THE UNIVERSITY OF CONNECTICUT
CIVIL & ENVIRONMENTAL ENGINEERING

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MASTER'S THESIS DEFENSE
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DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING
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Towards a global daily water fraction product based on microwave radiometer observations

ABSTRACT

Satellite microwave radiometer derived water fraction has been used as a daily indicator of flood status by many space agencies. However, existing empirical methods have strong assumption which strongly affects the accuracy. We develop a method which combines low-resolution daily brightness temperature from microwave radiometer and high-resolution intermittent inundation map from Synthetic Aperture Radar (SAR), to give a daily water fraction estimation. This method utilizes the emissivity difference between dry and wet areas to construct a linear system of brightness temperature (Tb), polarized emissivity and water fraction. This method eliminates previous strong assumption that 1) the same land cover has the same dry emissivity and 2) a close by calibration radiometer pixel is of the same physical temperature as the one to measure. We test this method using Tb of Soil Moisture Active and Passive (SMAP) and selected bands of Advanced Microwave Scanning Radiometer 2 (AMSR2) , and inundation maps from Radar Produced Inundation Diary (RAPID) system. The Singular Value Decomposition (SVD) is used to rule out pixels with a underdetermined linear systems due to the lack of water extent dynamics on SAR derived inundation maps. Result shows good agreement between water fraction estimation from radiometer at L- and X-bands and SAR (R^2>0.9,bias<3%).