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Forecasting for the ICARTT Lagrangian experiment - intercepting polluted air masses as they cross the Atlantic

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Long-term simulations of global atmospheric composition rely on models of transport and photochemistry. However, the chemical component of such models is uncertain, not only because its parameters are uncertain but also because chemical pathways are reduced to make the problem tractable. Observations along a single flight are insufficient to evaluate the chemistry model because uncertainties in the origins of air masses dominate the uncertainty in modelled composition. This motivated the ambitious ICARTT (International Consortium for Atmospheric Research on Transport and Transformation) Lagrangian experiment (summer 2004) which aimed to track polluted air masses and intercept them several times over the time taken to cross the Atlantic - sufficient time for observations of photochemical transformation and mixing. This talk describes the specialised forecast tools that were used to identify polluted air masses that would pass within range of aircraft based on the US East Coast, in the Azores and in France. The major opportunities that arose during the campaign window are discussed, focussing on the difficulties in identifying targets from accurate forecasts in time to coordinate the aircraft operations. An attempt is made to identify successful Lagrangian interceptions involving 4 well instrumented aircraft: the NOAA P3 (USA), NASA DC8 (USA), FAAM BAe146 (UK) and DLR Falcon (Germany). These interceptions constitute the first ‘‘direct observations" of chemical transformation following air masses over many days.