

Interactive comment on “Solid particles in the tropical lowest stratosphere” by J. K. Nielsen et al.

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Nielsen et al. have presented some very valuable observations of aerosols, temperature, ozone, and humidity in the lowermost southern summer stratosphere. Their conclusions, that the particles were frozen crystals, was reached after ruling out a few other possibilities, but absent two important resources. For one, it was apparent in the paper that the authors did not consider (at least they did not cite) works within the last five years showing other occurrences of apparently solid, non water-based aerosols in the summer lower stratosphere. For example, Siebert et al., *Annales Geophysicae*, 2000) showed a depolarizing layer in July 1998 over Sweden. Jost et al., *Geophys. Res. Lett.*, 2004) showed carbonaceous aerosols in the lowermost stratosphere during the CRYSTAL-FACE campaign. Neither these nor any other recent works showing nonvolatile solid biomass burning aerosols in the stratosphere were cited in this paper. Secondly, the authors did not include other readily/publicly available aerosol data

such as SAGE II, SAGE III, HALOE, POAM III, or lidar from southern hemisphere locations, which might have put their measurements at Bauru in the context of the regional/hemispheric aerosol picture at those times.

This second point is, from my cursory investigation, critical. A survey of SAGE II, POAM III, and HALOE data show unequivocally that there was an anomalous perturbation in lower stratospheric aerosols in January and February 2001. (The picture for 2004 is less clear and less fully developed at the time of this writing.) Strong layer enhancements of aerosols are seen in SAGE II between late January and early February in southern midlatitudes. POAM III even detects a few strong extinction enhancements in early February at its far south (70 degrees) location. HALOE sees enhancements at potential temperatures centered on ~400 K at the start of February at ~60S, and in mid February at latitudes close to Bauru. To my knowledge, these anomalous layers have not been the subject of any published study. To the extent that in southern summer 2003 there was a hemispheric stratospheric aerosol perturbation caused by pyroconvection in Australia in January 2003 (Fromm et al., GRL, 2006), these 2001 and 2004 aerosol layers should provoke a deeper investigation as to their cause.

These satellite data sets are publicly available; confirmation of my findings is easily achieved by acquiring/plotting the extinction profiles.

The obvious conclusion is that some very peculiar and strong event occurred to deposit aerosols in the southern stratosphere in summer 2001. They were observed in a 45 deg. latitude spread over 3+ weeks. And these are simply the most obvious layers being described. Presumably there are more, smaller layers in the full picture. I consider it doubtful that there were multiple and orthogonal reasons for the preponderance of aerosol layers observed by satellite and the localized measurements reported by Nielsen et al in 2001. Unless it can be certainly determined that the Bauru measurements can only be explained as frozen crystals, it seems to me to be incumbent on the authors to fully consider their measurements in the larger context and search for an answer that explains the whole picture before publishing this work.

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