

How accurate are our atmospheric observations?

Summary

Atmospheric observations are a fundamental component of the weather forecasting process. To produce skilful weather forecasts we need to understand the quality of these observations. At the University of Reading we have developed methods that allow us to determine the accuracy of atmospheric observations.

Why?

Millions of atmospheric observations are recorded every day, but observations alone can not describe the weather at all points on the globe. To get a complete picture we have to combine the observations with data from a computer model using a process called data assimilation. Every year approximately £2 billion is spent acquiring meteorological observations, but we can't use them all in the data assimilation process because we don't know how good they are. We may be able to use more of the observations if we can better understand the observation uncertainty.

How?

Observation uncertainties have previously been estimated using methodology that statistically analyses information from the data assimilation process. However, this method may be out-dated since improvement in computer power has allowed operational forecast centers to use more sophisticated data assimilation processes. We have mathematically examined the method and shown that it is not compatible with new complex assimilation systems. However, we are able to provide a modified version of the method that can be used to estimate observation uncertainties.

What now?

Our results provide methodology for determining observation uncertainties for state-of-the-art data assimilation systems. Accurate estimates of observation uncertainty may allow more of the expensively acquired observations to be used in data assimilation. Furthermore, improved specification of observation uncertainty in data assimilation can result in improved weather forecasts, particularly for local forecasts of natural hazards.

Reference

Waller, J. A., Dance, S. L. and Nichols, N. K., On diagnosing observation error statistics with local ensemble data assimilation. Q.J.R. Meteorol. Soc. doi:10.1002/qj.3117
<http://onlinelibrary.wiley.com/doi/10.1002/qj.3117/full>

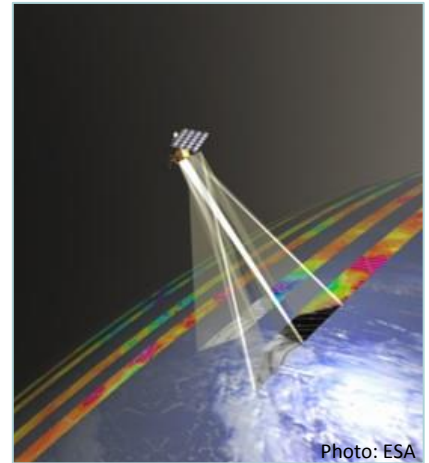


Photo: ESA

The DARE project aims to produce a step-change in the skill of forecasts of urban natural hazards by combining novel observations with data from state-of-the-art computer models. Our work allows us determine the accuracy of the observations so they can be used efficiently in the forecasting process.



Further information

For more information about how weather forecasts are created see:

<https://www.metoffice.gov.uk/learning/making-a-forecast>

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