

## Minor corrections done in the paper

Page 3, L5: We replaced “various meteorological operational” by “various operational meteorological”.

L31: We replaced “(geostrophic, hydrostatic, ...)” by “(geostrophic, hydrostatic, etc)”.

Page 4, L1: We corrected “has” by “have”.

L10: We replaced the sentence “This new flexibility associated with the possibility to define a set of control variables and their covariance errors as an input should reduce future developments of the code considerably and should benefit to a larger community in geophysical science” By “This new flexibility associated with the possibility to define a set of control variables and their covariance errors as an input should potentially reduce further developments effort of the code and benefit the larger community of geophysical science in general.”

L15,19, 23: **B** is Bold.

L20: We replaced “, to” by “and”.

L29: We replaced “are discussed for carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>) and ozone (O<sub>3</sub>) chemical species in a variational data assimilation framework”

By “are discussed for the chemical species carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>) and ozone (O<sub>3</sub>) in a variational data assimilation framework.”

P5: Eq. (1) corrected **B** is bold, **x** are vectors.

P6: Eq. (2), (3), (4) and (5) corrected.

L11: **H** is bold.

P7, L2 and L4: ***u*** is italic bold.

P7, L27: We replaced “Figures shown in the following Sect. were obtained from ...”

By “Here we present results obtained ...”.

P9, L1: We replaced “istropic” by “isotropic”.

L2: We replaced “option” by “options”.

L10: We replaced “hydrometeor cloud calculations, which is referred as “geographical binning” by “hydrometeor cloud calculations, referred to “geographical binning”.

L22: We replaced (t) by (*t*) italic.

L23: Eq(6) corrected.

P10, L1: We replaced (t) by (*t*) italic.

L3: Eq. (7) corrected.

P11, L6 and L10: We replaced by: “(*t* and ps)”, *t* is in italic.

P12, L23: We replaced “Hydrometeor mixing ratios show” by “Hydrometeors mixing ratio show”.

P14, L3: **B** is bold.

L6: We corrected “statistics” by “statistic”.

P15, L3: “in Figure 8” replaced by “Fig. 8”.

L20, We corrected “value” by “values”.

L21, We removed “the”.

P19, L4: We corrected, “localized” by “localize”.

L19: We replaced “cloudy” by “cloud”.

P20, L11: We replaced “The high rate of presence of snow mixing ratio equal to zero at these low levels tends to artificially enforce vertical correlation as well.”

By “The low presence of snow hydrometeors in the first model levels, i.e. close to the ground, is characterized by small values of mixing ratio, averaged by vertical level, which tends to artificially reinforce vertical correlation, as well.”

L22: Corrected by “gives general” removing “a”.

L24: We replaced “It is most of the time” by “It is mostly”.

P22, L11: We replaced “The well characterization” by “Characterization”.

L15: “*a posteriori*” is in italic.

P23, L1: “sea salt, particulate matter (PM)” corrected by “sea salt and particulate matter (PM)”.

L7: “and factors” corrected by “emission factors”.

L16: “on the ozone layer” replaced by “in the ozone layer”.

L17: we replaced the sentence “Concerning NO<sub>x</sub> concentration fluctuates as well in Figs 19b and 19c, due to photochemistry in the stratosphere and in the troposphere.” by “Figures 19b and c highlight NO<sub>x</sub> concentration fluctuations, due to photochemistry in the stratosphere and in the troposphere.”

L21: We corrected, “show” to “shows”.

L29-32: Modifications done in the text: “Horizontal length ... correlations.

P24, L1-L15: Modifications done in the text:” Concerning the vertical correlation ... the boundary layer”.

P26, L7: We replaced “existant” by “existing”.

L12: We corrected to “statistics”

L25: We corrected to “anisotropy”

L28: We replaced “ ... background error and to reduce the ensemble ...” by “...background error while keeping a reduced ensemble ...”

L31: We replaced “...(modeled) error and ensemble error covariances.” by “(modeled) with ensemble background error covariances.”

P27, L11: We added the word “together” in the text: “relevant information together with sampling noise”.

L12: We added v2.0 in the text: “the GEN\_BE v2.0”.

L13: We replaced “The GEN\_BE v2.0 code” by “The code”.

P28, L9: We removed “Only”.

P29, L31: We corrected to “statistics”.

P66-67: Captions corrected replacing “O<sub>3</sub> NO<sub>2</sub>” by “O<sub>3</sub> NO<sub>2</sub>”.