A states

Sampling points

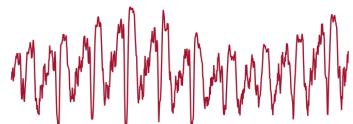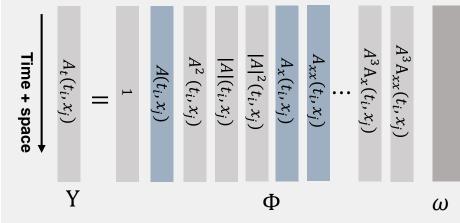Contours of states

Snapshot matrix

$$U = \begin{bmatrix} u_{11} & u_{12} & u_{13} & \cdots & u_{1n} \\ u_{21} & u_{22} & u_{23} & \cdots & u_{2n} \\ u_{31} & u_{32} & u_{33} & \cdots & u_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ u_{m1} & u_{m2} & u_{m3} & \cdots & u_{mn} \end{bmatrix}$$
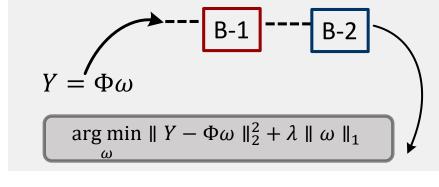
Derivative A_t from U

B Model specification

$$A_t(t_i, x_j) = 1 \quad A(t_i, x_j) \quad A^2(t_i, x_j) \quad |A|(t_i, x_j) \quad |A|^2(t_i, x_j) \quad A_x(t_i, x_j) \quad A_{xx}(t_i, x_j) \cdots A^3A_x(t_i, x_j) \quad A^3A_{xx}(t_i, x_j)$$

Time + space

$Y \qquad \Phi \qquad \omega$

B-1 Subsample

$$Y = \Phi\omega$$
$$\downarrow$$
$$CY = C\Phi\omega$$

$$\Phi = \quad \Psi \quad \Sigma_r \quad \Sigma \quad \Theta^T$$

B-2 Dimens. reduction $\quad Y = \Phi\omega \rightarrow \Psi^T Y = \Psi^T \Phi\omega$

C Sparse identification

B-1 — B-2

$$Y = \Phi\omega$$

$$\arg\min_{\omega} \| Y - \Phi\omega \|_2^2 + \lambda \| \omega \|_1$$

$$\omega = \quad \rightarrow \quad \cdots \quad \rightarrow$$

optimizing ω

$\omega_2 \qquad \omega_6 \qquad \omega_8 \qquad \omega_7 \qquad \omega_{18}$

$A \qquad A_x \qquad A|A|^2 \qquad A_{xx} \qquad |A_R|^2A$

D Model Validation

Experiment   vs.   Reconstruction

$$A_t(x,t) = (0.0054 - 0.0066i)A(x,t) +$$
$$(0.5930)A_x(x,t) +$$
$$(0.0148 - 0.6457i)A_{xx}(x,t) +$$
$$(-139.4494 - 37.6346i)|A|^2A(x,t) +$$
$$(-2.523 - 152.7833i)|A_R|^2A(x,t)$$

CGLE