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# A sequential Bayesian approach to vertical slice tomography of a shallow water environment

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A major challenge of acoustic tomography in shallow water environments is to track physical features that are highly variable in time and space and to properly account for sound interaction with the subbottom. In a previous work an extended Kalman filter (EKF) scheme was proposed to track the sound-speed field variations in a vertical slice of the water column for known bottom geoacoustic parameters. Although the results were encouraging, it was shown that some biases were encountered when using the standard EKF, principally because of the high nonlinearity between the observations (the multi-frequency pressure field) and the environmental parameters (here the sound-speed field). In this paper, we show that Ensemble Kalman or sequential Monte Carlo filtering significantly enhance the estimation of the sound-speed field, for both range-independent and range-dependent cases. Reproducible results show that the temporal variations are well tracked, even in presence of measurement noise and model uncertainty. Furthermore the sampling approach allows to increase the time interval between successive measurements, which is an advantage from an operational viewpoint. The performances of the different nonlinear filters are also discussed.