



Project 022 Evaluation of FAA Climate Tools: APMT

University of Illinois at Urbana-Champaign

Project Lead Investigator

Dr. Donald Wuebbles
Dept. of Atmospheric Sciences
University of Illinois
105 S. Gregory Street
Urbana, IL 61801
Tel: 217-244-1568
Fax: 217-244-4393
Email: wuebbles@illinois.edu

University Participants

University of Illinois at Urbana-Champaign

P.I.(s): Dr. Donald Wuebbles

- Period of Performance: October 16, 2017 to September 27, 2019
- Task(s):
 1. Evaluate version 24 of APMT
 2. Using the CESM global chemistry-climate model, update our earlier analyses of regional effects from aviation based on latitude bands and regions

Project Funding Level

This project did not receive funding from FAA during FY2019 and was operating under a no-cost extension.

Investigation Team

Dr. Donald Wuebbles: project oversight

Jun Zhang (graduate student): analyses of APMT and 3-D atmospheric climate-chemistry modeling analyses

Project Overview

The primary objective of this project was to evaluate the capabilities of the APMT-I model, particularly the Climate module, to ensure this FAA policy analysis tool uses the current state of climate science. Regional climate impacts of aviation were also evaluated using the 3D atmospheric climate-chemistry model. Findings from these studies were reported at several meetings and in special reports to the FAA.

Task 1- APMT-I Climate Evaluation and Review of Requirements Document

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Objective(s)

In this project, we act as a resource to FAA for analyses relating to metrics and to model development and evaluation of FAA modeling tools and datasets, with special emphasis on testing the Aviation Environmental Portfolio Tool (APMT) model and the further development and evaluation of its climate component to ensure that the underlying physics of the model is addressed properly. A specific focus of this project is on analyses of zonal and regional effects of aviation on climate and testing the resulting incorporation of such effects within APMT. As such, we want to make sure the APMT linking of aviation emissions with climate impacts and the representation of the various components of the cause-effect chain (i.e., from emissions to climate effect) properly represents the state-of-the-science.



Task 2- Three-dimensional Atmospheric Climate-Chemistry Modeling Studies for Aviation Regional Effects on Climate

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Objective(s)

The aim in this work was to have a better understanding of the climate impacts from aviation emissions on a zonal and regional basis. Since the aviation emissions have significant spatial variability in the sign and magnitude of response, the strength of regional effects is highly likely hidden due to the global averaging of climate change. Thus, it can be important to look at the impact of aviation emission on climate on a regional scale as well as on the global scale. We continue to use a state-of-the-art three-dimensional chemistry-climate model to further our understanding of the chemistry and climate effects from aviation emissions and to do our regional analysis and compare our results with the earlier findings. As part of this effort, we used CAM5-Chem and will now be using the new CAM6-Chem model, the atmospheric component of the Community Earth System Model (CESM). We plan to conduct a series of studies to evaluate aviation impact on climate both in 2006 and 2050. The ultimate goal of this project is to estimate the temperature change over specific regions of interest (e.g., the United States, Europe, and East Asia) resulting from aircraft emissions in 2006 and 2050.

Research Approach

These tasks were on hold during FY2019 due to delay in funding.

Milestone(s)

These tasks were on hold during FY2019 due to delay in funding.

Major Accomplishments

These tasks were on hold during FY2019 due to delay in release of FAA funding.

Publications

N/A

Outreach Efforts

N/A

Awards

N/A

Student Involvement

N/A

Plans for Next Period

- Complete evaluation of 2020 generation modeling capabilities and findings relative to the studies of SSTs done in the 2000 time period.
- Begin studies for new SST scenarios being developed for FAA.
- Evaluate APMT updates, as needed.
- For the regional analyses, reestablish where the project was two years ago when funding was suspended.