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AIRCRAFT EMISSIONS AND CLIMATE CHANGE: ATMOSPHERIC VARIABILITY AND THE IMPLICATIONS FOR CLIMATE POLICY

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One of the major impacts on climate from the aviation sector is the production of contrails in the atmosphere and their influence on cirrus cloud formation. Contrail coverage is recognized to play a significant role in climate forcing by aviation and new estimates have suggested that the radiative impact of cirrus clouds formed by spreading contrails may be up to 10 times larger than that due to emissions of CO2. Contrail formation requires appropriate ambient conditions. As such, atmospheric variability can change the amount of contrail and contrail-cirrus and hence the net radiative impact of a sample of air traffic. This research takes a new look at the issue of contrail formation, in the context of the wide range of proposed market-based and other measures to address the impact of aviation on climate, including the possible inclusion of aviation in emissions trading schemes for the European Union. The variability in the atmospheric conditions conducive to contrail formation is analyzed with a focus on identifying possible unintended climate consequences of policies designed to reduce aviation emissions of CO2 or to reduce the combined impacts of CO2 and NOx. The study considers the key region of Western Europe, where the high density of air traffic and prevailing climate conditions lead to high contrail coverage. Our initial results suggest that current thinking on the design of emissions trading policies may be counter-productive leading to a net increase in radiative forcing from the aviation sector.