

Praktikum 5, Monte Carlo Math modeling of the atmosphere

What-if simulations

What-if simulations take sample points from old simulations and re-use them for a new PDF, P .

Consider defensive importance sampling to the autoconversion integral that you have studied previously. The function to integrate, $f(\chi, N_c)$, is a function of χ , which is related to cloud water mixing ratio, and N_c , which is the cloud droplet number. The PDF, $P(\chi, N_c)$, is a normal-lognormal. As the defensive importance function q_α , choose the exponential tilting importance function, q , plus P itself: $q_\alpha = \alpha_1 P + \alpha_2 q$.

1. As a control case, perform defensive importance sampling on the autoconversion integral.
2. Now, re-use the same samples and function evaluations as in 1, but alter P in order to mimic what would happen if P evolved over time in a weather forecast. Change the means and variances in P , and re-compute the Monte Carlo integral of autoconversion. How much do you have to change P before the RMSE is increased by a factor of 2?