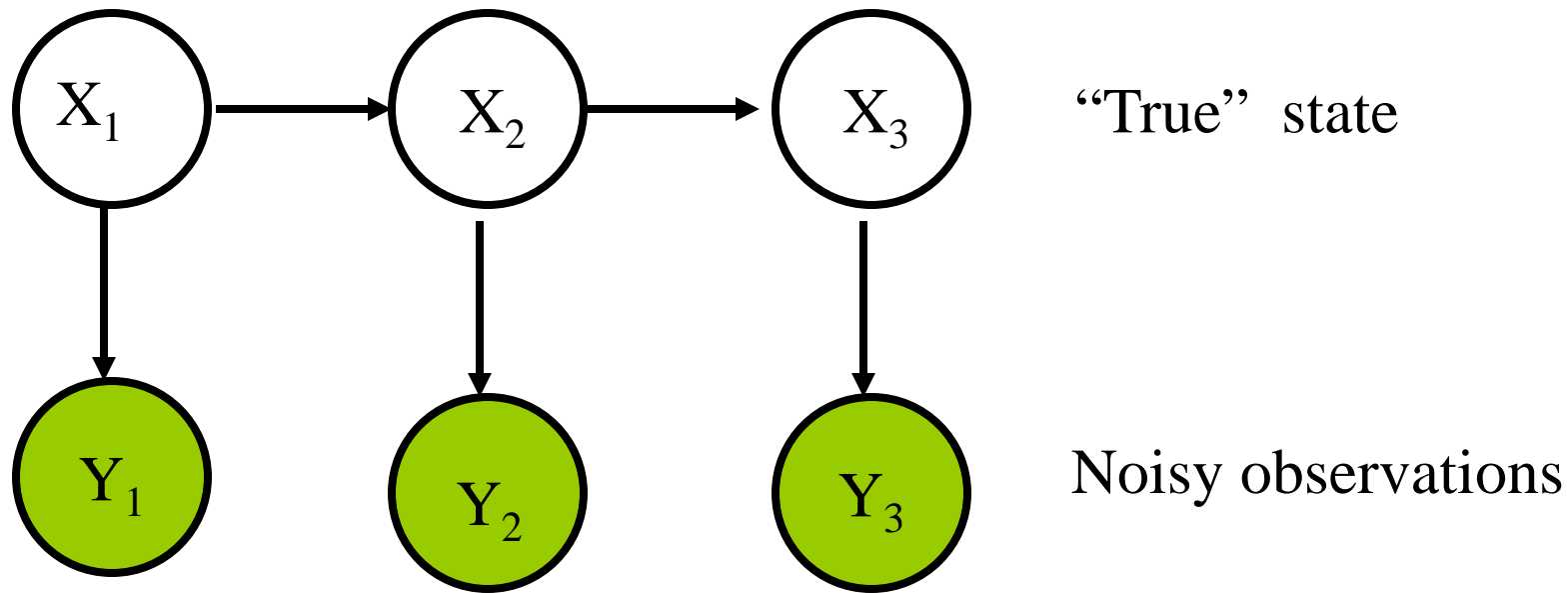


Meta-analytic
Robust
Switching
State-space
Models
for the Analysis of
Movement of Marine Animals

