Mixed Effect and Spatial Correlation Models for Analyzing a Regional Spatial Dataset

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Understanding the spatial variability of snow at many different scales is critically important for avalanche forecasting. This research uses new techniques to reanalyze an existing spatial dataset collected in southwest Montana's Bridger Range during the 1996-97 winter. Recent developments in statistical software have greatly increased the ease with which mixed effects and spatially correlated models can be run. Employing such advanced statistical procedures can lead to more beneficial use of available data sets and a more efficient use of limited financial funding. We reanalyzed the data using recently developed packages in SAS and the freely available software package R. The generalized linear model provides a suitable framework for categorical and / or dependent response variables. We analyzed the data using a fixed effect repeated measures model, a random effect clustered data model, and a spatially dependent fixed effects model using normally distributed continuous data. In addition, using the GLIMMIX procedure in SAS, we analyzed the data using a spatially dependent - random effects model with multinomial errors. This method allows for analysis of untransformed ordinal data, such as the data created when performing Rutschblock and stuffblock tests. Comparisons to the original analysis and suggestions for improving analytical efficiency are discussed. Our analyses help to provide a methodological context for future analyses of similar regional spatial data.