

Interactive comment on “Analysis of a rapid increase of stratospheric ozone during late austral summer 2008 over Kerguelen (49.4° S, 70.3° E)” by H. Bencherif et al.

Anonymous Referee #1

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General comments:

The authors report an increase of ozone observed at SH midlatitude site Kerguelen in April 2008, which is related to the large-scale isentropic transport. Although the paper does not bring thoroughly new scientific ideas, the novel contribution are the ozone profile measurements with balloon-sonde, never launched before at this site. Besides, the episode of ozone increase recorded during that campaign is well confirmed by the complementary data of independent measurements – ground-based SAOZ, satellite AURA OMI and MLS; and the analysis of assimilated atmospheric tracers and potential vorticity maps clearly explains the origin of detected ozone variation. However, the

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analysis part of the paper needs more clarification, which is proposed in the specific comments below.

Specific comments:

Basically, the authors describe two possible transport processes responsible for the observed ozone increase – one in the LS (475 K) and in the US (700 K). But the analysis of these two, and the way of presentation (Figures 3, 4 and 5) are rather different, which makes it difficult to follow and understand. Thus, the LS transport is analyzed by: 1) N₂O and O₃ maps assimilated at 475 K level by the MOCAGE-PALM system for one day, 16 April 2008 (figure 3); 2) PV and O₃ maps at 475 K for the same day, as obtained from ECMWF (figure 4). As opposed to LS, the US region is analyzed by: 1) a series of O₃ maps assimilated at 700 K level by MOCAGE-PALM for the 4 days of April (figure 5, upper plots); 2) a series of PV maps at 700 K derived from the MIMOSA model for the same dates. Why do the authors analyze a series of days at 700 K level, but only one day at 475 K? Why do they map the N₂O tracer at 475 K level, but not at 700 K? Why do they use ECMWF data to map PV at 475 K, but MIMOSA model to map PV at 700 K? (why not to use some similar tool to analyze both levels, 475 and 700 K?). What is the purpose to plot ECMWF O₃ map at 475 K level? (but not to plot it at 700 K?). In whole, I propose either to make the analysis of LS and US levels more uniform, or to explain the reasons for these differences.

17728 line 3-5: “It is evidenced...” – it is unclear from that sentence what kind of observations and assimilated fields were considered.

17729 lines 15-17: “The tropical stratosphere...” – why do the authors talk about tropics in this paragraph? It is unclear.

17731 lines 21-25: “Daily total ozone values...” – SAOZ provides data twice a day, at sunrise and sunset. What values were used as daily ozone, and how were the monthly means computed? Please, specify here or later in the text.

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17732 lines 14-17: “In order to emphasize. . .” – which month is selected from Fortuin & Kelder climatology? April? Please, specify.

17736 lines 10-12: “. . . whose amplitudes exceed the monthly climatological values” – which monthly values are meant here? Climatological amplitudes? This is unclear.

17737 lines 12-15: “The ozone profile recorded on 16 April at KER. . . illustrates a significant ozone increase in the lower stratosphere. . .” – What is the reason for that conclusion? Comparison with a climatology profile? Please, clarify.

17738 lines 16-20: “In fact, it is well illustrated. . .” – I don’t understand how we can see all the movements of air-masses described in these sentences, looking on the map of only one day (Figure 3)!

17739 lines 17-21: “However, by taking into account. . .” – How do the authors conclude that “the evidenced isentropic transport in the lower stratosphere could not explain alone the observed increase in total ozone. . .”? Please, clarify. In addition, the authors may try to estimate the share of contributions from the LS and US transport to the observed ozone increase.

Technical corrections:

17728 lines 16-17: misprint, “Microwave Limb Sounder”

17734 line 12: misprint, “PALM (Projet d’Assimilation par Logiciel Multi methode)”

17735 line 14: misprint, “measurements of total column ozone”

17739 line 10: misprint, “air mass”

17739 line 22: misprint, “air mass”

17748 Figure 2: the plots (a) and (b) should have uniform style – time axis (month labels on (a), but missing on (b)), and legend (“daily SAOZ” on (a), but “SAOZ 2008” on (b); “monthly mean” on (a), but “SAOZ 1996-2008” on (b))

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17749 Figure 3: concentric circles depicting 60° and 30° latitudes are not visible on the maps

17751 Figure 5: concentric circles depicting 60° and 30° latitudes are not visible on the maps

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