Sample sigma vectors χ
Dynamical system F

Current

x_n: state variables and parameters at time n
P_n: covariance matrix at time n

Time update via dynamical model
$$Z_i = F(\chi_i)$$

Extract observable state variables
$$Y_i = H(Z_i)$$

Take weighted average
$$\widehat{x_n}^- = \sum_{i=0}^{2L} W_i^m Z_i$$

Take weighted average
$$\widehat{y_n}^- = \sum_{i=0}^{2L} W_i^m Y_i$$

Project covariance matrix
$$P_x = \sum_{i=0}^{2L} W_i^c (Z_i - \widehat{x_n}^-)(Z_i - \widehat{x_n}^-)^T + Q$$

Project observable covariance matrix
$$P_y = \sum_{i=0}^{2L} W_i^c (Y_i - \widehat{y_n}^-)(Y_i - \widehat{y_n}^-)^T + R$$

Project covariance matrix between observable and latent states
$$P_{xy} = \sum_{i=0}^{2L} W_i^c (Z_i - \widehat{x_n}^-)(Y_i - \widehat{y_n}^-)^T + R$$

Calculate Kalman gain
$$KG = P_{xy}P_y^{-1}$$

Next time point data
$$y_{n+1}$$

Correct time estimate with Kalman gain with new data
$$x_{n+1} = \widehat{x_n}^- + KG(y_{n+1} - \widehat{y_n}^-)$$
$$P_{n+1} = P_x - KG\, P_y\, KG^T$$