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Singular vector-based thinning of satellite data

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The skill of numerical weather prediction has been constantly increasing thanks to the development of better models and data-assimilation systems capable of assimilating a constantly increasing number of observations, in particular remotely sensed data from satellites. Most of these data remain however underused, even in state-of-the-art, data-assimilation systems such as the 4-dimensional variational system operational at the European Centre for Medium-Ranger Weather Forecasts (ECMWF). This is partly due to the need to reduce data volume to a manageable size and partly to technical and scientific reasons. For example, one of the reasons to apply a rather dramatic thinning to the satellite data is to avoid the need for specifying spatial observation (operator) error correlations that are difficult to account for in current data assimilation algorithms. Since the future will see a further increase in the number of satellite data, it would be extremely valuable if thinning could be applied selectively, so that more data are used only in some, meteorologically relevant regions. In this work, a standard thinning is applied everywhere apart for sensitive regions where a denser use of satellite data is imposed, that could lead to a more accurate analyses and subsequent forecasts. The sensitive regions have been identified using an average vertically-integrated total-energy function computed using the leading singular vectors computed routinely in the ECMWF Ensemble Prediction System. In this talk, the methodology used is described, and the impact of the singular-vector based thinning of satellite data on the quality of the forecasts is discussed.