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An End-to-end Simulation Model for Thermal Imaging Systems

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Observations made by space-based thermal imaging systems have numerous applications such as environmental monitoring, disaster management, forestry, climate change monitoring and air quality studies.

Defining performance requirements of space-based thermal imaging systems, preparing a preliminary mission profile, deriving the instrument design requirements and evaluating the performance of space-based thermal imaging systems all require development of end-to-end simulation models.

This paper describes an end-to-end simulation package developed for thermal imaging systems.

As an example, simulated observations of space-based thermal imaging fire missions are presented. Retrieval of fire characteristics such as Fire Radiative Power (FRP) from the simulated mock raw data is described. Sample results of sensitivity analyses, error analyses and design optimization using the end-to-end simulation models are presented and discussed.

The simulation package is a useful tool for future space missions that are intended to generate thermal imagery of the Earth for various purposes such as fire detection and fire monitoring, sea/land surface temperature monitoring, and biomass burning.