Supplement

Tipping Point Detection and Early-Warnings
in climate, ecological, and human systems

5 Vasilis Dakos[*], Chris A. Boulton[*], Josh E. Buxton, Jesse F. Abrams, David I. Armstrong McKay, Sebastian Bathiany, Lana Blaschke, Niklas Boers, Daniel Dylewsky, Carlos López-Martínez, Isobel Parry, Paul Ritchie, Bregje van der Bolt, Larissa van der Laan, Els Weinans, Sonia Kéfi

10 **Supplement A - Literature review classifications**

We did a topic search (TS) in the Web of Science for the period from 01.01.2004 to 01.04.2023 with the following terms TS=(("tipping point*" OR "tipping" OR "catastrophic bifurcation*" OR "catastrophic shift*" OR "regime shift*" OR "abrupt shift*" OR "critical transition*") AND ("early-warning*" OR "early-warning*" OR "warning sign*" OR "resilience indicator*" OR "leading indicator*" OR

15 "precursor*")). (**https://www.webofscience.com/wos/woscc/summary/5c5fcb5b-76a0-4f0e-ae3a-742d406641e5-82c738be/relevance/1**).

We reclassified data-sources and early-warnings in the following ways:

20 Data-source

Survey = field survey, social study survey, monitoring data, historical climate data , weather station/ instrumental data [Medical data = EEG, hospitalisation records, metabolomics, gene/ protein exrpression from human/animal tissue => survey of patient health]

Paleo-data = sediment cores, paleo reconstruction

25 Experiment_lab

Experiment_field

Social data= financial data, epidemiological data, social media data

Early-warnings

30 Autocorrelation = cross-correlation, correlation coefficient, network_correlation, correlation strength, autocorrelation at lag 1, autoregressive coefficient, autocorrelation at lag 1

Variance= variance CV, SD

Recovery rate = return rate, recovery rate

Power spectrum = spectral redness, low-to-high power spectrum, power spectrum density, spectral

35 density, density ratio power spectrum

Spatial variance = spatial covariance, spatial variance

List of the 65 reclassified early-warnings:

early-warning	# papers
variance	136
autocorrelation	119
skewness	38
power_spectrum	18
recovery_rate	16
spatial_correlation	16
spatial_variance	15
dynamic_network_biomarkers	13
kurtosis	13
spatial_pattern	7
correlations	6
detrended_fluctuation_analysis	6
fisher	5

spatial_skewness	5
criticality_index	4
dynamical_eigenvalue	4
network_structure	4
deep_learning	3
network_correlation	3
entropy	2
heteroskedasticity	2
hysteresis	2
nonlinearity	2
potential_analysis	2
return_time	2
DNRS	1
Hidden_Markov_Model	1
Kullback_Leibler_index	1
MST_DNM_score	1
Marginal_expected_shortfall	1
SRISK	1
competition_coefficient	1
degenerate_fingerprinting	1
degree_distribution	1

spatial_fourier_transform	1
spatial_return_time	1
spatial_spectra	1
spectral_analysis	1
susceptibility	1
temporal_network_flow_entropy	1
trait_mean	1
transition-based_network_entropy	1
tropical_forest_vulnerability_index	1
turbulence	1

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Supplement B - Additional figures

