Spatio-Temporal Data Fusion for Big Data and its Application to Satellite Remote Sensing

Noel Cressie*
National Institute for Applied Statistics Research Australia (NIASRA),
University of Wollongong, Australia - ncressie@uow.edu.au

Abstract:
In this presentation, a spatio-temporal data fusion (STDF) methodology based on reduced-dimension Kalman smoothing is described. The methodology is able to combine (i.e., fuse) satellite-remote-sensing data from instruments that have different footprints, different measurement-error characteristics, and different data coverages. An empirical hierarchical statistical model, designed for big spatio-temporal datasets, results in a Kalman smoother that produces optimal estimates and their uncertainties. To illustrate the methodology, mid-tropospheric CO2 data from NASA's AIRS instrument is fused with total-column CO2 data from Japan's GOSAT instrument, which yields spatio-temporal fields of lower-atmospheric CO2 (in parts per million). This research is joint with Hai Nguyen and Amy Braverman of the Jet Propulsion Laboratory and with Matthias Katzfuss of Texas A&M University.

Keywords: atmospheric CO2; change of support; kriging; vector autoregression.