the current (hidden) spatial state is challenging, even for the Kalman filter. A large number of spatial locations observed through time quickly leads to an overwhelmingly high-dimensional statistical model. We demonstrate how a spatio-temporal random effects (STRE) component can reduce the model to one of fixed dimension, resulting in a method we call Fixed Rank Filtering (FRF). The unknown parameters of the model can be handled either through estimation or through a prior distribution. In this talk, both will be presented. A global remote-sensing dataset of mid-tropospheric CO_2 from the AIRS instrument on the Aqua satellite is analyzed, which results in optimally interpolated, optimally filtered predictions of CO_2 values along with their prediction standard errors.*

Keywords.