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Optimization of snow density parameter of Noah Land Surface Model using micro-genetic algorithm for estimating snow depth

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The Noah Land Surface Model (Noah LSM) estimates snow depth using snow water equivalent and snow density. The snow density is determined by snow compaction, snowmelt water storing, and density of fresh snowfall. The Noah LSM usually underestimates snow depth compared to the ground observations in Korea, which occurs from the beginning of snowfall. We performed an optimal estimation of parameters related to the density of fresh snowfall, using micro-genetic algorithm (μ-GA) that uses the evolution process concept through natural selection and mutation mechanism. Ground observations from 36 sites of the Korea Meteorological Administration, for the recent 10 years (May 2009 – April 2019), are used for offline forcing of the Noah LSM and evaluating the fitness function in μ-GA. Optimized parameters reduced the density of fresh snowfall, and improved the simulated snow depth. The root-mean-square error of snow depth decreased from 8.1 cm to 7.1 cm.