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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Analysis of 24 years of mesopause region OH rotational temperature observations at Davis, Antarctica – Part 1: Long-term trends" *by* W. John R. French et al.

Anonymous Referee #1

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Reviewer Report on the manuscript acp-2019-1001

Analysis of 24 years of mesopause region OH rotational temperature observations at Davis, Antarctica – Part 1: Long-term trends

by W.John R. French et al.

General Remarks

1. . .The paper presents 24 years of observations of OH temperatures, which is an intersesting extension of an earlier data set worth publishing.

2 The data were taken in Antarctica where such measurements cannot be performed

in summer. This is a drawback for several interpretation aspects and must be carefully considered.

3 The data are discussed in the context of increasing CO2 mixing ratios. They are extensively compared to MLS and SABER satellite results, and to computer models (WACCM-X).

4 The paper gives a long term analysis and discusses possible trend breaks. These results are questionable because of the lack of winter data.

5 The authors see a quasi-quadrennial oscillation (QQO) in their data. They announce a detailed discussion in a second part of the paper. This should take into account recent work in the literature on 3 – 5 year oscillations.

6 The paper is well written, and is recommende for publication after some modifications.

Major Comments

Line 221 pp: Figure 3 indicates five oscillation periods. The approximate period lengths are 2x 3 yr, 1x 4 yr, and 2x 5 yr. It is not obvious that a mean can be taken. Superposition of a 3 yr and a 5 yr oscillation should be checked (see for instance Offermann et al., JASTP 135,1, 2015).

Line 383 pp, 540: The paper Offermann et al., 2006, should not be used to demonstrate a trend break. It was outdated by Offermann et al., JGR 115, D18127, 2010, who show a longer data series.

Line 405 pp, Section 5.1, 5.4: In the discussion of the trend data it should be elaborated that the summer data at Davis are missing. Trend data are different in summer and winter as shown by the MLS data in your Fig. 6. They can also vary from month to month as shown in your Fig. 5, but variations could be much larger (see for instance Offermann et al., 2010, their Fig.9). Possibly the summer trends are larger than your 1.2 K/decade (by number), and so might be the trend of annual data. Hence, if you

want to include Davis data to Tab.1 please use annual MLS data!

Line 558/559: . . .”no . . .sign of a discontinuity in the trend. . .” Kalicinsky et al., 2018, in their long-term analysis find that the summer data may be much more important than the winter data. Therefore please check your above statement by means of annual MLS data.

Minor Comments

Line 219: The error of your solar cycle response (1.02 K/100sfu) appears relatively large (see Tab.1). Do you know a reason?

Line 295: Please give the error of the MLS trend.

Line 325 pp, Fig.6: a) Please show Panel numbers. b) Please show latitude scales. c) Part of the captions are difficult to read. d) Line 334: There is no Fig.1B. Do you mean Fig.3b?

Line 353 pp, Table 1: Plese give the selection criteria for the sires shown.

Line 456 pp: “. . .peak altitudes..” Here and in the following it is sometimes unclear whether you mean the maximum of the peak or the geometric altitude. Please clarify.

Line 505 pp, 508: It is unclear whether you mean your Fig.5 or Qqian et al.. Please clarify.

Line 686: Fig.1a does not show this! Do you mean that you derived it from this Figure?

Line 693: Sentence difficult to understand.

Line 706 pp: Where can this be seen?

The Supplementary Material was not available to me.

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