

The paper by Zheng et al. entitled "Observations of the boundary layer, cloud and aerosol variability in the southeast Pacific coastal marine stratocumulus during VOCALS-REX" provides a useful characterization of the Sc cloud and aerosol system off the north coast of Chile during VOCALS. This includes assessment of CCN, aerosol microphysics and their relation to the meteorological environment and associated satellite derived properties. The paper provides a valuable summary of observations and descriptive reference for modelers and others interested this cloud system. The paper is well organized and complete but could benefit from some clarification before publication in ACP.

Abstract

I suggest a more abbreviated abstract with rather less emphasis on specific measured values (eg. LWP influenced by occasional moist layers aloft) and greater emphasis on the significant findings (agreement. or disagreement with satellites etc.). Entrainment values relative to offshore VOCALS values are worth mentioning but why a reference to some unstated BL value of the coast of the Northeast Pacific, particularly in the abstract. The significance (presumably the reason it is mentioned in the abstract) of the aerosol and cloud LWP relation is diminished by vague references to other processes influencing LWP. The latter should be addressed in the text unless the former is suspect – in which case it should probably not be in the abstract.

Specific Comments

P15425 L28 deviations were less than 15% ... Is this a cross wind displacement of 15% of the along wind trajectory distance or something else?

P15425 L2 "...potential errors over coastal areas..?" Are these potential errors due to unresolved topography, sea-breeze effects or ???

P15428 L4 Which "large area" do you mean or do you mean the entire indicated area?

P15428 L23 air masses did not "originate" from these locations but only passed over them. Also, large variations are common for wind direction in the vertical above the inversion on a given profile. Can you say anything about the representativeness of stratifying trajectories by using winds from trajectories at only 2000m altitude? May be worth indicating variability over profiles with a plot to say 3km or so.

P15433 L20+ Here and elsewhere comparisons to DYCOMS are made but I am failing to see the relevance without further discussion. If these differences are important and affect conclusions then a more complete comparison of experiments seems warranted. If not, then why do we care? Similarly, any significance is undermined in the last sentence (L23-24) that suggests maybe the differences simply reflect measurement and calculation differences.

P15435 Eq. 5 I would expect the %error to depend upon not just the difference for profile vs. mean values but also the variance observed along the in-cloud leg. If the latter were high and the profile value differed by less than the variance then it seems this expression would not inform you of the uncertainty. There are also issues of cloud structure and scales and sloping profiles flown etc.

L 12-25 It would be preferable to have these LWP regressions and dependencies mentioned plotted.

P 15436 L1 Fig 7 suggests four flights and about 10 days with moist layer above inversion. Also, it would be helpful to try and follow differences in LWP discussed if the data in Fig.9 included an indicator of which ones are which (moist layer, decoupled, shear).

P15439 L15 After suggesting several reasons why entrainment values might be low (an uncertainty?) the last sentence argues that implementing a suggested correction might increase the uncertainty. What are the authors suggesting as most appropriate? BTW - Similar caveats terminate other discussion paragraphs elsewhere and tend to obscure the points raised.

P15439 L18-25. The authors use the operationally defined Na from the PCASP to characterize the accumulation mode number in both the BL and above the inversion. Most PCASP have a poorly known relative humidity but are generally measuring a wet aerosol in the BL and a dry one aloft. The same aerosol concentration will often be better resolved by the PCASP in the BL than it will be above the inversion due to a smaller dry size there. As size distributions tend to increase steeply near the lower detection limit of the PCASP, the comparison of Na above and below the inversion is problematic and probably biased low aloft. Some compelling arguments are needed here to support this claim.

L 25+ The estimation of CCN at 0.2%S from measurements at 0.5%S is problematic. The variability in chemistry and in size-distributions for other VOCALS platforms suggests one should not assume the composition and size distributions vary insignificantly throughout a mission. The variability in aerosol size distributions are generally large and the referenced Allen paper (Fig 12) shows the largest variability for the coastal free troposphere. If there is size data to support this argument then it should be shown. If, not what implications does reasonable uncertainty have for this assessment?

P15440 ...“The main aerosol source at Point Alpha was horizontal advection within the BL from the south rather than entrained from above the inversion....” Entrainment at point alpha will have little influence on the Na in the BL at point alpha. It will influence values further downwind (day or so) depending upon entrainment rate. The question is whether the Na advected to point alpha in the BL was influenced by previous entrainment of aerosol from above or directly by coastal emissions into the BL.

P15442 L19-18 seems to contradict L 3-5.

P15443 L10 “take into account” should probably read “to be taken into account”

Figure 6e. I suggest replotting with wind direction to say 0-400? In order to minimize the jumping from 360 to 0 degrees.