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Interactive comment on "The MIPAS/Envisat climatology (2002–2012) of polar stratospheric cloud (PSC) volume density profiles" *by* Michael Höpfner et al.

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Höpfner et al. present a global data set of vertical profiles of volume densities of PSCs. They have derived their data from MIPAS measurements. They use beta-NAT optical constants in the wavenumber range around 830 cm-1 in order to interpret the profiles of volume density. Strong variability of PSC parameters in different Artic stratosphere winters has been observed.

Unfortunately, the authors ignore the fact that more than one NAT phase (i.e. alpha and beta NAT) is known from literature [1] and that both phases in combination with ice can occur in the lower polar stratosphere [2]. For both phases, optical constants

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have not only been calculated, but have also been measured in the laboratory with high precision [3, 4]. The morphology of the crystalline particles can have an important impact on the spectra as well [5, 6].

Beside NAT also NAD is a possible phase in PSCs [7ab]. Also NAD exhibits two crystalline modifications (alpha and beta NAD) [8]. Cold chamber experiments show that the metastable low temperature phase is more likely [9]. The authors should include these latest spectroscopic and mechanistic results from the literature into their discussion. Eventually, this will help to understand the reported large variabilities.

In addition to the points raised above it behooves the authors to compare the complex index of refraction with absorption cross section data recently published in the literature [4]. The authors should use information from laboratory experiments to calibrate, or at least validate the field observations using independent verification. Retrievals do not mean anything unless the optical data are validated using information external to the retrieval cycle. Table 6 of reference 4 displays quantitative data on optical constants of alpha- and beta-NAT as well as NAD (exact phase unknown). The associated spectra also show that all three nitric acid hydrates absorb around 830 cm-1 such that basing the assessment of the occurrence frequency solely on a single wavelength region is a losing proposition. It behooves the authors to make better use of published results from laboratory experiments in order to maximize the scientific insight (phase, frequency of occurrence, interconversion dynamics and the like) to the benefit of the readers who will appreciate a break-out from the beaten path from time to time.

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