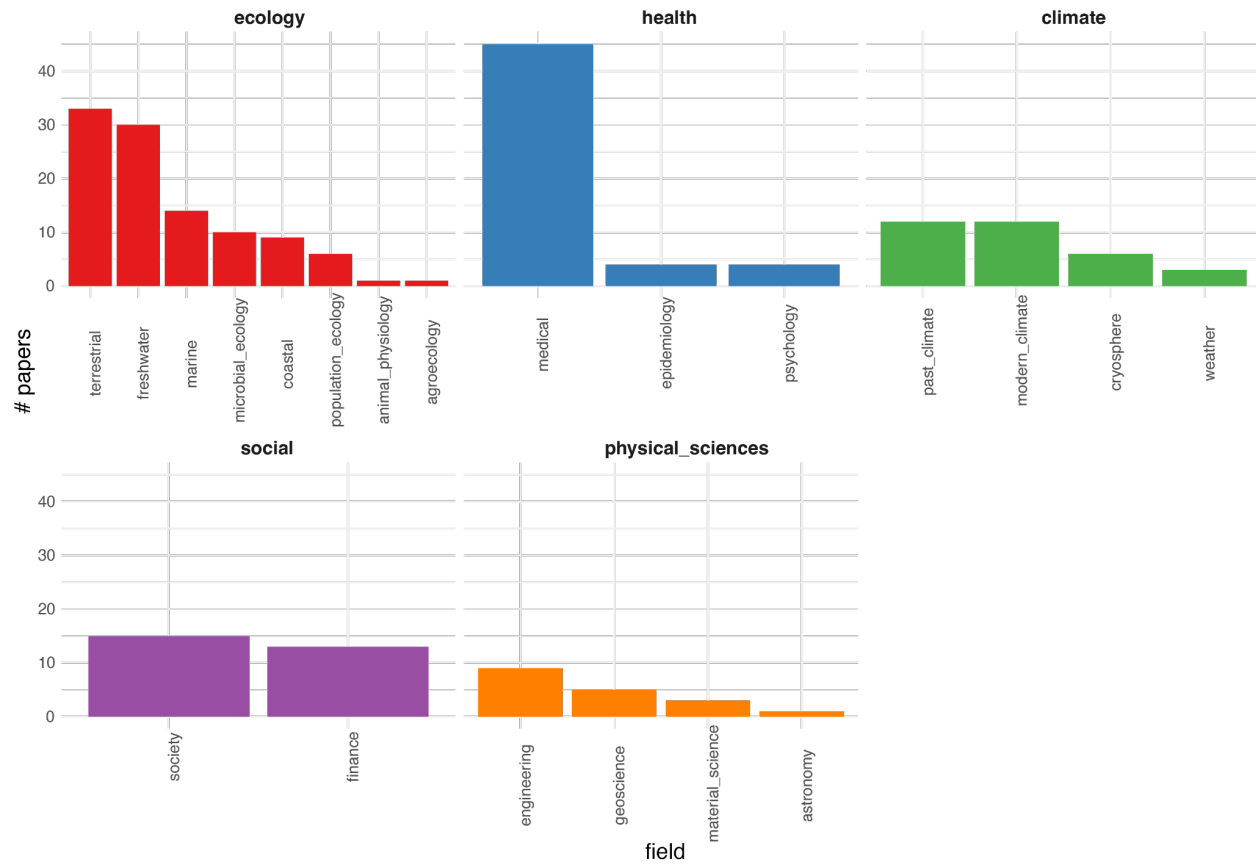



Figure S1: Fields within each scientific domain

45

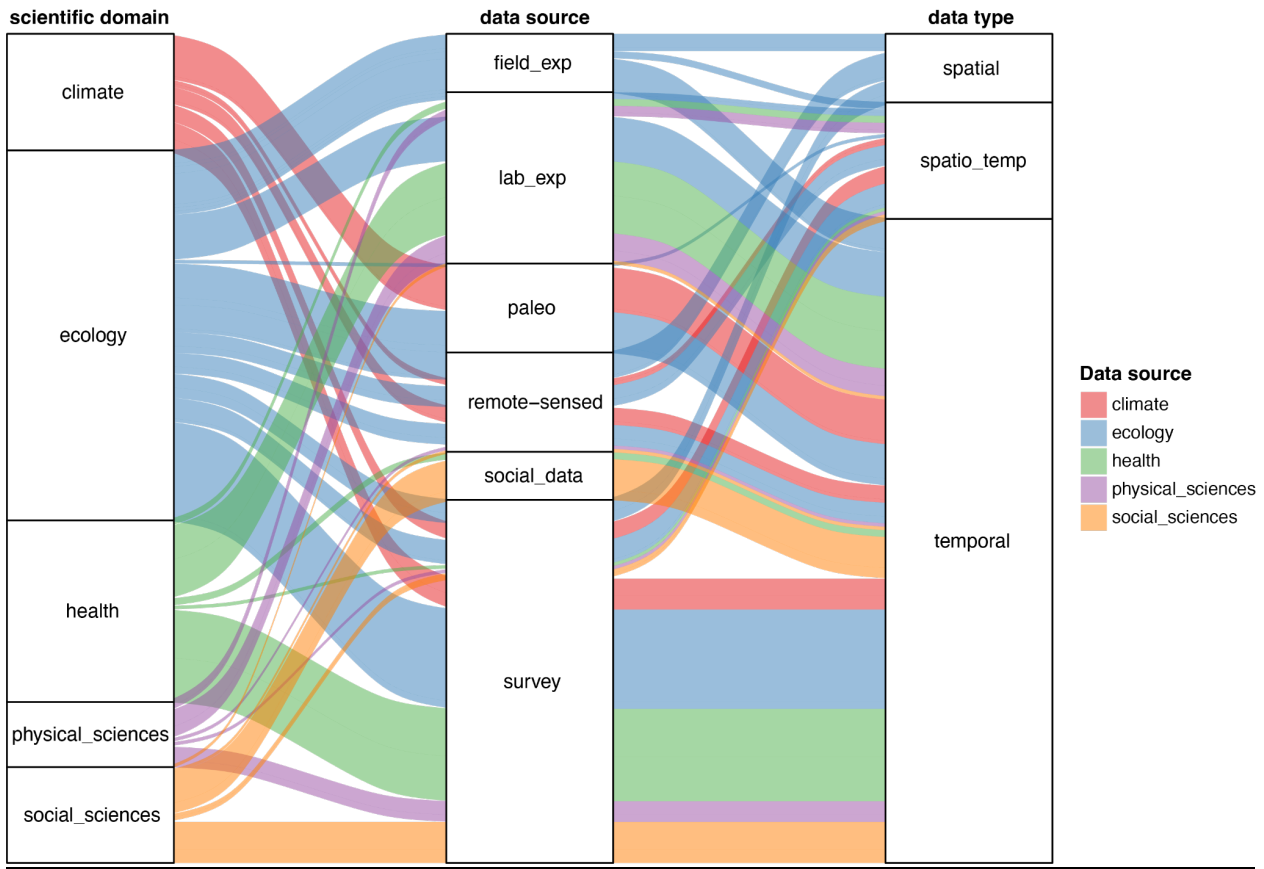



Figure S2: Alluvial plot of scientific domain, data source and data types where the lines represent the partitioning of the papers based on the scientific domain

