



Interactive comment on “Coupling global chemistry transport models to ECMWF’s integrated forecast system” by J. Flemming et al.

Anonymous Referee #2

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This report presented the design and the validation of a coupled system (IFS with three CTMs via the OASIS4 coupler).

The design of a modeling framework with multiple components (atmosphere, land, sea ice, ocean) connected by a coupler has been widely used for climate studies. The efforts to couple AGCM with CTMs for forecasts and reanalysis of atmospheric composition, from my personal view, reflect impressive scientific and technical advances in earth system modeling.

For coupled ocean-atmosphere systems, the coupler is used to exchange information among the components (specifically, fluxes across the sea-atmosphere interface). For a coupled chemistry-atmosphere system, the coupler faces the difficult challenges to communicate 3-D information between two components that both compute reac-

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tive gases but with quite different presentation of chemical and physical processes. I strongly believe that the community could appreciate some insightful discussions on the similarity/differences between coupled ocean-atmosphere systems and coupled chemistry-atmosphere systems.

This work is suitable for publication in GMDD. I recommend “accepted with revisions”.

Here is a list of suggestions and comments for the authors to consider.

Specific comments

(1) P764, L 13-14. I suggest the authors spell out or remove MOZART-3, TM5, MOCAGE and OASIS4. Even though the three CTMs are well known to the modeling community, the abstract should be a stand-alone entity.

(2) P675, L25-26: ‘IFS can simulate tropospheric and stratospheric O₃, carbon monoxide (CO), nitrogen oxides (NO_x), formaldehyde (HCHO) and sulphur dioxide (SO₂)’. This paper needs to describe the rationale for selecting the species to be included in IFS, e.g., long-lived species, species that are routinely observed from space, or species that affect climate projections and/or weather forecasts?

(3) P768, L15-19. The second and third themes (chemical mechanism and the feedback) are broad research topics while the first theme (vertical transport) is quite specific. Perhaps the authors can revise the first theme to ‘physics parameterization’

(4) P770, L2 “The un-coupled CTM species are initialised from the previous CTM run as in CTM-IC mode”. In IFS-IC mode, CTMs are initialized as such the coupled species are taken from IFC runs and uncoupled species are from previous CTM runs. I suspect the ingestion of IFS tracer fields into CTMs will lead to some inconsistency among chemical species and suggest the authors to address this issue.

(5) P775, L15 “against surface observation from the Global Atmosphere Watch network’. The authors indicate that a comprehensive evaluation is presented elsewhere. Nevertheless, I suggest the authors explicitly state why these stations are selected in

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this paper.

(6) P775 – P776. The authors discuss Figures 6-8 in Section 3.2 and discuss Figures 3-5 in section 3.3. The authors should swap the figures 6-8 with 3-5 or sections 3.2 with 3.3.

(7) P779 L2-20. I have got a problem with this paragraph. The contents are indeed consistent with the discussions presented in Section 3.3. However, it seems that this paragraph presents new (additional) interpretations on the tendency study (e.g., “O3 changes .. reached up to 5% in the PBL” (L10) and “CO causes an increase up to 3%” (L11)”. The summary section should summarize what has been presented and make conclusive remarks. This paragraph, in its current form, is confusing.

(8) P793 Figure 6. The O3 plot: Which station does STC stand for? The CO plot: NEU is not included. This site does not sample CO, and the authors should make it clear in the figure caption or the text.

Minor technical corrections are needed (see below).

P 775, line 11: ‘An comprehensive evaluation’ should be ‘A comprehensive evaluation’

P 775, line 15: Correct the typo for atmosphere in “ Global Atmopshere Watch’

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