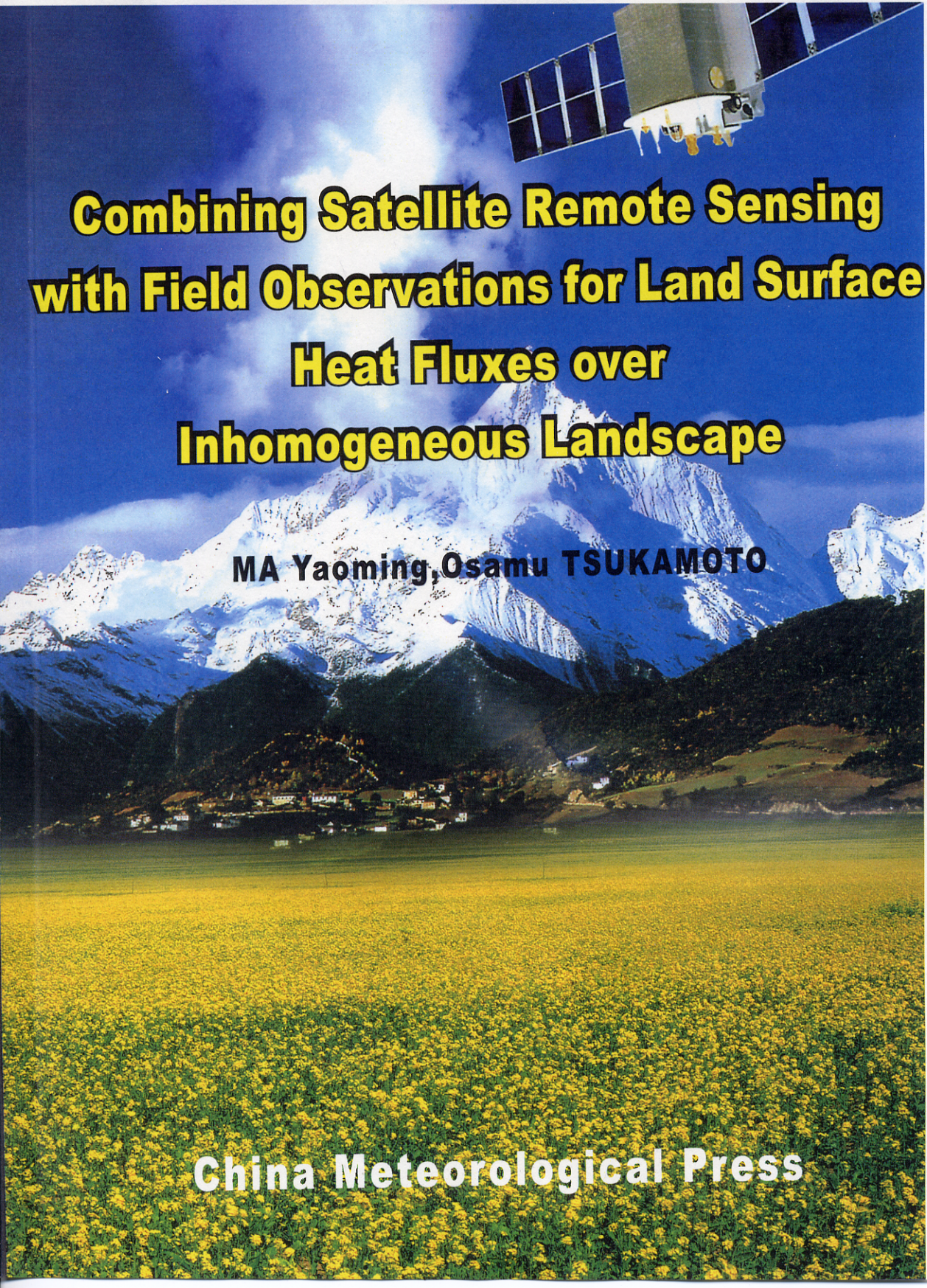

Combining Satellite Remote Sensing with Field Observations for Land Surface Heat Fluxes over Inhomogeneous Landscape

MA Yaoming, Osamu TSUKAMOTO

China Meteorological Press

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Abstract

Arid areas (e.g. desertification area—HEIFE) and high elevation areas (e.g. Tibetan Plateau) with an inhomogeneous landscape are characterized by extreme gradients in land surface properties, such as wetness, roughness and temperature, which have a significant but local impact on the atmospheric boundary layer (ABL). Observations of the actual extent over these areas are essential to understanding the mechanisms through which inhomogeneous land surfaces may have a significant impact on the structure and dynamics of the overlying ABL. Progress in this research area requires spatial measurements of variables such as surface hemispherical reflectance, radiometric surface temperature, Normalized Difference Vegetation Index (NDVI), Modified Soil Adjusted Vegetation Index (MSAVI), vegetation coverage, leaf area index (LAI), local aerodynamic roughness length, etc. Imaging radiometric on board satellites can provide useful estimates of most of these variables. By using these variables we can derive the distributions of land surface heat fluxes over inhomogeneous landscape.

Parameterization method to derive the regional land surface variables, vegetation variables and land surface heat fluxes over inhomogeneous landscape by using NOAA AVHRR data and field observations has been proposed in this book. The method was applied to the GAME/Tibet area. The distributions and seasonal variations of NDVI, MSAVI, vegetation coverage, leaf area index (LAI), surface reflectance, surface temperature, net radiation flux, soil heat flux, sensible heat flux and latent heat flux have been determined over the GAME/Tibet area. The derived results have been validated by using the "ground truth", and this implies that the derived results are acceptable.

New parameterization methods to derive the regional land surface variables, vegetation variables and land surface heat fluxes over inhomogeneous landscape by combining Landsat TM data and field observations have also been proposed in this book. The methods were applied to the inhomogeneous areas of HEIFE and AECMP'95. The distributions of NDVI, MSAVI, vegetation coverage, leaf area index (LAI), surface reflectance, surface temperature, net radiation flux, soil heat flux, sensible heat flux and latent heat flux have been determined over these two areas. By using the "ground truth" we validated the derived results. A comparison between the former results (of which the land surface variables and surface heat fluxes were derived from Surface Energy Balance Algorithm for Land—SEBAL) and the results derived from new parameterization method has also been given in this book. The results show that the new satellite remote sensing

parameterization methods are better approaches to get related air-land parameters over inhomogeneous landscape.

The utilization field of the new remote sensing parameterization methods and the recommendations of improving the scheme have also been presented in this book.

Key words: satellite remote sensing, field observations, land surface variables, vegetation variables, land surface heat fluxes, validation, inhomogeneous landscape, GAME/Tibet, HEIFE, AECMP'95, NOAA AVHRR, Landsat TM

Preface

The work reported in this book was funded by the Innovation Project of Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences (Grant No. CACX210072), Chinese National Key Project (Grant No.G1998040900), the Key Project of the Chinese Academy of Sciences (KZCX2-301), the "GEWEX Asian Monsoon Experiment on Tibetan Plateau (GAME/Tibet) " project and "HEIhe basin Field Experiment (HEIFE)" project. The idea about this research was formed after the HEIFE project experiment in 1995 and was strengthened during the Intensive Observational Period (IOP) of GAME/Tibet.

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