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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability and evolution of mid-latitude stratospheric aerosol budget from 22 years of ground-based lidar and satellite observations" *by* Sergey M. Khaykin et al.

Anonymous Referee #2

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This manuscript presents and discusses long-term (past 20 years) measurements of stratospheric aerosols, as measured by two co-located ground-based NDACC lidars (Haute-Provence, France), and by several satellites, including the lidar in-space CALIOP.

After separating the sAOD time-series into two volcanic "quiescent" periods and one volcanic-active period, the take-home message is that the second quiescent period shows a background aerosol level higher than that of the first period, leading to the hypothesis that the enhancement is due to the enhanced transport of aerosols within the Monsoon circulation (ATAL AOD). The authors are wise enough however to recognize that the second quiescent period is very short (2013-2015), and that more measure-

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ments in the years to come are necessary before the present conclusions can be firmly confirmed.

The manuscript is well-organized and well-written. Some minor corrections in English syntax are needed, which can be easily managed by one of the native English-speaking co-authors. The discussion occasionally lacks fluidity, for example section 5.2, and the last 3 paragraphs of the discussion/summary. Nevertheless, I recommend publication after some minor corrections, listed below.

Title/Abstract: Since this article is submitted to the NDACC 25th anniversary Special Issue, it would be suitable to explicitly cite NDACC either in the title, or in the abstract (when presenting the OHP lidars).

Section 2.3: Are all extinction coefficient conversions factors (ke) using the same reference of Jäger and Deshler (2002; 2003)? Please specify if so.

Line 200 and Fig. 1: The number of CALIOP samples is much larger than the number of samples from the other instruments. Why not restricting the CALIOP coincidence window within the OHP region instead of the full zonal-mean? This would (maybe) improve the agreement with the lidars, for example during the periods 2007-2008 and 2010-2011.

Fig. 1: Can the aspect ratio of this figure be less elongated (more square) in order to distinguish the various measurements from each other?

Lines 285-287: Fig. 3 does not really show a difference in the e-folding rate for Sarychev and Nabro, it looks more like the background level after Nabro (late 2012) is simply higher than that after Sarychev (early 2010). The authors refer to time-series from CALIOP and OSIRIS . Can they refer to specific publications?

Lines 329-330 and fig.3: How do the monthly-mean sAOD uncertainties compare with the 1-sigma threshold level set to determine what is quiescent and what is not? Although there is a risk to overload Fig. 3, it would be interesting to overplot vertical

bars to denote +/- 1 standard uncertainty for each monthly mean sAOD sample plotted. In any case, some text should be added to discuss the relative magnitude of this uncertainty and the 1-sigma threshold value. This will determine whether the observed increase can be considered statistically significant or not.

Lines 440-441: See above comment on line 200: For CALIOP, it would make more sense to use an average over a longitude band centered over OHP (e.g., +/-20 deg) rather than a full zonal mean.

Last Paragraph (Lines 558-563): The authors should also emphasize on the critical need for ground-based lidar observations in the next decade, as there will possibly be a gap in aerosol profilers from space after CALIOP has ceased operation.

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