



Figure 1. Schematic of the proposed HEAVEN method in a reciprocal form. B_s and B_d are respectively the static and dynamic prior error covariance matrices. Steps 1 through 6 indicate the procedure for one assimilation cycle. k, K, N, i show time step in each assimilation window, assimilation window size, ensemble size, and particle index respectively. B, R_k, Q_k specify prior, observation, and model error covariance matrices respectively. Initial deterministic guess for state variables and parameters are also respectively represented by $x_{0,b}$ and Θ .