



Sensitivities of trans-Atlantic photochemistry to uncertainties in the ICARTT Lagrangian experiment.

S.R. Arnold (1), M.J. Evans (1), J. Methven (2), M.P. Chipperfield (1), UK ITOP Science Team, European ITOP Science Team, INTEX Science Team, ICARTT Science Teams

(1) Institute for Atmospheric Science, School of Earth and Environment, University of Leeds, Leeds, UK. (2) Department of Meteorology, University of Reading, Reading, UK.

The ICARTT (International Consortium for Atmospheric Research on Transport and Transformation) Lagrangian experiment (Summer 2004) aimed to make observations in polluted air masses at several stages during their transport from the US East coast across the Atlantic into Europe. This provided a unique opportunity to assess our understanding of ozone photochemistry in an air mass-relative framework, removing uncertainties introduced by the advection of air masses from different origins into the observed domain. However, the observed change in ozone can be used to test our understanding of photochemistry only if we can correctly describe the impacts of processes such as mixing, cloud processing and uncertainties in the observed chemical state and rate constants. We have used the CiTTyCAT Lagrangian model to assess the sensitivity of modelled ozone change during air mass transport typical of an ICARTT Lagrangian case, to uncertainties in these parameters. Results suggest that these uncertainties, particularly in mixing processes and the observed concentrations, can produce a large range in the modelled photochemical ozone change. Due to the relatively small change in ozone observed across the Atlantic, these uncertainties result in a poor constraint on our attempt to understand the photochemical contribution to the observed change.