Reviewer 2

General Comments:

The paper describes model study to assess the inter-related impacts of ozone- and water-stress-induced yield losses in two wheat cultivars in an agricultural region in India. The authors model ozone fluxes into the plant using WRF-Chem simulations of current and future surface ozone and meteorological conditions, using the RCP4.5 and RCP8.5 future scenarios. The study finds that under rainfed conditions, water stress induces stomatal closure, thus protecting plants from ozone uptake and minimizing ozone-induced yield losses, though water-stress-induced losses remain. However, under irrigated conditions, stomatal opening sustains high ozone uptake, resulting in substantial ozone-induced yield losses that largely offset reductions in water-stress-induced losses. The authors advocate for more research into ozone-water effects in crops and suggest potential changes in irrigation management to find practicable strategies for mitigating wheat yield losses due to both water stress and ozone.

We thank the reviewer for their insightful feedback which has enabled us to substantially improve the quality of our manuscript. We address the specifics of their feedback below.

Specific Comments:

Section 2.3-2.4: I have seen some studies (not treating wheat) that suggest the timing of ozone exposure and water stress may be important in predicting how they interact to impact plant damages (e.g., Matyssek 2006; https://doi.org/10.1055/s-2005-873025). For example, if ozone exposure preceding drought damages stomatal regulation, this could impact stomatal response to VPD under water stress. Can you please expand on whether the DO3SE model has any mechanism to test this type of asynchrony in drought or ozone exposure leading to injury or impairment of stomatal regulation? Could this be applied in such a study?

Unfortunately, the current version of the DO_3SE model is unable to simulate O_3 impact on stomatal functioning. However, the reviewer raises an important point here. To address this we now include an additional few sentences in section 3.3.

'*The timing of O_3 and water stress may be important in predicting how plants respond to these stresses since O_3 has been found to damage stomatal functioning causing plants lose the ability to respond to water stress (e.g. Wilkinson et al., 2010). Ideally, O_3 impact models would include mechanisms that simulate O_3-induced loss in stomatal functioning, however, to our knowledge such modelling mechanisms have not yet been developed or included and would likely require experimental data to identify thresholds at which stomatal functioning is impaired*'.

Section 2.3: Are there any data to validate the DO3SE derived ozone fluxes, even at other field sites? What is the uncertainty in model derived fluxes?

The wheat stomatal ozone flux model used in the DO_3SE model has been evaluated against wheat stomatal conductance data (the primary determinant of stomatal ozone flux) collected under experimental conditions in Ostad, Sweden (Pleijel et al 2007) and found to perform well (with an R2 value of 0.83 for regression of observed against modelling g_{sto}. The DO_3SE model has also been extensively evaluated at a number of crop sites (as reported in Tuovinen, Clifton, Emmerichs (sub)) although these evaluations rely on total ozone flux and deposition measurements (since they use ozone flux tower data) so incorporate whole canopy ozone deposition and flux rather than representative upper leaf stomatal ozone flux required for PODy calculations. The combination of these evaluation methods that focus on leaf level stomatal conductance and canopy level stomatal ozone flux model together provide confidence in the predictive abilities of the DO_3SE model. To make this clearer in the manuscript we have incorporated the following sentence in the discussion at the end of a renamed section 3.1 (see also comment from Reviewer 1).

'The DO_3SE wheat stomatal ozone flux model has been evaluated against wheat gsto data (the primary determinant of stomatal ozone flux) collected under experimental conditions in Ostad, Sweden (Pleijel et al. 2007) and found to perform well (with an R^2 value of 0.83 for a regression of observed against modelled gsto). The DO_3SE model has also been extensively evaluated for a number of crops at locations around the world (as reported in Tuovinen et al. (2004) for wheat growing near Cumono novo in Italy and Emmerichs et al. (2025) for wheat growing near Grignon in France). These evaluations rely on total ozone flux and deposition measurements (since they use ozone flux tower data) or water flux measurements and thereby test whole canopy fluxes rather than the representative upper leaf stomatal flux required for PODy calculations. The combination of these evaluation methods focussing on both leaf level stomatal conductance and canopy level ozone flux together provide confidence in the predictive abilities of the DO_3SE model'.

Equation 4: Some more clarification would be helpful. Where does the factor of 3.85, for example, come from? Can you provide a reference for this?
We have now added a sentence to the manuscript to explain where this regression comes from along with the corresponding citations.

Line 273-76/Figure 3: It is compelling to see a plot of WRF vs site temperatures over the growing season. The authors should expand a bit on how they expect modeled meteorology to impact their conclusions. Does WRF under-predict humidity for example? I think it would also be very compelling to see a similar plot of modeled and observed ozone at this site, since according to the authors, this site was chosen in part due to availability of ozone data (L116-18).

We have now included text describing an evaluation of the WFR-Chem model (in response also to a comment by Reviewer 1). We also refer to details of how modelled meteorology influences O_3 concentration modelling in relation to an underestimation of relative humidity as reported by Sharma et al. (2023).

We agree that it will be useful to add a plot of modelling and observed [O_3] data to complement the existing Fig 3 for surface air temperature and will include this in the revised paper.

Technical Corrections:

L26-7: O3-RYL is given a slightly different meaning later on (see L287)
We thank the reviewer for spotting this typo. The discussion should use the term 'ozone relative yield loss' as defined earlier in the text. We have now ensured that O3-RYL for any RYL related to O3 stress and WS-RYL for any related to water stress.

L109: POD-SEPC acronym not previously defined
We now define POD$_{6}$SPEC prior to use

L189: Symbol of Et is elsewhere fully capitalized
The Et symbol in eq. 5 has been corrected to ET_a