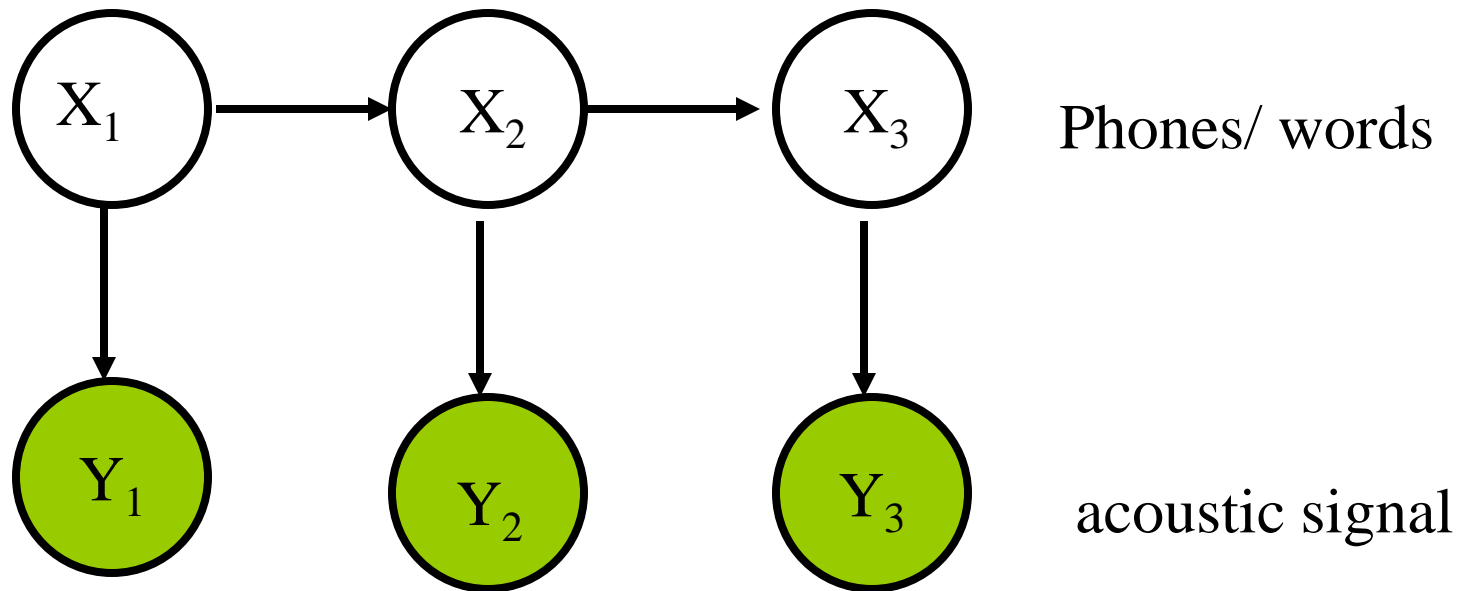
State-space model (SSM)



$$p(X_t | X_{t-1}) = \mathcal{N}(X_t; AX_{t-1}, Q)$$

$$p(Y_t | X_t) = \mathcal{N}(Y_t; BX_t, R)$$

Hidden Markov model (HMM)

