



FINAL REPORT

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Fitting Stochastic Partial Differential Equations to Spatial Data

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The research under this project was aimed at developing numerical methods for fitting stochastic partial differential equations to irregularly spaced spatial data. This is related to two dimensional smoothing spline fitting where the partial differential equation is the Laplacian driven by white noise. A class of continuous two dimensional spatial autoregressive, moving average (ARMA) models were investigated and numerical methods developed to implement fitting these models to spatial data. The spatial ARMA models provide a complete class of covariance structures rather than a very limited set of covariance functions that are typically used in Kriging. Since maximum likelihood methods are used to fit the models, methods such as likelihood ratio tests and Akaike's Information Criterion (AIC) can be used for model selection. Prediction maps can then be calculated at a grid of points, and contour maps drawn. Also maps can be drawn of the standard deviation of the predicted fields giving indications of the variability of the predictions. Applications include aquifer heights, coal field depth and thickness and snowfall amounts. Results have been presented in a number of presentations and publications.

Invited Presentations

Fitting continuous ARMA models to unequally spaced spatial data. Office of Naval Research Workshop on Random Fields for Oceanographic Modelling, 12-14 February, 1991, Santa Barbara, California.

Presented seminar, Statistics Department, Colorado State University, Fitting continuous ARMA models to unequally spaced spatial data.

The 25th Symposium on the Interface: Computing Science and Statistics: Statistical Applications of Expanding Computer Capabilities, San Diego, April 15-16, 1993

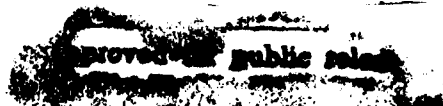
Office of Naval Research Workshop on Random Fields for Oceanographic Modeling, Santa Monica, California, April 21-23, 1993

Vecchia, A. V. and Jones, R. H. Modeling spatial and temporal variability of snowpack in western Colorado. WNAR meetings, June 28-30, Laramie, Wyoming.

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Published Papers

Jones, R. H. and Vecchia, A. V. (1993) Fitting continuous ARMA models to unequally spaced spatial data. *Journal of the American Statistical Association*, **88**, 947-954.

Jones, R. H. and Vecchia, A. V. (1993) Modelling Snowmass Data. *Proceedings of the 25th Symposium on the Interface: Computing Science and Statistics: Statistical Applications of Expanding Computer Capabilities*, 91-100.

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