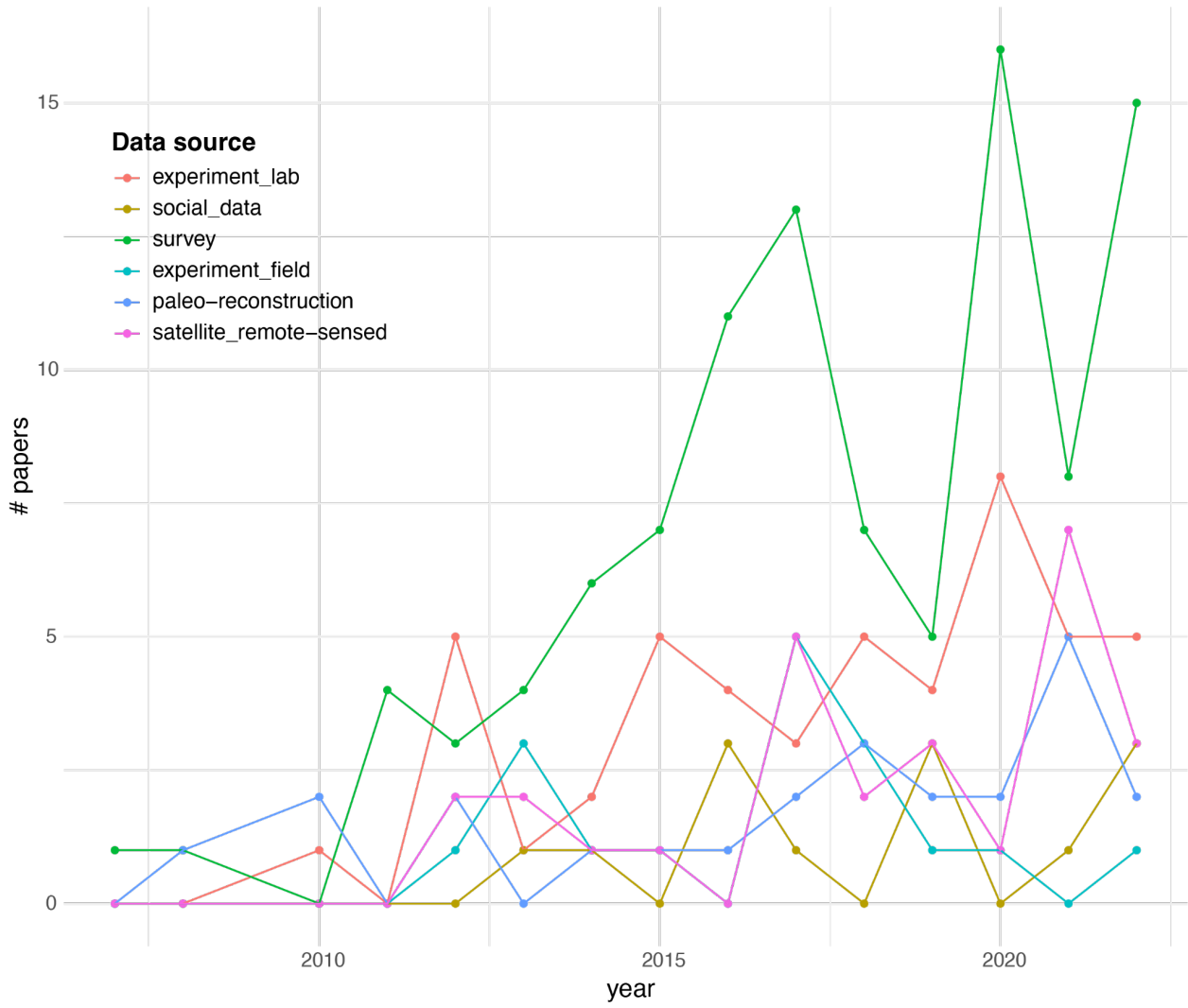



Figure S3: Evolution of data sources over time

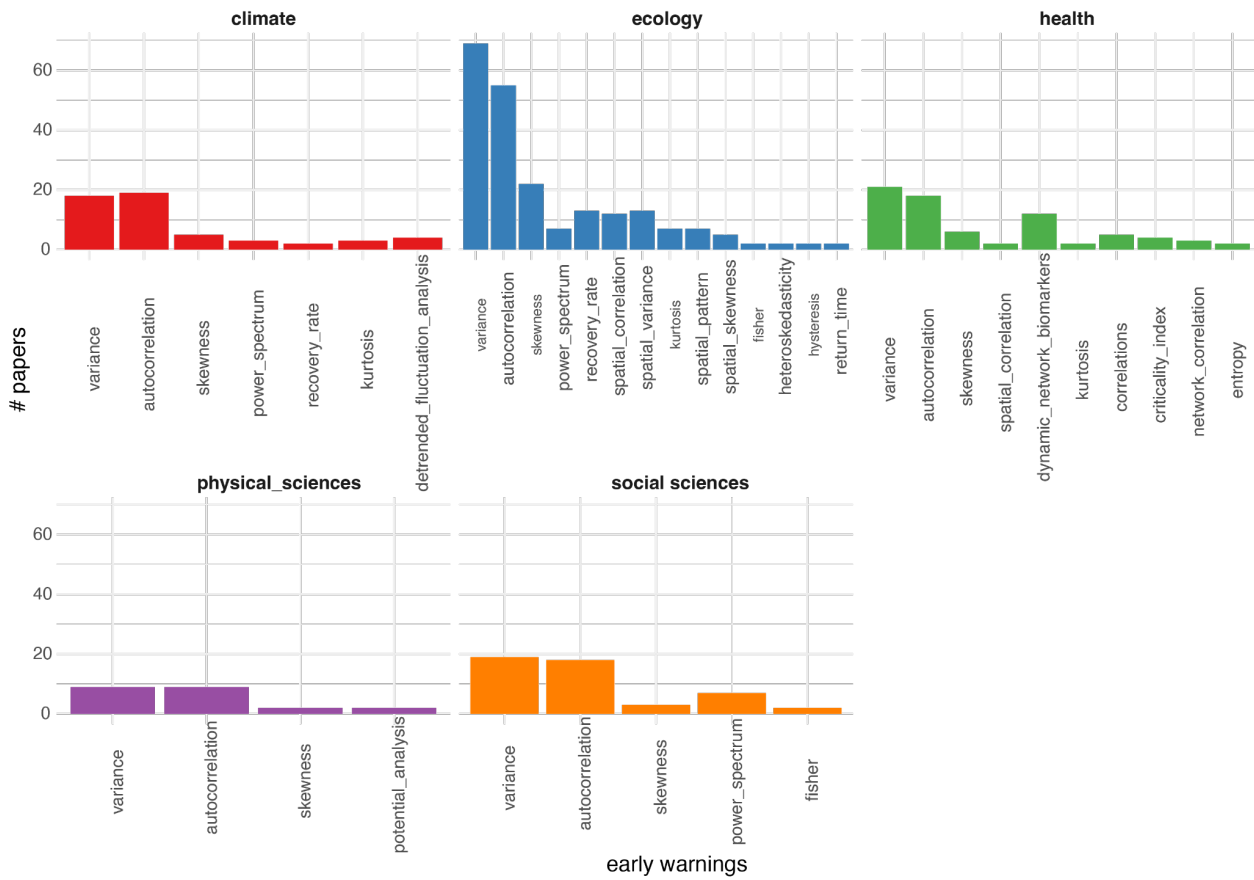
55

60

Figure S4: All early-warnings used more than once per scientific domain

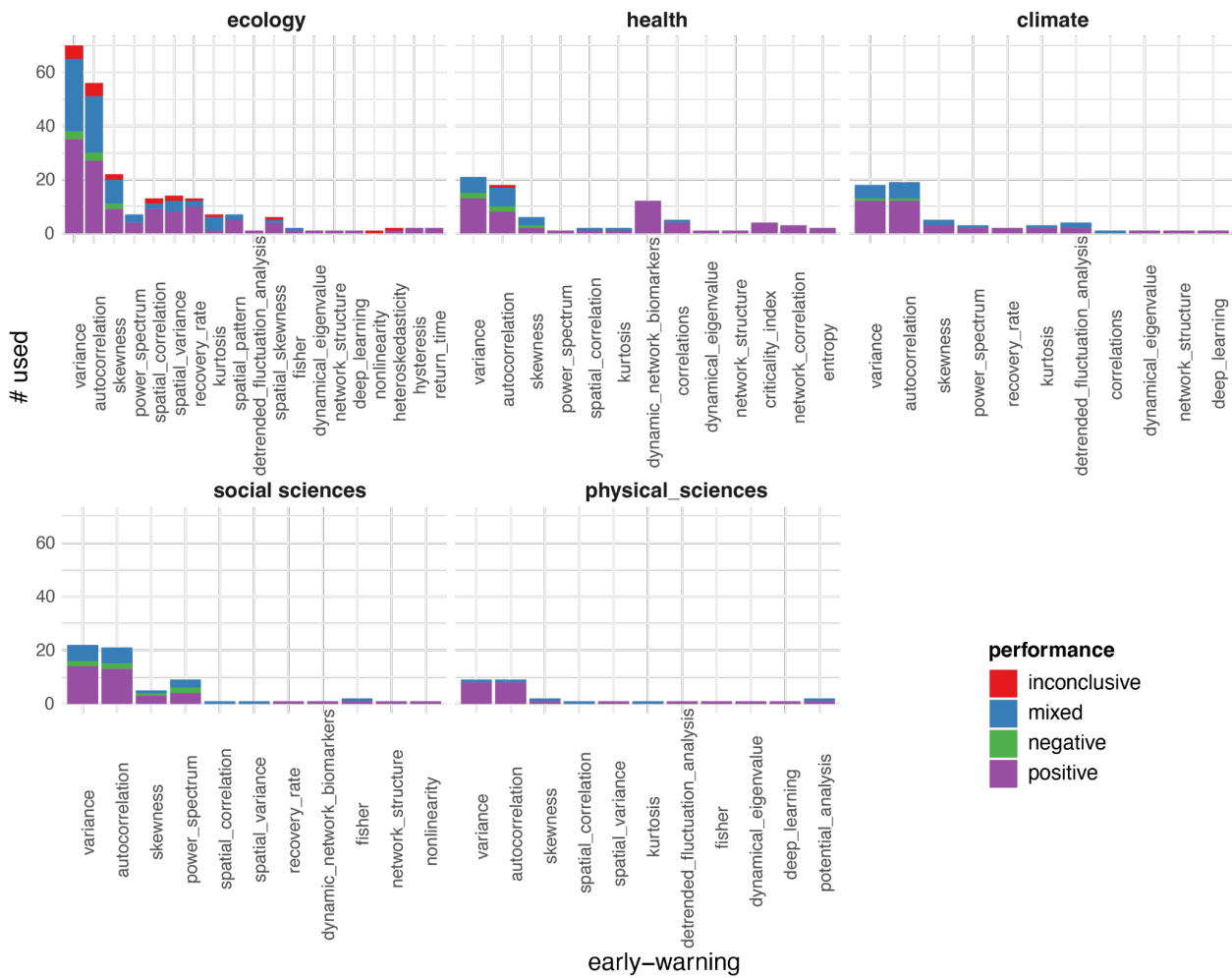



Figure S5: Performance of early-warnings used more than once per domain

Supplement C - Tables

Table S1 - Ecology

Field	System	Tippping point	Indicators	Performance	DOI
agroecology	agroecosystem	disease_onset	recovery_rate	mixed	10.1038/s41598-022-05362-0
animal_physiology	salamander_vision	flicker_vision	autocorrelation;variance; kurtosis;skewness	mixed	10.1140/epjs/s11734-021-00113-0
coastal	estuary	eutrophication	variance	positive	10.1016/j.envpol.2020.115472
	intertidal	canopy_loss	spatial_correlation;spatial_varian ce;spatial_skewness;spatial_spect	positive	10.1002/ecy.2391
	intertidal	community_shift	autocorrelation;variance	mixed	10.1016/j.ecss.2013.05.005
	intertidal	community_shift	autocorrelation;variance; skewness	positive	10.1016/j.cub.2015.05.035
	intertidal	community_shift	recovery_length	positive	10.1038/s41559-017-0153
	intertidal	community_shift	variance	mixed	10.1002/ecm.1556