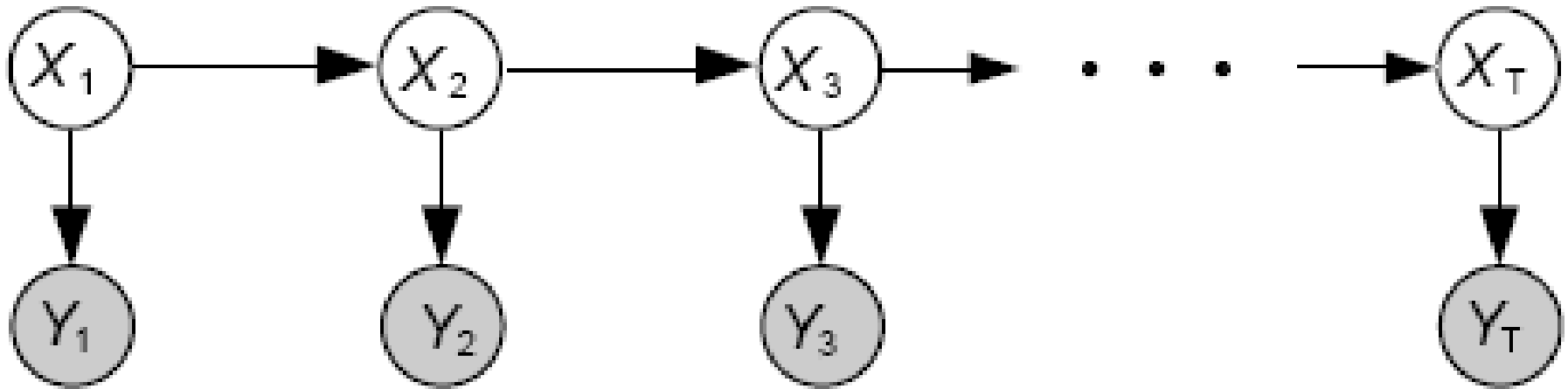


Sparse transition matrix / sparse graph

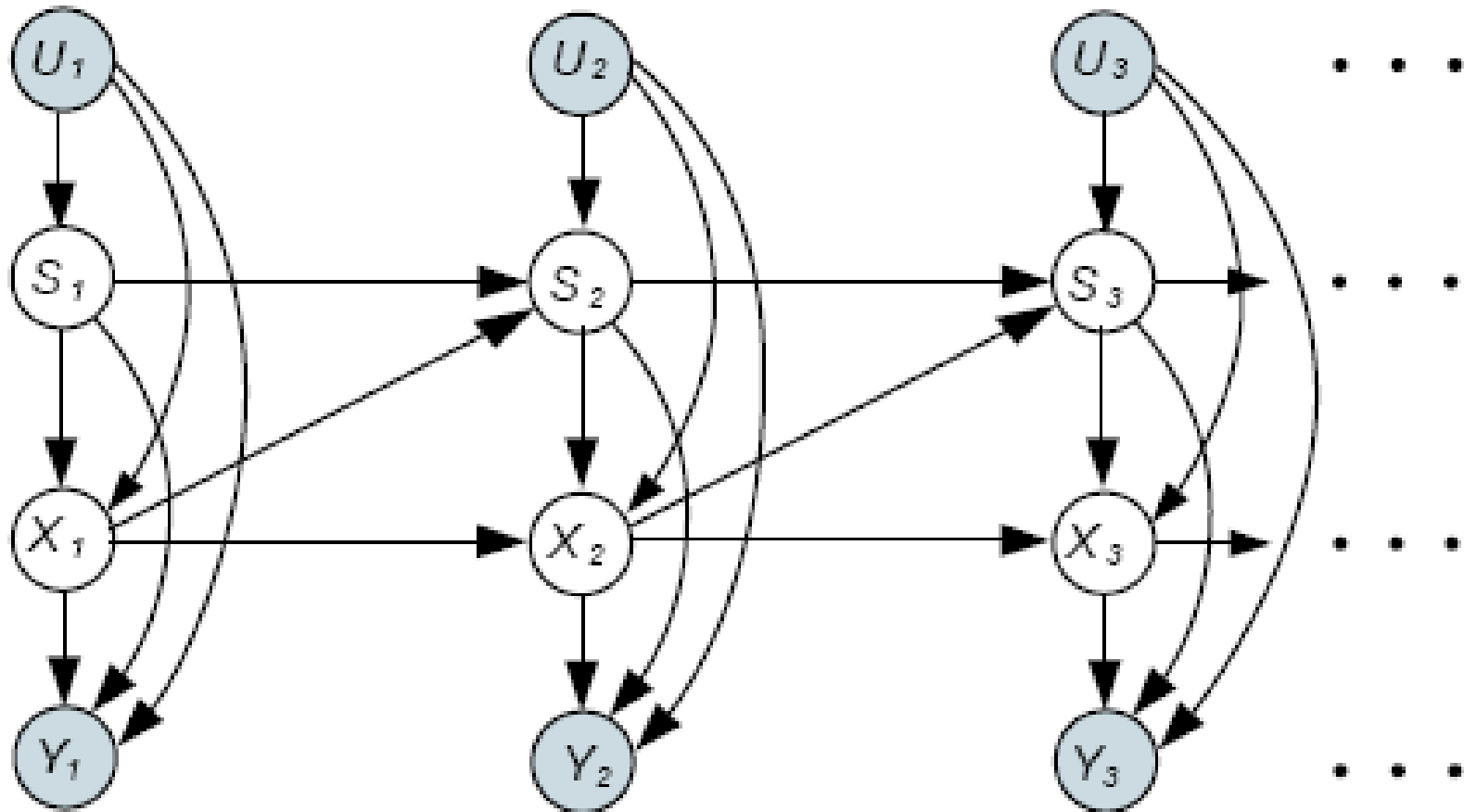
$$P(X_t = j | X_{t-1} = i) = A(i, j) \quad \text{transition matrix}$$

