



## **Evaluation criteria on the design for assimilating remote sensing data using variational approaches**

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Remote sensing, as a powerful tool for monitoring atmospheric phenomena, has been playing an increasingly important role in inverse modeling. Remote sensing instruments measure quantities that combine several state variables. This creates correlations between the state variables which share the same observation variable. Sometimes strong Sensor-Induced Artificial (SIA) correlations are introduced between physically unrelated states or parameters. This may cause numerical problems resulting in a low convergence rate or inaccurate estimates in gradient-based variational assimilation.

In this work, two criteria or scoring rules are proposed to quantify the effectiveness of assimilating a specific set of remote sensing observations and to quantify the reliability of the estimates of the parameters. The criteria are derived by analyzing how the SIA correlations are created via shared observation data and how they influence the process of variational data assimilation. Experimental tests are conducted and show a good agreement with theory. The results illustrate the capability of the criteria to indicate the reliability of the assimilation process. Both criteria can be used as prejudice before the assimilation methodology is implemented.