URBAN MORPHOLOGY RETRIEVAL BY MEANS OF REMOTE SENSING FOR CLIMATE MODELING NEEDS

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1. INTRODUCTION

Majority of mankind nowadays lives in cities. Cities, especially megacities, generate a great proportion of wealth and economic power. However, transportation of pollution and other micro level particles as well as weather affect and hinder human actions. For this reason micro climate modeling is needed. These models need a database [1] of urban morphological features and characteristics.

This study is made in framework of international "Megapoli" project, which is developing models for local climate and air quality of worlds big cities. The goal of our work package is to provide the city morphology information for modeling needs by means of remote sensing. Our approach uses various data sources, optical images, infrared images and interferometric SAR images.

2. MATERIAL AND METHODS

Material used for this database is derived from various existing sources and databases. For example, topography of a test city is received from NASA Shuttle Radar Topography Mission [2] (SRTM) database, interferometric ASAR images are retrieved from ESA archives and optical images are gathered from Google earth. Also other existing topographic, cartographic and elevation information is used.

Optical images are used for street and block map composition. Infrared images are used for city heat exchange estimation. However the biggest challenge of the city mapping is accurate building height retrieval for large areas with affordable price. One possible technique for this task is multi-aspect SAR interferometry. However the complex urban environment is very challenging for interferometric technique because of steep vertical slopes where interferometric phase discontinues. On the other hand, interferometric coherence can provide good parameter for landscape roughness estimation.

3. RESULTS AND CONLUSION

In this work we have compiled a database of city morphology for part of Paris. The database ground resolution is 10 m. The database includes city road map, classification of important land use classes, elevation model of the ground and rough elevation model of the buildings, cityscape roughness, energy heat balance parameters and other parameters.

Height of the buildings cannot yet be retrieved accurately from interferometric SAR images due to SAR instruments steep look angle. The interferometric phase discontinuity and shadows pose most significant problems. However, some estimates are still possible to retrieve. The interferometric coherence provides significant information about cityscape roughness and land use classes. By using multiple images, look angle problems can be bypassed. The accuracy of heat flux images is equal to that of optical instrument data, but overall accuracy is adequate for the purposes.

4. REFERENCES

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