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# Targeted observations of chemical constituents

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Targeted observations can -in combination with data assimilation techniques- reduce the initial conditions uncertainties and decrease forecast errors. Singular vectors have been proved useful to target adaptive observations since they specify the directions of maximum error growth over a finite time intervall. This feature can be used to optimally configure the observational network. While in meteorology singular vectors have been applied to specify sensitive regions, in this study singular vector analysis is implemented to identify sensitive chemical constituents. This optimisation of observation configuration aims to make best use of available satellite data, subject to technical or computational limitations. The results are given in terms of ranking lists, which specify which species are to be retrieved with priority to get a best possible chemical state estimate.

For that purpose the singular vectors were first implemented into a box model and the algorithm was tested to investigate how variations of the initial concentrations of VOC/NOx influence the final concentration of ozone. The results demonstrate that the algorithm clearly identifies sensitive chemical constituents. Since singular vectors depend on the length of the simulation intervall as well as on the chemical scenarios and the choice of the error norm, several case studies have been done to investigate the influence of those. Furthermore the singular vectors were implemented into the three-dimensional chemical transport model EURAD-IM (which features 3- and 4-dimensional data assimilation). This provides a powerful tool able to calculate sensitivities not only with foci on different species and simulation intervals but as well on different locations.