Exploring the possibility to improve passive microwave SWE retrieval

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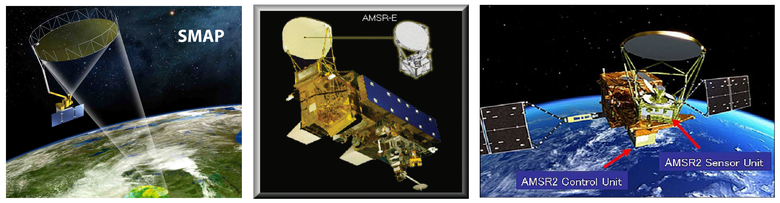
Introduction

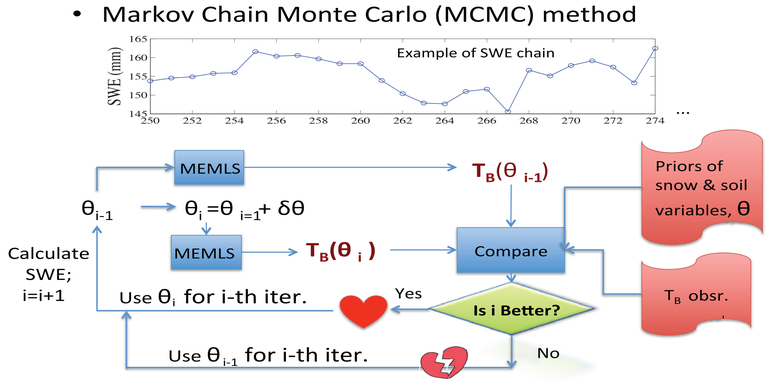
We used the Bayesian Algorithm for SWE Estimation with Passive Microwave measurements (***BASE-PM***) (Pan et al., 2017) to explore the possibility of improving ***snow water equivalent (SWE)*** estimation for ***shallow and deep snow*** using L- and traditional AMSR (Advanced Microwave Scanning Radiometer) bands based on ***synthetically-generated*** brightness temperature (T_B).



(nasa.gov, global.jaxa.jp)

Method

- Markov Chain Monte Carlo (MCMC) method

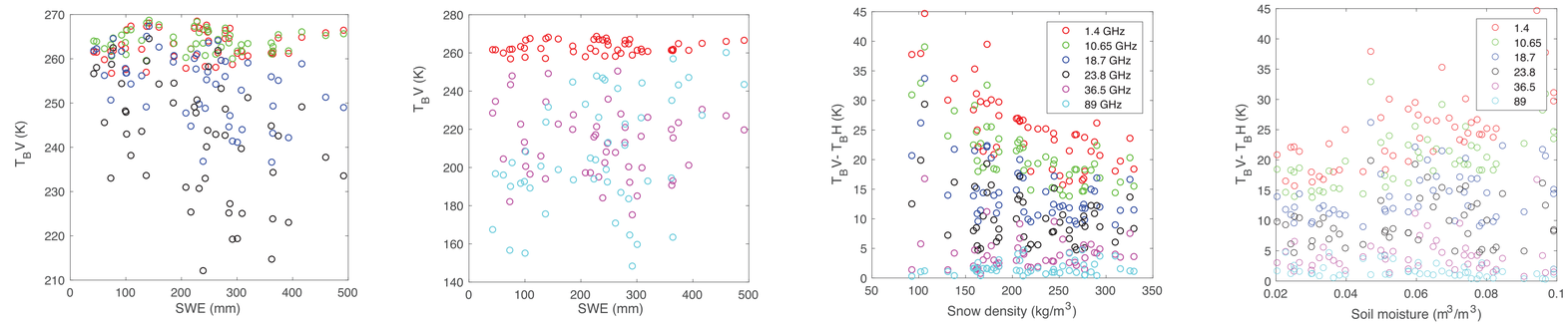


Dual-polarization T_B at L (1.4 GHz)- , X (10.65 GHz)-, K (18.7 GHz)-, dual-Ka (23.8 & 36.7 GHz)- and W (89 GHz)-bands generated by ***MEMLS*** (Mätzler & Weismann, 1999) was inputted to ***MCMC*** to estimate ***snow depth, grain size (p_{ex}), density and soil moisture.***

