

	Bayesian	Variational	OPTIMISTS
Resulting state-variable estimate	Probabilistic: Gaussian (KF, EnKF), non-Gaussian (PF)	Deterministic (unless adjoint model is used)	Probabilistic (using kernel density estimation)
Solution quality criteria	High likelihood given observations	Minimum cost value (error, departure from history)	Flexible: e.g. minimum error, maximum consistency with history
Analysis time step	Sequential	Sequential (1-D–3-D) or entire assimilation window (4-D)	Flexible
Search method	Iterative Bayesian belief propagation	Convex optimization	Coupled belief propagation and multi-objective optimization
Model dynamics	Linear (KF), non-linear (EnKF, PF)	Linearized to obtain convex solution space	Non-linear (non-convex solution space)