1. Introduction

Measurements from microwave sounders and imagers provide a valuable source of information including atmospheric temperature and water vapor. Satellite systems are essential for monitoring these variables that are critical for weather and climate predictions. For example, the outgoing long wave radiation (OLR) from water vapor sources (oceans and other large water bodies), and this is a source of radiative cooling. Several studies have examined the impacts of changes in both the spatial and temporal distribution of OLR (e.g., Chang et al., 2017; Ringerud et al., 2018). The impact of changes on OLR is significant as it is linked to the global energy budget, and modifies the effective radiative temperature of the Earth’s surface. This leads to the question of how changes in OLR can be related to changes in different surface types (e.g., land, water, sea-ice).

2. Microwave Emissivity Surface Data and Models

2.1 Emissivity available in CRTM

The central core of this work involves the default emissivity models over land, snow, and ice and was used in this study. CRTM is a 3-channel optically thin radiative transfer algorithm developed as part of the Global Modeling and Assimilation Office (GMAO) at NASA/Goddard Space Flight Center (GSFC). CRTM is a widely used radiative transfer model that is frequently used in global and regional climate simulations. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

2.2 GMAO Emissivity Database

Data from the GMAO Microwave Emissivity (0.9 to 0.92) is utilized both in M2020 and in this study. CRTM is a 3-channel optically thin radiative transfer algorithm developed as part of the GMAO at NASA/GSFC. CRTM is a widely used radiative transfer model that is frequently used in global and regional climate simulations. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

3. Evaluation of Active-Passive Microwave Surface Database using GEOS

3.1 Introduction

This work focuses on testing the ability of the CRTM to simulate the emissivity data at different spatial and temporal resolutions. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

3.2 Results of Evaluation

3.2.1 Emissivity database validation

In this section, we evaluate the performance of the CRTM for different spatial and temporal resolutions. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

3.3 Comparison of GMI Emissivity Over Land, Snow, and Sea Ice in the GEOS System

3.3.1 Introduction

In this section, we evaluate the performance of the CRTM for different spatial and temporal resolutions. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

3.3.2 Results of Evaluation

In this section, we evaluate the performance of the CRTM for different spatial and temporal resolutions. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

4. Summary

In this paper, we have shown that using simulated emissivities from M2020, we can improve simulations of brightness temperatures for passive microwave instruments. The improvements are most pronounced for land and sea-ice emissivities. The results suggest that future studies should focus on improving emissivity simulations for different surface types, including land, water, and sea-ice, as well as different spatial and temporal resolutions. The model is designed to be used in a simulation mode, and the code is available from http://www.gmao.gsfc.nasa.gov. The model is used extensively in both climate and weather research.

Acknowledgements

We would like to thank Nasa/Goddard Space Flight Center for supporting the development of the CRTM model. We would also like to thank the members of the MIT Acoustics and Radar Department for their help in conducting this study.

References

1. Acknowledgements

2. References