# 2.057 The development of modelling methods to assess the combined threat of climate extremes and ozone on ecosystems.

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Abstract:

Extreme climate and ground level ozone ($O_3$) air pollution stress are likely to co-occur and affect ecosystems. This is due to elevated $O_3$ episodes being more frequent under hot, dry sunny conditions as well as in rural agricultural regions (downwind of source $O_3$ precursor pollutant emissions). Most pollution risk assessment studies have used methods that relate damage to ambient ozone ($O_3$) concentrations rather than stomatal $O_3$ flux, now widely accepted as the most suitable predictor of damage. Even where stomatal $O_3$ flux is used, studies rely on whole season accumulations from which to determine yield losses even though $O_3$ will be compromising photosynthetic capacity over shorter time-periods (hours to days) as well as over whole growing seasons. Advances in climate modelling provide opportunities to use a combination of finer spatially and temporally resolved meteorological data (for both current and future projected climates) in conjunction with a new photosynthetic based $O_3$ deposition and stomatal flux model ($DO_3SE$) to produce novel methods to assess the effects of interactions between nitrogen availability (soil fertility), heat, drought and $O_3$ on photosynthesis, crop growth and yield. These efforts will focus on regions in Asia, where high $O_3$ concentrations and climate extremes are already threatening crop productivity in a food insecure region. These new risk assessment methods will be able to inform policy through evaluating a number of emission storylines to identify those most likely to mitigate the effects of both $O_3$ pollution and climate change. The work will also develop new $O_3$ damage crop modelling methods that can be easily incorporated into existing photosynthesis-based crop modelling methods for application among the wider crop modelling community.