

APPLICATION OF C-BAND SCATTEROMETERS ON EXTRACTING SURFACE STATE INFORMATION

ABSTRACT

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Information on soil surface state is valuable for using in many applications as in climate studies and monitoring of permafrost regions. C-band scatterometer data have the potential to deliver information on surface freeze/thaw conditions as the backscatter measurements are strongly affected by soil surface conditions. Variation in state or amount of water contained in the soil causes significant alteration of dielectric properties of the soil which is markedly observable in scatterometer backscattered signal. Hence, Scatterometer data can be utilized for monitoring of surface state after removing the effect of surface roughness. In this study we first use normalization module of the TU-Wien soil moisture retrieval algorithm to normalize backscatter measurements to 40° reference incidence angle. In this way, sensitivity of backscatter measurements will be limited to soil surface state and moisture

content. Subsequently we use a threshold-analysis method to derive a set of parameters which are used to evaluate the normalized backscatter measurements through decision trees for determination of freeze/thaw conditions. The model parameters are extracted from multiyear backscatter data from ASCAT scatterometer onboard Metop by comparing with ECMWF ReAnalysis (ERA-Interim) soil temperature. As a result of analysis, backscatter measurements are flagged as indicator of frozen/unfrozen surface, thaw condition/snow melt or permanent ice/frozen water body. The validation results of surface state flag against in-situ measurements from synoptic meteorological stations, show a pretty well correlation with air temperature. However, a full validation procedure is challenging as no global and operational field measurements of soil temperature is available.