

Interactive comment on “High-resolution modeling of atmospheric dispersion of dense gas using TWODEE-2.1: application to the 1986 Lake Nyos limnic eruption” by Arnau Folch et al.

Anonymous Referee #2

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The discussion paper submitted by Folch and co-authors presents an important improvement of the TWODEE-2.1 code, with the main impact being the methodology used to account with the microscale wind field characterization. In addition, the improvements give also the possibility to assess the impact in terms of human fatalities depending on the CO₂ concentrations and exposure time. Authors compared the results here obtained for Lake Nyos limnic eruption with results from a previous version of the TWODEE code (published by Costa and Chiodini, 2015), and check the fits between the observed fatalities and the results here presented. The good fits argue to justify the significant improvements of this new version of the code. In my opinion the article is quite interesting and a great improvement for the code that can be applied in

C1

several degassing areas where CO₂ constitutes a permanent hazard. In addition, the results now submitted for publication give some insights for the modeling of the 1986 Lake Nyos limnic eruption. Looking at figures 3, 4 and 13 there are some areas where fatalities occurred (for example L30 and L33) and that are not accounted by any of the models. It could be interesting to add some comment about this in the discussion (still some wind change that was not accounted or some limitation with the digital elevation model?). I have just few comments that can improve the paper, which are listed below: - Line 43 (page 1): I suggest to add the information that CO₂ is denser than air at STP: "..., being denser than air at STP"; - Line 56 (page 1): comma is missing before "respectively" (other similar situations appear on the article); - Line 90 (page 2): remove one endpoint that is in excess; - Lines 5, 14, 17 and 21 (page 4): check and correct the number format. Periods indicate the decimal place in English, so the period should be replaced with comma (you want to separate groups of thousands); - Lines 5 to 22 (page 4): Authors use the thresholds mentioned by Costa and Chiodini (2015) to discuss the exposure limits for the CO₂. References should be added for the symptoms and time of exposure mentioned for the 10%, for instance, since differences exist in the literature for the levels of CO₂. As an example, some works mention that on the presence of 10% CO₂ fainting can occur, so the 10-15 minutes mentioned by the authors in this article seem to be too long for exposure to these concentrations. In this paragraph authors should also mention the STEL for the CO₂, which is 3%, value that is after used as the SLOT (it would be important to mention it before appearing as SLOT, as it is also defined as the STEL by OSHA, NIOSH and other international entities); Lines 47 and 51 (page 9): check the format of the CO₂ (2 needs to be as subscript). Same comment for line 12 (page 10). Figures 4 and 13 - the dimension of the circles is too small (difficult to read). I suggest to increase the dimension of the circles.

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C2