EVALUATION OF THE IMPACT OF OBSERVATIONS ON ANALYSES BASED IN INFORMATION CONTENT

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The Degrees of freedom for signal (DFS) is used in data assimilation applications to indicate the self-sensitivity of analysis to different observation types. In this study the impact of a complete set, or subsets, of observations on the analysis is assessed by evaluating the information content of observations or DFS. Based on the results of Desroziers *et al.* (2005), a practical method to estimate DFS is introduced and it is shown that the information content brought in by the data assimilation system can be estimated from observation departures of the analysis and forecast. When the error statistics of the system are not at optimality, it is found that the estimated observation error cannot be assumed to be diagonal when the a priori error statistics differ from those estimated from observation departures. This is not because observation error correlation is present but because the innovation error covariances involve the background error as well. When not at optimality, a priori and posterior innovation error terms do not cancel out. It is found that the information content estimated from the *a posteriori* and *a priori* statistics *is the same*. The method is applied in the framework of the 3D-Var assimilation scheme developed at MSC and the results obtained are compared with those obtained with a randomization technique. The results show some agreement with methods focusing on the impact on the forecasts but some differences are observed, particularly when humidity is involved. This study is interested in the evaluation of the Canadian observing network and is applied to Observing Systems Experiments carried out in Laroche and Sarrazin (2009).