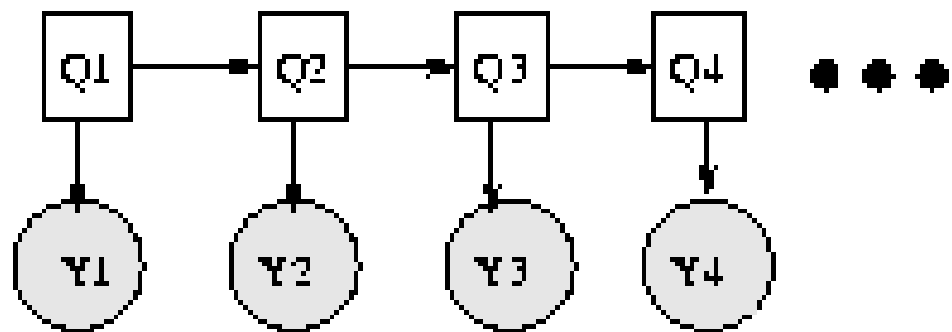
$$p(Y_t = y | X_t = i) = \mathcal{N}(y; \mu_i, \Sigma_i) \quad \text{Gaussian observations}$$

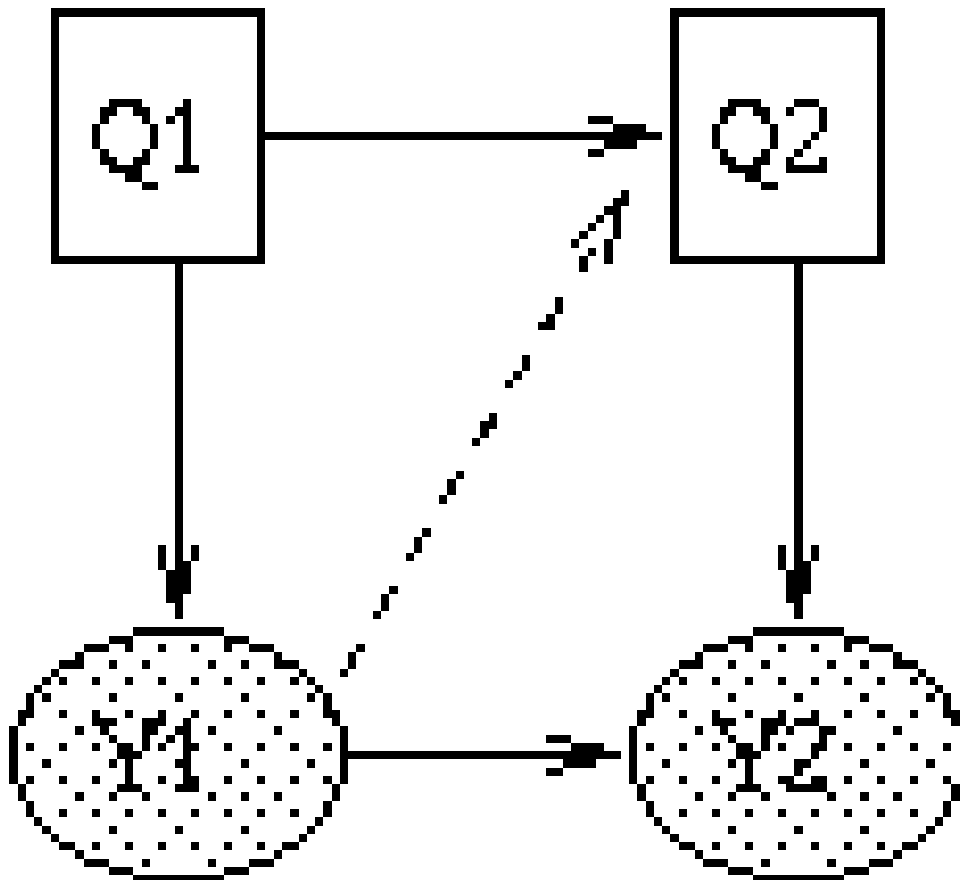
Hidden Markov models or Linear Dynamical system



