

## 2.156 The impacts of VOCs on atmospheric chemistry: The Common Representatives Intermediates Chemical Mechanism in UKCA.

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Abstract:

Ozone production in the troposphere is driven by the photo-oxidation of volatile organic compounds (VOCs) in the presence of NO<sub>x</sub>. However, there are many thousands of VOC species in the atmosphere, and the simulation of all these species and their products is not feasible. In 3D models, various techniques for reducing complexity are used, but may introduce errors that are hard to identify. The Master Chemical Mechanism (MCM) is a near-explicit scheme, with several thousand species and 10s of thousands of reactions, but is almost exclusively used in box-model applications due to its high cost. The Common Representative Intermediates (CRIV2-R5) mechanism is an effective compromise, preserving the ozone forming potential of the MCM whilst reducing the number of species and reactions to be feasible in a 3D model (approximately 240 species, 650 reactions), whereby it can be used as a benchmark to assess simpler schemes in realistic, 3D modelling environments.

We present first results using CRIV2R5 in a global chemistry-climate model, the United Kingdom Chemistry and Aerosol model (UKCA) used in the Met-Office Unified Model. Detailed VOC speciation of emissions are required, so we utilise the new EDGAR v4.3.2 inventory with emissions of 25 VOC classes by 17 sectors. The CRI scheme is first implemented in a Box-Model version of UKCA, to test the scheme under a range of idealised chemical environments. It is further run in the full 3D modelling suite and evaluated against model runs using standard chemistry and routine observations used in chemistry-climate model inter-comparisons. Differences due to chemical mechanism for key chemistry-climate processes, such as tropospheric ozone production, the OH radical

burden and lifetime of methane, are discussed, as well as identifying errors which cannot be attributed to the chemical mechanism and are more sensitive to other model parameters.