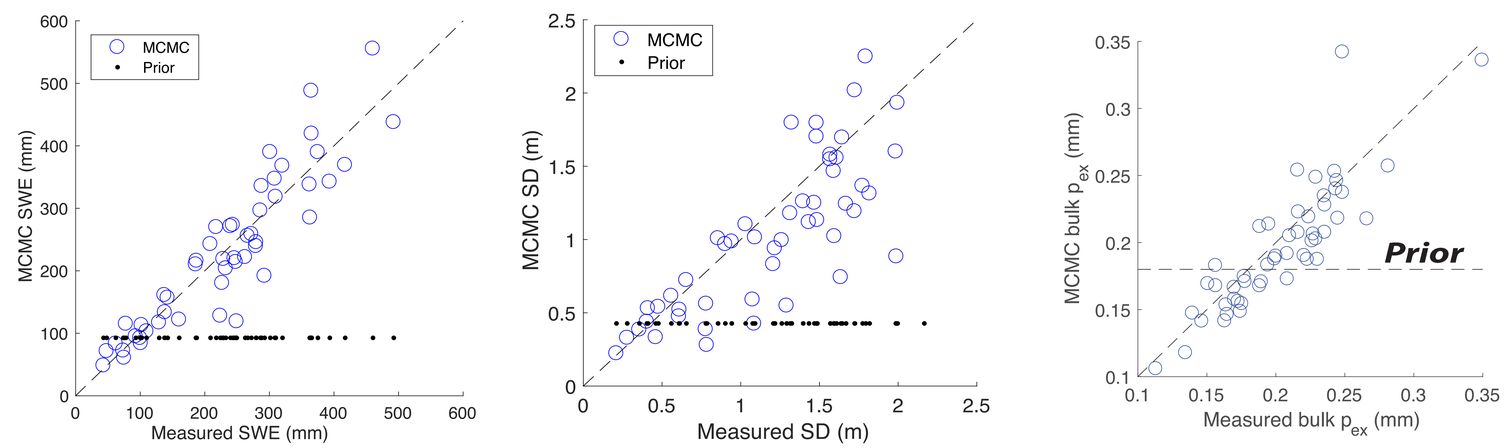
Randomly-generated snow & soil properties

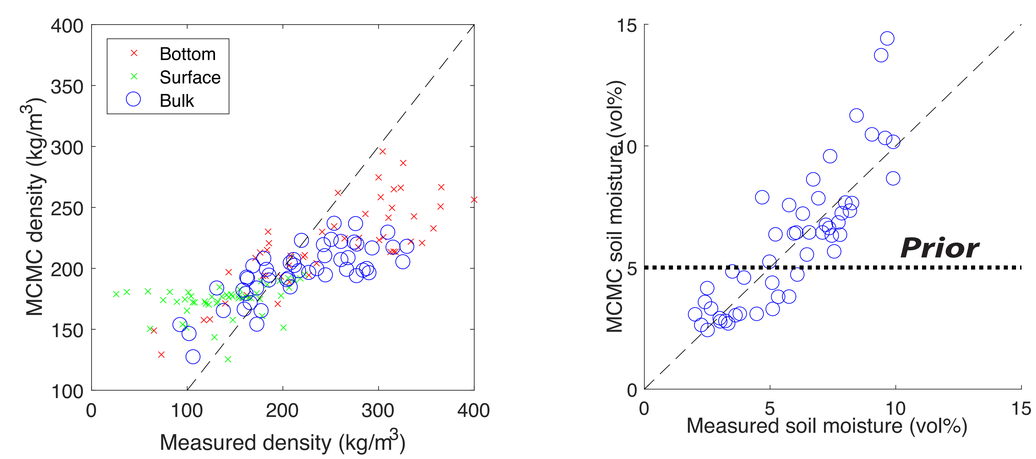
Bottom-layer ***snow thickness***: 20 - 200 cm (uniform distr.)
Surface/bottom-layer ***relative snow thickness***: 1±0.2 (normal distr.)
Bottom-layer ***snow density***: 250±75 kg/m3 (normal distr.)
Surface-layer ***snow density***: 150±50 kg/m3 (normal distr.)
Bottom-layer ***p_{ex}***: 0.25±0.05 mm (normal distr.)
Surface-layer ***p_{ex}***: 0.1±0.05 mm (normal distr.)
Soil moisture: 2% - 10% (uniform distr.)
Soil roughness: 1 mm - 1 cm (uniform distr.)

T_B response to snow & soil properties



Retrieval Results





Note: Soil moisture and snow density were estimated using a known soil roughness