	intertidal	community_shift	variance	positive	10.3354/meps08626
	salt-marsh	tidal_marsh_inundation	recovery_rate;spatial_correlation ; spatial_variance	positive	10.1038/ncomms15811
	seagrass	population_collapse	recovery_rate	positive	10.1038/s41598-018-34977-5
freshwater	lake	algal_bloom	autocorrelation;variance; spatial_correlation; spatial_variance	mixed	10.1002/eap.2616
	lake	community_shift	autocorrelation;variance	positive	10.4319/lo.2013.58.2.0525
	lake	community_shift	autocorrelation;variance	mixed	10.1111/1365-2664.12519
	lake	community_shift	heteroskedasticity	positive	10.1007/s10021-012-9542-2
	lake	community_shift	spatial_variance	mixed	10.1890/ES13-00398.1
	lake	community_shift	variance;autocorrelation	positive	10.1073/pnas.1316721110
	lake	community_shift	variance;autocorrelation	mixed	10.1007/s10452-017-9618-3
	lake	community_shift	variance; power_spectrum	positive	10.1111/j.1600-0706.2013.00539.x
	lake	community_shift	variance;recovery_rate;skewness; power_spectrum	positive	10.1126/science.1203672
	lake	community_shift	variance;skewness;kurtosis; autocorrelation;fisher	mixed	10.1371/journal.pone.0108936
	lake	community_shift	variance;spatial_pattern	mixed	10.1098/rspb.2016.0249

