

Interactive comment on “Horizontal and vertical profiles of ozone, carbon monoxide, non-methane hydrocarbons and dimethyl sulphide near the Mace Head observatory, Ireland” by R. M. Purvis et al.

Anonymous Referee #1

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Review of Purvis et al., “Horizontal and vertical profiles \ddot{E} near the Mace Head observatory, Ireland”, ACPD-2005-0291.

General comments: This report presents aircraft data on ozone, CO, VOCs, and DMS above and offshore from Mace Head during the NAMBLEX campaign. Comparison of measurements between airborne and ground platforms is attempted, but interpretation is complicated due to instrumental problems and limited justification of comparability between the 20m surface sampling elevation and the 390m lowest aircraft leg. Some

species seemed to agree (e.g., ozone, many NMHCs) but no quantification is provided. C4 and C5 alkanes did not agree, and local sources at MH are invoked; this seems inconsistent with the assumption that vertical mixing has made a 390m altitude leg comparable to MH in other species - wouldn't the C4 alkanes also have been mixed?

Large uncertainties in the MH ozone data (see Heard et al. overview paper in ACP) make this a less rigorous comparison. Further, large (30 ppbv) differences in CO suggest either different air masses (aircraft did not sample the surface layer) or an unexplained instrument problem. The case that the aircraft was sampling the same air at 390m as the MH ground site is not strongly made. A figure showing vertical profiles of met. data (wind speed, direction, temp, RH) with the MH ground values plotted might help to establish this better. If the same air mass was indeed sampled, without providing more information on instrumental accuracy, little quantitative basis for comparison is established. More work needs to be done to establish comparability of samples, and then quantify the instrumental uncertainties for both sites for each species, before conclusions can be drawn regarding the data comparison.

Mention of photochemical lifetimes of DMS and other reactive species emitted from the ocean surface would enhance the discussion of vertical profiles observed from the aircraft. Further, regarding the source regions inferred from back-trajectories, the authors do not incorporate chemical transformation as a contributor to the variability and contributing to the possible “footprint” sampled by the aircraft.

Before publication as part of the NAMBLEX special issue in ACP, these issues should be fully addressed, as mentioned specifically below.

Specific comments:

p. 12508, line 26: The ozone measurement was based on an absolute absorption technique and should not ever need “calibration”. The procedure mentioned here is better interpreted as empirically changing the instrumental output determined by the Beer-Lambert law in an attempt to correct for unspecified instrument problems. Please

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state the magnitude of the “calibration” adjustment in the text.

p.12509, first paragraph and following: Information on detection limits is provided but no assessment of any measurement uncertainty is given for any of the species compared or interpreted. Without these, no sense of what level of uncertainty exists, or is acceptable, in the following analysis. Please provide an uncertainty estimate, its relevant time scale (e.g., plus or minus X pptv for a 30s average of the 1s data), and an short explanation of how these values were arrived at, for each chemical species used in this report.

p. 12509, line 24: Garmisch misspelled. Better as Garmisch-Partenkirchen perhaps.

p. 12509, line 25: What was the delivered mixing ratio of CO to the instrument from the 1.5 ppmv calibration standard? What additional uncertainty in the flight data might be introduced by interpolating from calibrations performed on the ground?

p. 12510, line 6: The mention of humidity changes affecting the ozone absorption measurement is somewhat surprising; can this be explained in more detail? How long did the instrument take to “re-equilibrate” after altitude or humidity changes? In comparing the aircraft ozone data to the MH ground values, which MH instrument (of the three measurements during NAMBLEX - Leicester, Leeds, or DEPRA (see Heard et al., ACP Special Issue overview)) was used for this comparison? The ground ozone data showed large (for ozone) disagreements of up to 20% and several ppbv. Please explain how the ground ozone data were chosen against which to compare, and what residual uncertainty exists in both aircraft and ground data.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 12505, 2005.

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