

Table 1: The North Pacific SST data sets and NLSA parameters^{a,b} used in this work.

Data set	C42	C85	EM
Model	CCSM3	CCSM3	ECHAM5/ MPI-OM
Experiment	b30.004 ^{c,d}	b30.009 ^{c,d}	EH5-T63L31-OM- GR1.5L40-CTL ^e
Ocean grid	gx1v3	gx1v3	GR15
Atmosphere grid	T42	T85	T63
Nominal ocean resolution	1°	1°	1.5°
Nominal atmosphere resolution	2.8°	1.4°	1.9°
Data set grid	gx1v3	gx1v3	T63
Gridpoints in data set d	6671	6671	1204
Temporal extent (yr)	900	450	506
Number of samples s	10,775	5375	6048
NLSA lag window q	24	24	24
Embedding space dimension $n = qd$	160,104	160,104	28,896
NLSA Gaussian width ϵ	1	1	1
NLSA nearest neighbors b	1000	750	1000
NLSA temporal space dimension l	26	21	21

^aSee pseudocode in Giannakis, D., and A. J. Majda (2012), Nonlinear Laplacian spectral analysis for time series with intermittency and low-frequency variability, *Proc. Natl. Acad. Sci.*, 109(7), 2222–2227, doi:10.1073/pnas.1118984109.

^bThe NLSA distance function D between data samples \mathbf{X}_{t_i} and \mathbf{X}_{t_j} in embedding space was area-weighted, i.e., $D(\mathbf{X}_i, \mathbf{X}_j) = [\sum_{k=1}^n w_k (X_{ki} - X_{kj})^2]^{1/2}$ with w_k the area of the k -th gridpoint in embedding space.

^cBryan, F. O., et al. (2005), Response of the North Atlantic thermohaline circulation and ventilation to increasing carbon dioxide in CCSM3, *J. Clim.*, 19, 2382–2397, doi:10.1175/jcli3757.1.

^dCollins, W. D., et al. (2006), The Community Climate System Model version 3 (CCSM3), *J. Clim.*, 19, 2122–2143, doi:10.1175/jcli3761.1

^eRoeckner, E., M. Lautenschlager, and M. Esch (2006), IPCC-AR4 MPI-ECHAM5-T63L31 MPI-OM-GR1.5L40 PIcntrl (pre-industrial control experiment): atmosphere monthly mean values, MPImet/MaD Germany, World Data Center for Climate, doi:10.1594/WDCC/EH5-T63L31 OM-GR1.5L40-CTL-MM.

Table 2: Summary of the spatiotemporal patterns determined through NLSA for the C42, C85, and EM datasets. A boldface font indicates the modes shown in Figure 4 and Animations 1–3.

C42		C85		EM	
Mode	Type	Mode	Type	Mode	Type
1, 2	annual	1, 2	annual	1, 2	annual
3, 4	semiannual	3, 4	semiannual	3, 4	semiannual
5	PDO	5	PDO	5	PDO
6	NPGO	6	NPGO	6	NPGO
7	low-frequency	7	low-frequency	7	low-frequency
8, 9	4-month	8, 9	4-month	8, 9	intermittent ^a
10, 11	intermittent ^a	10, 11	intermittent ^a	10, 11	4-month
12, 13	intermittent ^b	12, 13	intermittent ^b	12, 13	intermittent ^b
14, 15	3-month	14, 15	3-month	14, 15	3-month
16, 17	intermittent ^c	16, 17	intermittent ^c	16, 17	intermittent ^c
18, 19	2-month	18, 19	2-month	18	intermittent
20	1-month	20	1-month	19, 20	2-month
21, . . . , 26	intermittent	21	intermittent	21	1-month

^aboundary currents, subtropical gyre

^bKuroshio current, subpolar (Alaskan) gyre

^cKuroshio current, semiannual base frequency