Using ETM+ Imagery to Constrain Cokriging Interpolation of the Shuttle Rader Digital Elevation Model

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Shuttle Radar Topography Mission (SRTM) digital elevation data from Baja California were corrected and enhanced by replacing artifacts with real values derived using a series of geostatistical techniques. Ordinary kriging was used initially to regionalize the DEM (hard variable) and provide estimates for missing data. A sum of transformed reflectance bands of the ETM+ images was derived by using the Alternating Conditional Expectations (ACE) algorithm; these results were then used as a soft variable for cokriging. Modeled experimental semivariograms for both hard and soft variables and cross semivariograms for the spatially correlated variables were then evaluated using cross-correlation methods to assess the accuracy of the techniques. Cokriging was more accurate and efficient than ordinary kriging for retrieving the missing data and for creating more geologically realistic maps. This technique provides a new and accurate way to quantitatively correct and enhance DEMs and to incorporate spectral reflectance as a soft constraint for estimating missing values.