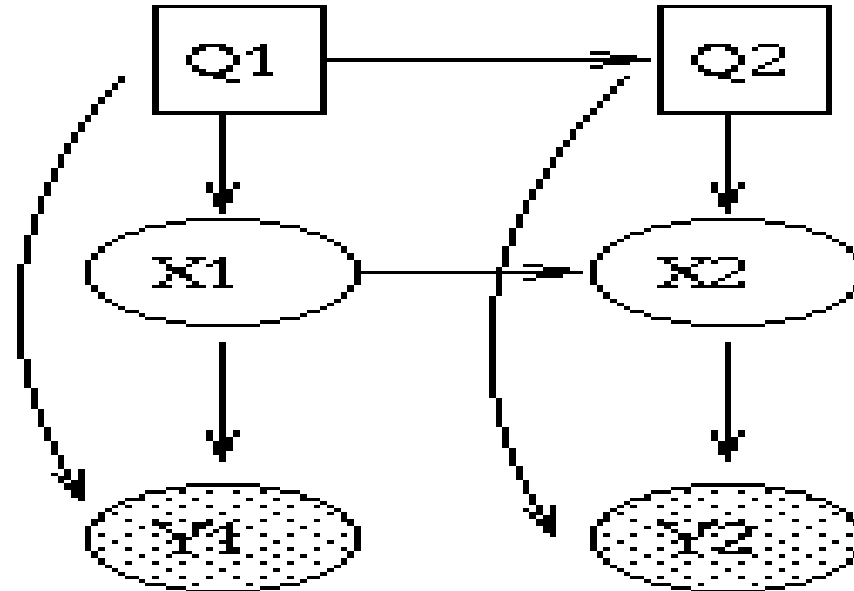
Switching State Space Model



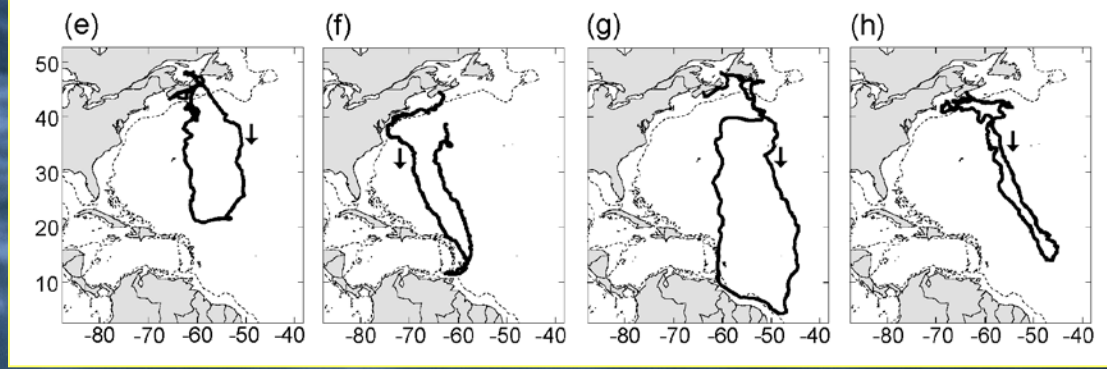




