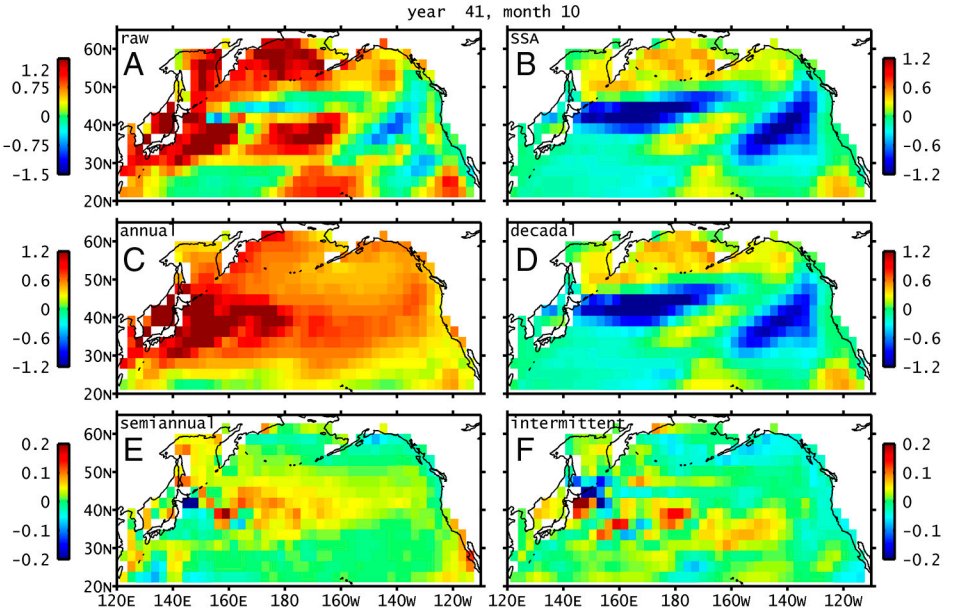
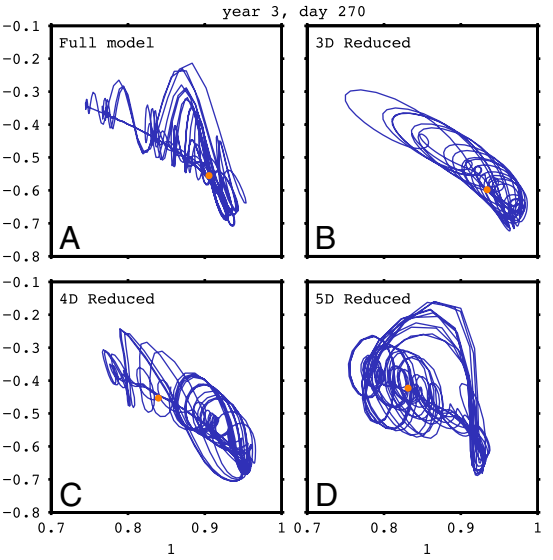
Supporting Information

Giannakis and Majda 10.1073/pnas.1118984109



Movie S1. Spatio-temporal patterns $\sum_k \tilde{x}_t^k$ of the upper 300 m temperature anomaly field (annual mean subtracted at each gridpoint, color-coded in °C) evaluated using [**9**] and [**1**] for a 100-y portion of the dataset. (*A*) Raw data. (*B*) The PDO mode from SSA. (*C*–*F*) NLSA patterns using (*C*) the annual modes, $k \in \{1,2\}$ (see Figs. 1 and 2); (*D*) The leading-low-frequency (PDO) mode, $k = 3$; (*E*) The semiannual modes, $k \in \{6,7\}$; (*F*) The leading two intermittent (Kuroshio) modes, $k \in \{9,10\}$. The starting time of this animation is the same as in Fig. 2. PDO, Pacific Decadal Oscillation; SSA, singular spectrum analysis.
Movie S1 (MP4)



Movie S2. 1,000-d trajectories for the zonal modes $\{x_1, x_4\}$ in (*A*) the full model (Table S1); (*B*–*D*) reduced models constructed by projection onto the NLSA modes u_k from [**9**].
Movie S2 (MP4)

Table S1. Governing equations and parameter values of the six-mode low-order atmospheric model; after Crommelin and Majda (1)

$$\dot{x}_1 = \gamma_1^* x_3 - C(x_1 - x_1^*)$$
$$\dot{x}_2 = -(\alpha_1 x_1 - \beta_1)x_3 - Cx_2 - \delta_1 x_4 x_6$$
$$\dot{x}_3 = (\alpha_1 x_1 - \beta_1)x_2 - \gamma_1 x_1 - Cx_3 + \delta_1 x_4 x_5$$
$$\dot{x}_4 = \gamma_2^* x_6 - C(x_4 - x_4^*) + \epsilon(x_2 x_6 - x_3 x_5)$$
$$\dot{x}_5 = -(\alpha_2 x_1 - \beta_2)x_6 - Cx_5 - \delta_2 x_4 x_3$$
$$\dot{x}_6 = (\alpha_2 x_1 - \beta_2)x_5 - \gamma_2 x_4 - Cx_6 + \delta_2 x_4 x_2$$

$x_1^* = 0.95$	$x_4^* = -0.76095$
$b = 0.5$	$C = 0.1$
$\beta = 1.25$	$\gamma = 0.2$
$\alpha_m = \frac{8\sqrt{2}}{\pi}\frac{m^2}{4m^2-1}\frac{b^2+m^2-1}{b^2+m^2}$	$\beta_m = \frac{\beta b^2}{b^2+m^2}$
$\delta_m = \frac{64\sqrt{2}}{15\pi}\frac{b^2-m^2+1}{b^2+m^2}$	$\gamma_m^* = \gamma\frac{4m}{4m^2-1}\frac{\sqrt{2}b}{\pi}$
$\epsilon = \frac{16\sqrt{2}}{5\pi}$	$\gamma_m = \gamma\frac{4m^3}{4m^2-1}\frac{\sqrt{2}b}{\pi(b^2+m^2)}$

1 Crommelin DT, Majda AJ (2004) Strategies for model reduction: Comparing dierent optimal bases. *J Atmos Sci* 61:2206–2217.

Other Supporting Information Files

SI Appendix (PDF)