

# ACTIVE AND PASSIVE MICROWAVE REMOTE SENSING OF SPRINGTIME NEAR-SURFACE SOIL THAW EVENTS AT MIDDLE LATITUDES

L. Han<sup>\*a</sup> A. Tsunekawa<sup>a</sup> M. Tsubo<sup>a</sup>

<sup>a</sup> Tottori University, Arid Land Research Center, Hamasaka 1390, 680-0001, Tottori, Japan

Technical Commission VII Symposium 2010

**KEY WORDS:** Snow Ice, Soil, Application, Estimation, Algorithms, Radar, Passive

## ABSTRACT:

Springtime near-surface soil thaw event is important for understanding the near-surface earth system. Previous researches based on both active and passive microwave remote sensing technologies have paid scant attention, especially at middle latitudes where the near-surface earth system has been changed substantially by climate change and human activities, and are characterized by more complex climate and land surface conditions than the permafrost areas. SSM/I brightness temperature and QuikSCAT Ku-band backscatter were applied in this study at a case study area of northern China and Mongolia in springtime of 2004. The soil freeze-thaw algorithm was employed for SSM/I data, and a random sampling technique was applied to determine the brightness temperature threshold for 37 GHz vertically polarized radiation: 258.2 and 260.1 K for the morning and evening satellite passes, respectively. A multi-step method was proposed for QuikSCAT Ku-band backscatter based on both field observed soil thaw events and the typical signature of radar backscatter time series when soil thaw event occurred. The method is mainly focuses on the estimated boundary of thaw events and detection of primary thaw date. The passive microwave remote sensing (SSM/I) based result had a good relationship with the near-surface soil temperature, while the active microwave remote sensing (QuikSCAT) based result had both relationships with temperature and surface humidity conditions. And also, QuikSCAT result identifies the geographical boundary of water-drove thaw event, which is crucial for understanding the different types of springtime near-surface soil thaw at middle latitudes.

**TOPIC:** Microwave remote sensing

**ALTERNATIVE TOPIC:** Remote sensing applications