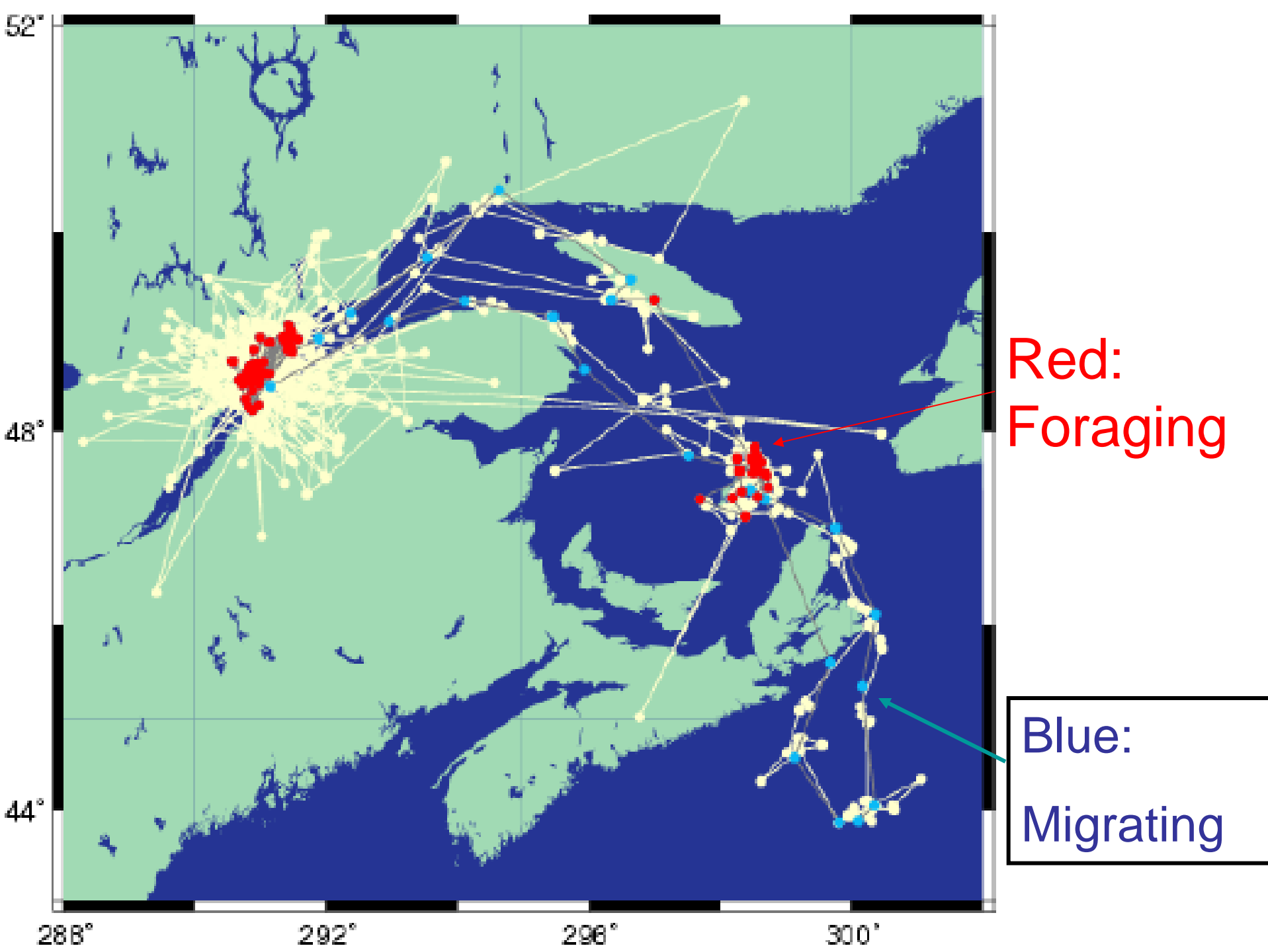
Switching AR model

