I would like to thank the authors for carefully replying to comments raised by both referees. The replies are appropriate and clarifications have been added to revised manuscript. There are only some very minor comments remaining, concerning the newly added description of the CSR system. Once these are adjusted, the study is fit for publication.

Lines numbers as taken from Track-changes version of revised manuscript.

L86ff: The description seems overly complicated. Consider:

"A global forward run is then carried out using 'global' observations to obtain simulated concentrations for the regional sites. A second forward run is conducted applying zero-fluxes outside of the regional domain. This can be considered as a regional run utilizing a global transport model at a coarse spatial resolution. The subtraction of the 'regional' run from the 'global' run results in the far field contribution on the sites within the regional domain. Subtracting the latter from the measurements and yields the remaining regional mixing ratio that is used in the regional inversion applying the regional-scale transport model at finer spatial resolution."

Equation 1: To me it is not clear what the matrix **p** contains. Is this equivalent to the frequently used prior contribution to the cost function: $(x - x\_prior)^T R^{-1} (x-x\_prior)$? x being the state vector, x_prior the prior state and R the prior covariance matrix. Why would parameters p have zero mean? Please also add the variable name for the cost function in the text (L94).

Equation 2: I assume that Qc does not only contain observation uncertainty but also representativeness uncertainty?