	lake	community_shift; eutrophication	autocorrelation;variance	mixed	10.1016/j.ecolind.2020.106536
	lake	community_shift; eutrophication	autocorrelation;variance; skewness; power_spectrum	mixed	10.1073/pnas.1608242113
	lake	eutrophication	autocorrelation	positive	10.1371/journal.pone.0223366
	lake	eutrophication	autocorrelation;variance	positive	10.1002/ecm.1286
	lake	eutrophication	autocorrelation;variance	positive	10.1073/pnas.1612424114
	lake	eutrophication	autocorrelation;variance	positive	10.1002/ecs2.3200
	lake	eutrophication	autocorrelation;variance; hysteresis	positive	10.1111/1365-2745.13544
	lake	eutrophication	autocorrelation;variance; skewness;kurtosis	positive	10.1016/j.scitotenv.2021.147059
	lake	eutrophication	spatial_correlation; spatial_variance;spatial_pattern	positive	10.1002/ecs2.1941
	lake	eutrophication	variance	positive	10.1038/nature11655
	lake	eutrophication	variance;autocorrelation; skewness	positive	10.3390/w15061245
	lake	eutrophication	variance;autocorrelation; skewness; kurtosis	mixed	10.1002/eap.2685
	lake	extinction	dynamical_eigenvalue	positive	10.1126/sciadv.abq4558
	lake	seizures	autocorrelation;variance; skewness	negative	10.1016/j.ecolind.2017.05.059
	lake	vegetation_change	variance	positive	10.1002/2017JG004135
	lake	water_level	spatial_correlation; spatial_variance;spatial_skewness	positive; inconclusive	10.4491/eer.2020.225
	lake;river	dimictic_to_monomictic	variance	positive	10.1111/j.1365-2486.2010.02249.x
	river	eutrophication	variance;autocorrelation; skewness	mixed	10.1002/lno.11789
	wetland	community_shift	autocorrelation;variance; skewness	positive	10.3390/rs9040352
marine	deep_waters	anoxia	autocorrelation;variance	positive	10.1029/2020GL089183
	deep_waters	anoxia	deep_learning	positive	10.1073/pnas.2106140118|1of9

	fisheries	community_shift	variance	positive	10.1890/07-0998.1
	fisheries	overexploitation	nonlinearity	inconclusive	10.1098/rsif.2016.0845
	fisheries	overexploitation	variance;spatial_skewness; spatial_variance	mixed	10.1890/12-0670.1
	fisheries	population_collapse	autocorrelation;variance	mixed	10.1016/j.ecolind.2020.106371
	fisheries	population_collapse	autocorrelation;variance	mixed	10.1098/rspb.2013.3221
	lake; marine_community	community_shift	autocorrelation;variance	mixed	10.1111/1365-2664.12519
	marine_community	community_shift	autocorrelation;variance	positive	10.1016/j.ecss.2014.10.017
	marine_community	community_shift	autocorrelation;variance; spatial_variance; spatial_correlation	inconclusive	10.1371/journal.pone.0038410
	marine_community	community_shift	shannon_entropy; simpson_diversity	positive	10.1016/j.palaeo.2017.07.042
	marine_community	past_climate_shifts	variance;autocorrelation	inconclusive; negative	10.1007/s10661-021-09463-7
	marine_community; fisheries	community_shift	autocorrelation;variance	mixed	10.1002/ecs2.1614
	marine_community; fisheries	community_shift	autocorrelation;variance; spatial_correlation;hysteresis	positive	10.3354/meps12137
microbial_ecology	methane-consumption	resilience_loss	recovery_rate	positive	10.1038/s41598-018-27168-9
	phytoplankton	extinction	recovery_rate;autocorrelation; variance	positive	10.1038/nature10723
	protists	extinction	autocorrelation;recovery_rate; variance;skewness;kurtosis	inconclusive	10.1007/s10750-016-2948-7
	protists	extinction	autocorrelation;variance; power_spectrum;recovery_rate	positive	10.1038/ncomms10984
	protists	population_collapse	variance;autocorrelation	inconclusive	10.1002/ecy.3040
	yeast	extinction	autocorrelation;variance; recovery_rate;skewness	positive	10.1126/science.1219805
	yeast	extinction	recovery_rate;autocorrelation; variance	positive	10.1038/s41598-018-27573-0

	yeast	population_collapse	autocorrelation;variance	mixed	10.1073/pnas.1418415112
	yeast	population_collapse	spatial_return_time	positive	10.1038/nature12071
	zooplankton	population_collapse	autocorrelation;variance; skewness; spatial_correlation	positive	10.1038/nature09389
population_ecology	bobwhite_quail	extinction	variance	positive	10.1007/s12080-013-0195-3
	Drosophila	population_collapse	autocorrelation;variance; power_spectrum;recovery_rate; trait_mean	mixed	10.1111/1365-2656.13474
	freshwater_population	extinction	autocorrelation;recovery_rate; variance	positive	10.1002/ece3.2339
	honeycreepers	extinction	autocorrelation;variance; skewness	negative	10.1371/journal.pone.0187518
	protists	population_collapse	autocorrelation;power_spectrum ; recovery_rate;variance	positive	10.1086/681573
	sea-cucumber;penguin	community_shift	variance	mixed	10.1890/ES11-00216.1
terrestrial	drylands	community_shift	autocorrelation;variance; power_spectrum;skewness	mixed	10.1086/694821
	drylands	community_shift	spatial_correlation; spatial_variance;spatial_skewness ; spatial_fourier_transform	positive	10.1111/geb.12570
	drylands	desertification	spatial_pattern	positive	10.1038/nature06111
	drylands	desertification	spatial_pattern	positive	10.1038/s41559-016-0003
	drylands	desertification	spatial_skewness;spatial_variance ;spatial_correlation; spatial_pattern	positive	10.1111/ecog.06139
	drylands	desertification	variance	positive	10.1002/ldr.4466
	drylands	desertification; community_shift	spatial_variance	positive	10.3389/fevo.2019.00407
	drylands	overexploitation	spatial_pattern	mixed	10.1111/ele.12045
	forest	community_shift	heteroskedasticity	inconclusive	10.1038/s41598-018-19985-9
	forest	desertification;extinction	autocorrelation; tropical_forest_vulnerability_ind	positive	10.1016/j.oneear.2021.06.002

