

**Submission Title:**

Assimilation of TROPICS Radiance Data in NASA GEOS System and impact assessments through Observing System Experiments

**Author(s):**

Min-Jeong Kim, min-jeong.kim@nasa.gov, NASA

Nikki Prive, nikki.prive@nasa.gov, Morgan State University

Patrick Stegmann, stegmann@ucar.edu, JCSDA

Zach Griffith, zach.griffith@ssec.wisc.edu, University of Wisconsin

Matthew Thomson, matthew.thompson@nasa.gov, SSAI

**Abstract**

Since the first full-scale weather satellite Television Infrared Observation Satellite (TIROS)-1 was launched in 1960 to measure weather patterns from space, the number of satellites carrying various sensors to measure atmospheric properties has increased rapidly. Data from these meteorological satellites have been crucial to the advancement of the NWP forecasts. Especially, space-borne measurements of atmospheric temperature and moisture information provided by microwave sounders were reported to contribute most to positive impacts on global NWP forecasts.

Developing and launching an operational weather satellite is a daunting and tremendously expensive mission that requires many years of planning, developments, and maintenance after the launch. Small satellites with low size, weight, and power requirements can reduce the cost associated with the construction and launch of large bus platforms and draw attention of several space agencies and weather technology companies that started investing their resources to develop small satellites and measure the potential benefits and weaknesses. The NASA Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS) mission is a constellation of small satellites carrying state-of-art microwave temperature and humidity sounders with 12 channels between 91 GHz and 205 GHz frequency. Currently five TROPICS cubsats, including TROPICS-pathfinder, are in space and provide the temperature and humidity data from space to the meteorological community.

This study seeks to assess the potential impact that the constellation of TROPICS satellites may bring to the global NWP analysis and forecasts by assimilating all-sky TROPICS data and implementing observing system experiments (OSE) using the NASA GEOS system. Various evaluations metrics including forecast skills, fit to other observations such as radiosondes and microwave and infrared sounder are used. Along with the NWP impact assessment, the quality of the TROPICS data is evaluated by looking at observation minus forecast statistics in comparisons with other conventional satellite temperature and humidity sounders.