



## **Evaluating the model forecasts of plume evolution in BORTAS**

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We develop a novel forecast quality measure that is designed to reflect the 3-dimensional structure of biomass burning plumes and use it to evaluate the quality of the plume forecasts that were produced during the "Quantifying the impact of BOREal forest fires on Tropospheric oxidants over the Atlantic using Aircraft and Satellites" (BORTAS) project. In recent years, several approaches have been developed to quantify numerical forecast errors, but most are designed for 2-dimensional fields and do not consider the 3-dimensional structure of plumes, in particular the altitude of individual plume features. Here, we extend a displacement-based method to include the vertical dimension. The algorithm calculates the 3-dimensional displacement that would be needed to transform the forecast field into the observed field. This displacement then forms the basis for a quantitative forecast quality measure. This method is used to evaluate model forecasts of boreal wildfire plumes within the BORTAS project. During the BORTAS intense measurement campaign (Summer 2012), forecasts of carbon monoxide concentrations from boreal biomass burning over North America and the North Atlantic were produced twice daily over several weeks using the NASA GEOS-5 model for operational purposes. We analyse the quality of the forecasts and discuss areas and meteorological situations that influence the local forecast quality.