	forest	desertification;extinction	spatial_pattern	positive	10.1007/s10980-017-0553-4
	forest	desertification; tree_mortality	autocorrelation;variance; detrended_fluctuation_analysis	positive	10.1038/s41558-022-01287-8
	forest	desertification; tree_mortality; past_climate_shfts	autocorrelation;variance	mixed	10.1016/j.quascirev.2019.01.009
	forest	forest_carbon_uptake	skewness;autocorrelation;variance; kurtosis	mixed	10.1111/gcb.14664
	forest	forest_grassland_transition	spatial_variance; spatial_correlation	positive	10.1002/ecy.2722
	forest	tree_death	variance	mixed	10.3389/fpls.2017.00135
	forest	tree_mortality	autocorrelation	positive	10.1038/s41558-019-0583-9
	forest	tree_mortality	autocorrelation;variance	positive	10.3389/fpls.2018.01964
	forest	tree_mortality	competition_coefficient	positive	10.1016/j.ecolind.2021.107506
	forest	tree_mortality	variance;autocorrelation; skewness	inconclusive	10.1016/j.agrformet.2022.109103
	forest	tree_mortality	variance;autocorrelation; skewness	mixed	10.1111/1365-2745.12295
	forest	tree_mortality	variance;drift_diffusion_jump	mixed	10.1088/1748-9326/10/8/084021
	grassland	community_shift	spatial_correlation; spatial_variance	mixed	10.1111/1365-2745.12696
	grassland	desertification	variance;skewness	positive	10.1111/ele.13126
	land-use	land_surface_change	autocorrelation;variance; skewness	positive	10.1073/pnas.1220161110
	land-use	land_surface_change	network_structure	positive	10.1016/j.ecolind.2014.05.018
	peatlands	drought	return_time	positive	10.1016/j.scitotenv.2020.143312
	peatlands	fire_recovery	return_time	positive	10.1088/2515-7620/ac1a5f
	sea-cucumber; penguin; terrestrial_vegetation	community_shift	variance	mixed	10.1890/ES11-00216.1
	terrestrial_community	spatial_regimes	fisher	positive	10.1111/ele.12709
	terrestrial_vegetation	ecological_regime_shift	autocorrelation;variance	positive	10.1038/s41558-022-01352-2

	terrestrial_vegetation	ecological_regime_shift	autocorrelation;variance; skewness; kurtosis	mixed	10.1038/s43247-021-00163-1
	terrestrial_vegetation	resilience_loss	variance;autocorrelation	mixed	10.5194/esd-14-173-2023

Table S2 - Climate

Field	System	Tippping point	Indicators	Performance	DOI
cryosphere	Antarctic_ice_sheet	deglaciation	directed_affinity_segmentation	positive	10.5194/npg-28-153-2021
	arctic_sea_ice	deglaciation	autocorrelation; detrended_fluctuation_analysis	mixed	10.5194/tc-7-275-2013
	arctic_sea_ice	deglaciation	variance	positive	10.1007/s13280-011-0224-7
	arctic_sea_ice	sea_ice_loss	nonstationary_probability_density	inconclusive	10.1103/PhysRevE.88.052917
	arctic_sea_ice	sea_ice_loss	variance	mixed	10.1007/s13280-011-0223-8
	Greenland_ice_sheet	deglaciation	autocorrelation;variance	positive	10.1073/pnas.2024192118|1of7
modern_climate	AMOC	AMOC_collapse	autocorrelation	positive	10.1038/s41467-022-32704-3
	AMOC	AMOC_collapse	autocorrelation;variance; recovery_rate	positive	10.1038/s41558-021-01097-4
	atmosphere	wind_extreme_events	autocorrelation;variance	positive	10.3390/atmos11090952
	atmospheric_boundary_layer	temperature_inversion	dynamical_stability	mixed	10.1175/JAS-D-19-0287.1
	earth_climate	temperature	autocorrelation;variance; skewness;kurtosis	positive	10.1038/s41598-018-28386-x
	El_Nino	onset_elnino	susceptibility;number_links; degree_distribution;correlations	mixed	10.1103/PhysRevE.103.L040301
	El_Nino	thermohaline_circulatio	network_structure	positive	10.1038/srep29552
	European_climate	abrupt_warming	skewness	positive	10.1029/2020GL089794
	hydrological	flooding	variance;power_spectrum	positive	10.1038/s41598-021-86739-5
	hydrological	precipitation	variance;autocorrelation;skewness	mixed	10.5194/hess-26-1845-2022
	monsoon	monsoon_intensity_shif	autocorrelation;variance	mixed	10.5194/cp-11-1621-2015
	PDO	regime_shift	autocorrelation;variance	positive	10.1088/1674-1056/24/8/089201
past_climate	BA;YD; antarctica_glacial_terminatio	past_climate_shifts	autocorrelation; detrended_fluctuation_analysis	positive	10.1098/rsta.2011.0304
	BA;YD;Eocene; sahel_desertification;intersta	past_climate_shifts	autocorrelation	positive	10.1073/pnas.0802430105
	Cenozoic	past_climate_shifts	autocorrelation;variance	mixed	10.1016/j.quascirev.2021.107177
	DO_events	past_climate_shifts	autocorrelation;variance	negative	10.1029/2010GL044486

