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Evaluation of model-data mismatch errors in the CarboScope-Regional Inversion System

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With an increasing network of atmospheric stations that produce a constant data stream, top-down inverse transport modelling of GHGs in a quasi-operational way becomes feasible. The CarboScope-Regional inversion system embeds the regional inversion, within a global inversion using the two-step approach. The regional inversion consists of Lagrangian mesoscale transport from STILT, prior fluxes from the diagnostic VPRM biosphere model, and anthropogenic emissions from a combination of EDGAR v4.3 with the annually updated BP statistical report. Regional ocean fluxes were derived from the CarboScope ocean flux product based on SOCATv2019 data. The inversion uses atmospheric observations from 44 stations to infer biosphere-atmosphere exchange. The regional domain covers most of Europe (33 – 73N, 15W – 35E) with a spatial resolution of 0.25 degree for fluxes and 0.5 degree for flux corrections inferred by the inversion (i.e. the state space).
One of the critical parameters is the assumed uncertainty of the observations, and the major contribution to this is the model-data mismatch error, or representation error. Within CarboScope-Regional, this model-data mismatch error is specified differently for different station types, such as tall towers, mountain or coastal stations, etc. To evaluate the validity and appropriateness of these assumed uncertainties, a leave-one-out cross-validation is applied for a single year, using all stations except one for the inversion, and comparing posterior concentrations predicted for the omitted station with the observed concentrations. Results of this cross-validation will be presented separately for the different station types, and will be used to evaluate the magnitude of the assumed model-data mismatch errors.