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The choice of the prior model can have a large impact on the ability to assimilate data in geophysical inverse problems. In standard applications of ensemble Kalman-based data assimilation, all ensemble members from the prior are generated from the same prior covariance matrix. In a non-centered hierarchical approach, the parameters of the covariance function, that is the variance, the orientation of the anisotropy and the ranges in two principal directions, may all be uncertain. In this talk I discuss three approaches to sampling from the posterior for this type of problem: an optimization-based sampling approach, an iterative ensemble smoother (IES), and a hybrid of the previous two approaches (hybrid-IES). I apply the three methods to a linear sampling problem for which it is possible to compare results with marginal-then-conditional approach. I also test the IES and the hybrid-IES methods on a 2D flow problem with uncertain anisotropy in the prior covariance. The IES method is shown to perform poorly in the flow examples because of the poor representation of the local sensitivity matrix by the ensemble-based method. The hybrid method, however, samples well even with a much smaller ensemble size.