



A PROTOTYPE OF A DATA ASSIMILATION SYSTEM BASED ON AUTOMATIC DIFFERENTIATION

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We introduce the Automatic Differentiation-Tool Transformation of Algorithms in Fortran (TAF)

and list a number of successful applications to large Fortran 77-90 codes in geosciences. We highlight a prototype of a Carbon Cycle Data Assimilation System (CCDAS), which is composed of a process model (BETHY), the corresponding derivative codes (tangent linear, adjoint, and Hessian) as well as an optimisation routine.

In calibration mode, model parameters and their uncertainties are determined by atmospheric observations and their uncertainties.

In prognostic mode, model parameters and their uncertainties are mapped onto prognostic quantities and their uncertainties.

Having been set up for the initial model version, CCDAS now serves as a frame for model development, which allows immediate adaptation of the derivative code to changes in the model code.

Thus model development directly benefits from both sensitivity information and the confrontation with observational data.