



Statistical balance of moisture variable

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The assimilation builds on the assumption that involved variables have a Gaussian probability distribution. The forecast errors for all analysis variables except humidity can be approximated by a Gaussian PDFs. This is due to the condensation effects near saturation and the strict limit at zero humidity. The present HIRLAM humidity assimilation uses specific humidity increments. The new moisture variable has been adapted to the statistical balance background constraint, including a new moisture balance formulation avoiding “double counting”. The total assimilation increment of moisture consists of two parts, one balanced part that is obtained through regression from the other assimilation control variables, and one unbalanced part used as assimilation control variable. Both parts are expressed in terms of specific humidity normalized with the background saturation value. The unbalanced part is furthermore normalized with a standard deviation depending relative humidity. The statistical distribution of this new humidity variable has a near-Gaussian characteristics. Sensitivity studies using HIRLAM, in which the new moisture variable and three simulated observations were included, reveal that the humidity structure functions are flow dependent. Results will also be shown from ongoing assimilation experiments with the new variable. The ultimate purpose of this work is to improve assimilation of humidity.