# Computational Methods for Data Evaluation and Assimilation

*Dan Gabriel Cacuci, Ionel Michael Navon, Mihaela Ionescu-Bujor*

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Data evaluation and data combination require the use of a wide range of probability theory concepts and tools, from deductive statistics mainly concerning frequencies and sample tallies to inductive inference for assimilating non-frequency data and *a priori* knowledge. **Computational Methods for Data Evaluation and Assimilation** presents interdisciplinary methods for integrating experimental and computational information. This self-contained book shows how the methods can be applied in many scientific and engineering areas.

After presenting the fundamentals underlying the evaluation of experimental data, the book explains how to estimate covariances and confidence intervals from experimental data. It then describes algorithms for both unconstrained and constrained minimization of large-scale systems, such as time-dependent variational data assimilation in weather prediction and similar applications in the geophysical sciences. The book also discusses several basic principles of four-dimensional variational assimilation (4D VAR) and highlights specific difficulties in applying 4D VAR to large-scale operational numerical weather prediction models.

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