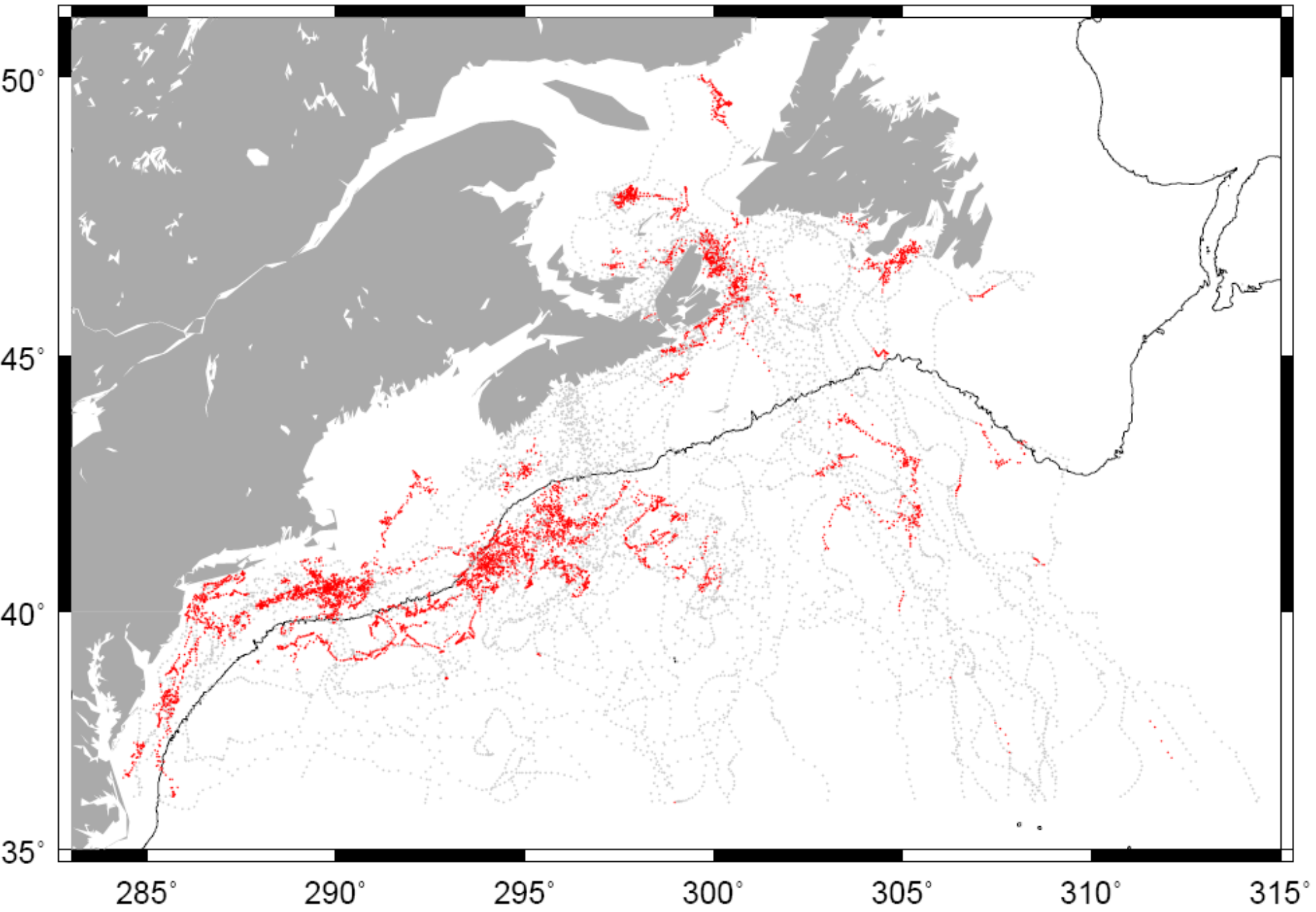


Switching Kalman filter

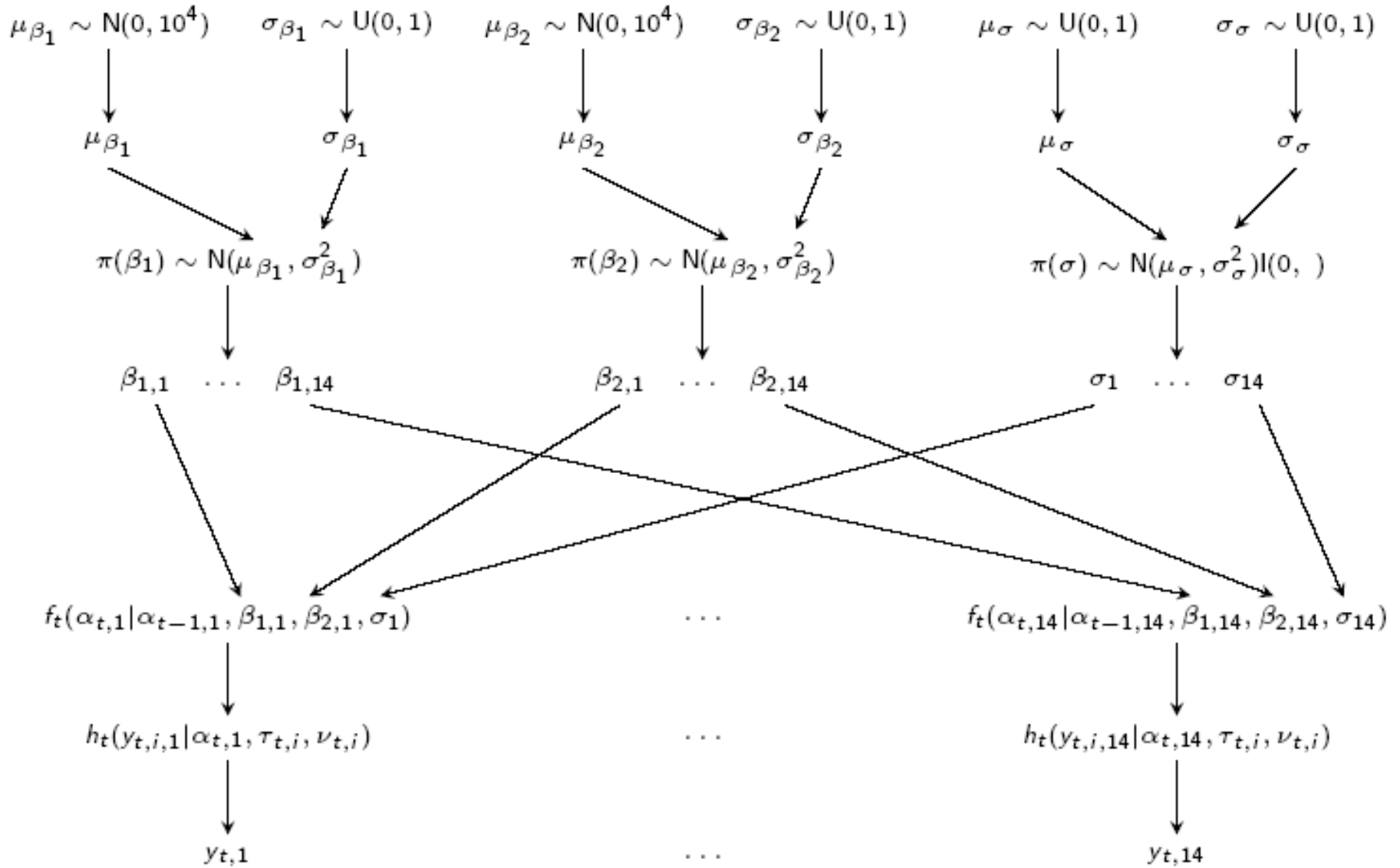


James, Eckert, Myers
Mar. Bio. 2005





HB SSM



Conventional Approaches Do Not Work

