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Historical analyses of climate fields are often based on sparse and irregularly sampled data. Although the historical sampling networks were not developed with global or near-global analyses in mind, such analyses are necessary for the study of climatic variations over the past 100+ years. To help address this need, new analysis methods have been developed over the past 10-15 years. These methods take advantage of large-scale spatial field covariations for improved analyses of sparse data. Spatial covariance functions are defined using satellite-based sampling along with the denser in situ sampling available for roughly the past 25 years. For the reconstruction, historical data are fit to the set of spatial functions. This discussion gives an overview of reconstruction methods with examples. Near-global sea-surface temperature (SST) and surface precipitation reconstruction are used to illustrate the methods, while cross-validation testing is used to show their skill. Using sampling from the past 100+ years, reconstructions are able to represent most interannual and longer-period climatic variations. Shorter-period variations are often filtered out due to insufficient sampling and the filtering of variations that can not be fit to the set of spatial functions. (Received September 11, 2007)