Approaches to the inverse problem for atmospheric remote sensing

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Abstract

One of the major applications of inverse methods in atmospheric studies is the interpretation of spectroscopic remote sounding measurements of the atmosphere. Forward models for the problem are straightforward, but generally complicated and computationally intensive. The inverse problems are generally solved by constrained least squares methods.

One of the critical aspects of the practical use of data derived from inverse solutions is in understanding the relationship between the solution and reality. The Bayesian interpretation leads naturally to the use of information theory to analyse information content, optimisation of observing systems, and characterisation and error analysis of the result. The concepts can be applied, for example, to the optimal use of remote sounding data to atmospheric data assimilation, itself a large-scale inverse problem.