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QUARTERLY PROGRESS REPORT

Contract No. NAS5-26442

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A Study of Model Parameters Associated With  
the Urban Climate Using HCMM Data

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ASSOCIATED WITH THE URBAN CLIMATE USING HCMM  
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Prepared for

The National Aeronautics & Space Administration  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

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## 1.0 Introduction

The Research Triangle Institute (RTI) is using infrared and visible data from the Heat Capacity Mapping Mission (HCMM) satellite to study the intensity of the urban heat island, commonly defined as the temperature difference between the center of the city and the surrounding suburban and rural regions, as a function of changes in the season and changes in meteorological conditions in order to derive various parameters which may be used in numerical models for urban climate. The analysis is focused on the city of St. Louis; and in situ data from St. Louis will be combined with HCMM data in order to derive the various parameters. The following are research tasks which we performed in order to meet the overall objective:

- 1) Determine specific case studies and obtain HCMM data and in situ data for each case study.
- 2) Establish ground temperatures using HCMM data corrected for the effects of atmospheric absorption.
- 3) Compare the corrected and uncorrected HCMM data to determine the magnitude of the error induced by atmospheric effects.
- 4) Compute the friction velocity, the Monin-scale temperature, the Monin-scale length, the surface roughness, and the eddy exchange coefficient using the HCMM in situ data.
- 5) Compute the heat island intensity using both HCMM ground temperature and in situ surface air temperature.
- 6) Determine estimates of anthropogenic heating using a boundary-layer model and parameters developed in Tasks 3) and 4).

## 2.0 Progress to Date

All HCMM CCT's have been received. This includes the 10 June 1978 case study which, up to the last reporting period, had not yet been received. The analysis of all HCMM data, both IR and visible data, have been completed for the case studies delineated in the progress report dated

July 1981. These data show that an urban heat island exists day and night and in all seasons when clear skies exist. During the daytime period, the urban region, besides being characterized by warm ground temperature, is also characterized by a lower albedo value than the surrounding suburban and rural region, suggesting in part that the higher temperatures are due to more absorption of solar radiation.

The in situ meteorological data have been examined and those data which appeared to be erroneous were removed from the data set. The meteorological data for four of the six studies have been entered into the computer and analyses of the surface winds and temperatures have been produced. These data have been merged with the HCMM data for the 9 June case and calculations of the surface roughness, the exchange coefficient, and the soil moisture have been made. Analyses of these parameters are forthcoming.

### 3.0 Problem Areas

No major problem areas developed during this quarter.

### 4.0 Work for Next Quarterly Period

During the next reporting period, analyses of the surface roughness, the exchange coefficient, and the soil moisture distribution will be completed for the six case studies. The results will be compared with known relationships in urban regions such as St. Louis. Most of these relationships were developed as a result of the Regional Air Pollution Study (RAPS) and the Metropolitan Meteorological Experiment (METROMEX).

After that portion of the analysis has been completed, a report outlining the results will be presented to NASA/GSFC.