	DO_events	past_climate_shifts	autocorrelation;variance; skewness;kurtosis	positive	10.1007/s00382-014-2405-0
	greenhouse_earth	past_climate_shifts	dynamical_eigenvalue	positive	10.1126/sciadv.abq4558
	interstadials;YD	past_climate_shifts	variance	positive	10.1175/JCLI-D-15-0828.1
	Little_Ice_Age	past_climate_shifts	variance;autocorrelation	positive	10.1038/s41467-022-32653-x
	North_Pacific_sea_level	past_climate_shifts	local_Lyapunov_exponent	positive	10.1007/s00382-021-05676-1
	past_climate	past_climate_shifts	deep_learning	positive	10.1073/pnas.2106140118|1of9
	past_climate	past_climate_shifts	variance	positive	10.1007/s10933-018-0047-7
	PETM;ETM2	past_climate_shifts	autocorrelation;variance;detrended_fluctuation_analysis;skewness; kurtosis; diffusion;jump_intensity	mixed	10.5194/cp-14-1515-2018
weather	cyclones	cyclone_formation	autocorrelation;eigenvalue; power_spectrum	mixed	10.1063/1.5093495
	cyclones	storm_development	autocorrelation;detrended_fluctuation_analysis;power_spectrum	positive	10.1209/0295-5075/121/10002
	heatwaves	heatwaves	autocorrelation;recovery_rate; variance	positive	10.1029/2020GL088503

Table S3 - Health

Field	System	Tippping point	Indicators	Performance	DOI
epidemiology	COVID	epidemic_outbreak	autocorrelation;variance;skewness; kurtosis	positive	10.1371/journal.pcbi.1009958
	COVID	epidemic_outbreak	variance;autocorrelation	mixed	10.3389/fpubh.2020.569669
	COVID	epidemic_outbreak	variance;autocorrelation;skewness	mixed	10.1098/rsbl.2021.0487
	foot_hand_mouth_disease	epidemic_outbreak	dynamic_network_biomarkers	positive	10.1186/s12879-020-05709-w
medical	cancer	cancer_growth	autocorrelation	positive	10.3389/fgene.2015.00252
	cancer	cancer_growth	criticality_index	positive	10.3389/fbioe.2020.00530
	cancer	cancer_growth	dynamic_network_biomarkers	positive	10.3390/genes8100268
	cancer	cancer_growth	variance;network_correlation	positive	10.1007/s12282-023-01438-5
	disease	disease_onset	autocorrelation;variance;index_of_ dispersion;skewness;kurtosis	mixed	10.1098/rsif.2022.0123
	disease	disease_onset	autocorrelation;variance;skewness; spatial_correlation	mixed	10.1007/s00477-014-0887-2
	disease	disease_onset	correlations;variance	positive	10.3389/fonc.2021.684781
	disease	disease_onset	correlations;variance	positive	10.1155/2018/6807059
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1016/j.gene.2021.145997
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1038/srep00342
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1111/jcmm.13943
	disease	disease_onset	dynamic_network_biomarkers	positive	10.3390/genes11060676
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1093/jmcb/mjac052
	disease	disease_onset	dynamic_network_biomarkers	positive	10.3390/e24091249
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1093/jmcb/mjw016
	disease	disease_onset	dynamic_network_biomarkers	positive	10.1016/j.ymeth.2014.01.021
	disease	disease_onset	dynamic_network_biomarkers; variance;correlations	positive	10.1038/s41598-019-45119-w
	disease	disease_onset	dysregulation_score_threshold	positive	10.1093/bfgp/elad006
	disease	disease_onset	entropy	positive	10.1038/srep00813
	disease	disease_onset	entropy	positive	10.1371/journal.pone.0180937
	disease	disease_onset	MST_DNM_score	positive	10.1155/2020/7351398
	disease	disease_onset	temporal_network_flow_entropy; dynamic_network_biomarkers	positive	10.1093/bib/bbac164

	disease	disease_onset	transition-based_network_entropy	positive	10.1016/j.ymeth.2015.05.004
	disease	disease_onset	variance	positive	10.1016/j.isci.2022.104385
	disease	disease_onset	variance;autocorrelation	positive	10.1016/j.envint.2018.09.007
	disease	disease_onset	variance;autocorrelation;correlations	mixed	10.1093/gerona/glx065
	disease	disease_onset	variance;skewness	positive	10.1098/rspb.2017.0882
	epilepsy	seizures	autocorrelation;variance	negative	10.1063/1.5122759
	epilepsy	seizures	power_spectrum; spatial_correlation;autocorrelation	positive	10.1073/pnas.1210047110
	epilepsy	seizures	variance	positive	10.1371/journal.pone.0030371
	epilepsy	seizures	variance;autocorrelation	positive	10.1038/s41467-020-15908-3
	epilepsy	seizures	variance;autocorrelation;skewness	negative	10.1142/S0129065716500532
	physiology	cancer_growth	criticality_index	positive	10.1038/s41467-018-03024-2
	physiology	disease_onset	Hidden_Markov_Model	positive	10.3389/fgene.2019.00285
	physiology	disease_onset	Kullback_Leibler_index	positive	10.1186/s12864-020-6490-7
	physiology	disease_onset	landscape-DNB	positive	10.1093/nsr/nwy162
	physiology	embyonic_development; metastasis	DNRS	positive	10.1093/bioinformatics/btac707
	physiology	epithelial-mesynchymal_transition	criticality_index	positive	10.1016/j.scib.2020.01.013
	physiology	exercise	network_structure	positive	10.1016/j.physa.2020.125108
	physiology	gene_correlation	network_correlation	positive	10.1093/nar/gkx787
	physiology	gene_correlation	network_correlation	positive	10.1093/jmcb/mjx021
	physiology	hypoxia	dynamical_eigenvalue	positive	10.1126/sciadv.abq4558
	physiology	lung_cancer	criticality_index	positive	10.1016/j.jhazmat.2021.128089
	physiology	neuron_spiking	autocorrelation;variance	positive	10.1371/journal.pcbi.1004097
	physiology	sleep_dynamics	variance;autocorrelation	positive	10.1016/j.cmpb.2020.105448
psychology	bi-polar_disorder	depression_onset	autocorrelation	mixed	10.1186/s40345-022-00258-4
	depression	depression_onset	autocorrelation;variance	mixed	10.1177/21677026221137006
	depression	depression_onset	variance;autocorrelation; correlations	positive	10.1073/pnas.1312114110
	depression;alzheimer	depression_alzheimer_on	autocorrelation	inconclusive	10.1080/09296174.2017.1405719

