

Estimation of Land Surface Parameters over the Tibetan Plateau area Using MODIS and AVHRR Data

Lei Zhong^{1,2,3}, Yaoming Ma^{1,4}, Bob Su² and Kun Yang¹

¹Institute of Tibetan Plateau Research, the Chinese Academy of Sciences,
Beijing 100085, China

²International Institute for Geo-Information Science and Earth Observation,
Enschede 7500 AA, the Netherlands

³Institute of Plateau Meteorology, China Meteorological Administration,
Chengdu 610071, China

⁴School of Geography and Remote Sensing, Beijing Normal University,
Beijing 100875, China

Referred to as the ‘Roof of the World’ and the ‘Third Pole of the Earth’, the Tibetan Plateau is well-known both for its high altitude and unique geographical features. The variations of land surface parameters over the Tibetan Plateau are very important for the study of energy and water cycle over this area and the surrounding regions. However, the history of existing observation is rather short and the observation sites over the Tibetan Plateau are not only sparse but also uneven. With the implement of GEWEX Asia Monsoon Experiment on the Tibetan Plateau (GAME/Tibet), Coordinated Enhanced Observing Period (CEOP) Asia-Australia Monsoon Project on the Tibetan Plateau (CAMP/Tibet) and some new observation stations being set up over the Tibetan Plateau, a large amount of valuable atmospheric data has being achieved. Simultaneously, the fast development of remote sensing technique provides good methods to study the regional surface characteristics over the Tibetan Plateau area. In this paper, based on the MODIS L1B and AVHRR L1B data, several satellite images are chosen as the representation cases of winter, spring, summer and autumn. The images are taken on January 17, April 14, July 23 and October 16 in 2003. After the radiation calibration, the solar elevation angel correction of the visible and near infrared band, geometrical correction, image mosaic and subset, the atmospheric correction through Simplified Method for the Atmospheric Correction (SMAC) is carried out. The spatial distribution and seasonal variation patterns of land surface albedo are achieved after the narrowband to broadband conversions. As for the retrieval of land surface temperature, the pixel-based land surface emissivity and atmospheric water vapor content are firstly derived from the satellite images of AVHRR and MODIS. Then the split-window algorithms are applied to achieve the spatial distribution and seasonal dynamics of land surface temperature. The estimation results are proved to be satisfactory after comparison with the ground measurements from the observation sites in the CAMP/Tibet area.

Corresponding author: Lei Zhong

Lei Zhong

Post-Doctor

Institute of Tibetan Plateau Research, the Chinese Academy of Sciences, Beijing 100085,
China

Email: zhongl@itpcas.ac.cn

Yaoming Ma

Professor

Institute of Tibetan Plateau Research, the Chinese Academy of Sciences, Beijing 100085,
China

Email: ymma@itpcas.ac.cn

Bob Su

Professor

International Institute for Geo-Information Science and Earth Observation, Enschede 7500
AA, the Netherlands

Email: b_su@itc.nl

Kun Yang

Professor

Institute of Tibetan Plateau Research, the Chinese Academy of Sciences, Beijing 100085,
China

Email: yangk@itpcas.ac.cn