A dynamic approach to retrieving snow depth based on the technology of integrating satellite remote sensing and in situ data

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Hydrological processes and climate in the extratropics are highly affected by the seasonal snow. Essential characteristics both for hydrology and climatology include snow water equivalent and snow depth. We develop a new approach to dynamically retrieving snow depth based on integration of passive microwave remote sensing and in situ data. First, the snow-cover confidence index is established by use of both the passive microwave remote sensing and in situ data, identifying together the snow cover; second, a new dynamic parameterized scheme (distance weighted method) is developed based on the index. The characteristics of the snow-depth retrieval approach are following: on the one hand, for the difference issue of retrieval coefficients in different spatial-temporal circumstances, a solution is proposed that retrieval coefficients are adjusted according to real-time observed snow depth, being the biggest difference from static retrieval approaches; on the other hand, the advantage of spatial-temporal continuity of the passive microwave remote sensing data has been exploited, being able to retrieving the snow depth with relative high resolution and precision in the west China where few stations are located. The results show that the approach implements the efficient integration of passive microwave remote sensing and observed data, exerts the advantages of different source data, improves obviously the retrieval precision in the west China and the south marginal regions of snow cover in the east China, and solves the question in the old integrating approach that the area of snow cover was always relatively smaller in the west China, amplifying the detectable coverage area of snow depth. In contrast to the static retrieval approach, the dynamic retrieval approach avoids efficiently the question that snow depth was overestimated in mountain regions and underestimated in plain regions, so the snow cover and the snow depth are both more real.

Keywords: Snow depth retrieving, Passive microwave remote sensing, dynamical retrieving