Table S4 - Social sciences

Field	System	Tippping point	Indicators	Performance	DOI
finance	crypto_market	market_crash	turbulence	positive	10.1016/j.physa.2019.123843
	crypto_market	price_collapse	variance;autocorrelation	mixed	10.1098/rsos.191450
	stockmarket	bankruptcy	spatial_correlation;spatial_variance	mixed	10.1038/srep01898
	stockmarket	bankruptcy	variance;autocorrelation	positive	10.3389/fams.2022.940133
	stockmarket	financial_crisis	autocorrelation;variance;power_spectrum	negative	10.1371/journal.pone.0144198
	stockmarket	financial_crisis	Marginal_expected_shortfall; delta_conditional_value_at_risk; SRISK;network_centrality	mixed	10.1007/s10479-021-04120-1
	stockmarket	financial_crisis	variance;autocorrelation	positive	10.1016/j.physa.2019.121392
	stockmarket	stock_crash	autocorrelation;variance;power_spectrum	mixed	10.1109/ACCESS.2020.3036370
	stockmarket	stock_crash	autocorrelation;variance;power_spectrum	positive	10.1371/journal.pone.0191439
	stockmarket	stock_crash	autocorrelation;variance;power_spectrum	mixed	10.1016/j.physa.2021.126459
	stockmarket	stock_crash	autocorrelation;variance;recovery_rate; flickering	positive	10.1016/j.chaos.2016.03.005
	stockmarket	stock_crash	motif_transition_intensity	positive	10.3389/fphy.2021.800860
	stockmarket	stock_crash	network_structure	positive	10.1038/s41598-019-42223-9
society	anthropology	population_collapse	autocorrelation;variance;skewness	positive	10.1073/pnas.1602504113
	Arab_spring	protest	nonlinearity	positive	10.1098/rsif.2015.0712
	farmers	protest	autocorrelation;variance;skewness	positive	10.31577/cai_2022_2_463
	housing_market	financial_crisis	autocorrelation;skewness;variance; power_spectrum	mixed;negative ;positive	10.1371/journal.pone.0162140
	housing_market	market_bubble_burst	variance;autocorrelation;spectral_analysis	mixed	10.1140/epjb/e2014-41038-1
	political_regime	political_regime_shift	fisher	positive	10.1016/j.heliyon.2017.e00465
	social_behavior	emergencies	dynamic_network_biomarkers	positive	10.1016/j.ins.2023.01.076
	social_behavior	onset_motion	autocorrelation;variance	positive	10.1371/journal.pcbi.1007821
	social_behavior	social_trend_uptake	autocorrelation;variance	positive;mixed	10.1073/pnas.1704093114
	social_media	drastic_events_in_social_media	variance;autocorrelation	positive	10.1093/comnet/cnt022
	social_media	social_trend_uptake	variance;autocorrelation	positive	10.1002/cplx.20347
	socioecological_system	social_transformation	variance	positive	10.1371/journal.pone.0163685
	socioecological_system	socio_ecological_regime_shift	fisher	mixed	10.1080/13504509.2014.978832
	transport	traffic_jam	autocorrelation;variance;power_spectrum	positive	10.1109/TITS.2021.3095897
	transport	traffic_jam	variance;power_spectrum;autocorrelation	positive	10.1109/TITS.2020.2964021

Table S5 - Physical sciences

Field	System	Tippping point	Indicators	Performance	DOI
astronomy	astronomy	star_dimming	autocorrelation;variance; detrended_fluctuation_analysis; recurrence_based_analysis	positive	10.1051/0004-6361/202038785
engineering	electronic_assemblies	component_failure	autocorrelation	positive	10.1007/s10836-020-05899-w
	materials	material_failure	autocorrelation;variance	positive	10.1088/1742-2140/aac009
	materials	phase_transition	skewness	positive	10.1002/smll.202200113
	materials	themoacoustic_instabilities	autocorrelation;variance	positive	10.1038/srep35310
	materials	wear_out	autocorrelation;potential_analysis	mixed	10.1007/s13349-013-0066-z
	power_systems	instability	variance;autocorrelation	positive	10.1109/TSG.2012.2213848
	power_systems	power_blackout	dynamical_eigenvalue	positive	10.1126/sciadv.abq4558
	thermoacoustics	themoacoustic_instabilities	autocorrelation;variance	positive	10.1115/1.4041963
	thermoacoustics	thermoacoustic_instability	deep_learning	positive	10.1073/pnas.2106140118|1of9
geoscience	geology	earthquake	skewness;kurtosis;variance	mixed	10.1007/s11069-016-2460-4
	geology	rock_fracture	variance;autocorrelation	positive	10.1155/2020/8820506
	geology	rockfall	variance;autocorrelation	positive	10.1016/j.enggeo.2020.105960
	hydrology	hydrological_regime_shift	spatial_correlation	mixed	10.1016/j.jhydrol.2016.05.039
	river	hydrological_regime_shift	fisher	positive	10.3390/w14162555
material_science	materials	crack_formation	degenerate_fingerprinting; potential_analysis	positive	10.1088/0964-1726/25/1/015027
	materials	dielectic_breakdown	variance;spatial_variance	positive	10.1063/1.4865240
	materials	landslides	persistent_pattern	positive	10.3390/e22010067