

Thresholds and triggers for Anticipatory Action in Karamoja Region

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Documentation on analysis for verification of Seasonal drought forecast for Anticipatory action in Karamoja region, thresholds and triggers

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1 Thresholds and triggers for Anticipatory Action in Karamoja Region

1.1 Introduction

This document details the analysis for verifying seasonal drought forecasts for anticipatory action in the Karamoja region, including thresholds and triggers.

A trigger is a forecast issued at a certain lead time that exceeds both the danger level and the probability threshold, leading to the initiation of predefined actions. Thresholds, on the other hand, are past drought extreme observations that can be set forward to monitor future forecasts based on predefined triggers. This helps determine whether a given forecast exceeds the threshold, aiding in decision-making for anticipatory action.

In Karamoja, the danger levels for drought, defined as thresholds (Moderate, Extreme, Severe), are predefined through an analysis of the frequency of long-term SPI values observed in the region (Figure 1.1) and subsequent stakeholder consultations during 2023, comparing these values with the drought disaster impact experienced in the region (Table 1.1). The current analysis explores the long-term monthly SPI variability in Karamoja, verifying forecast quality and determining the trigger for each threshold in terms of probability for defined danger levels for SPI products, namely SPI3-MAM and SPI4-JJAS (Figure 1.2).

The final product is a trigger value (empirical probability of ensemble forecasts exceeding the given threshold ranges) reflected in terms of False Alarm Ratio and Hit Rate with respect to different lead times and threshold levels.

Table 1.1. SPI threshold for Karamoja. Which is higher side of the range set in the consultation workshop 2023

	Moderate	Extreme	Severe
MAM	-0.55	-0.98	-0.99
JJAS	-0.41	-0.98	-0.99

The method closely follows the paper by Gabriela et.al 2024 and 2023,

Guimarães Nobre, G.; Towner, J.; Nhamumbo, B.; João da Conceição Marcos Matuele, C.; Raiva, I.; Pasqui, M.; Quaresima, S.; Bonifácio, R. Ready, Set, Go! An Anticipatory Action System against Droughts. EGUsphere 2024, 2024, 1-30. <https://doi.org/10.5194/egusphere-2024-538>.

Nobre, Gabriela Guimarães, et al. "Forecasting, thresholds, and triggers: Towards developing a Forecast-based Financing system for droughts in Mozambique." Climate Services 30 (2023): 100344.

1.2 Analysis Steps

1. **Data Processing of SEAS5 and CHIRPS** (scripts for this step: <https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/01-input-spi-seas51.ipynb> and <https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/02-input-spi-chirps.ipynb>)

CHIRPS monthly mean observation data, upscaled from 5km to 25km.

SEAS5 forecast data, lead time 1-6 months, downscaled from 100km to 25km.

SPI calculation on CHIRPS data.

Processing SEAS51 data.

Replacing time steps with lead time.

Converting precipitation from m/s to mm/month.

SPI calculation on SEAS51 data, considering SPI product and month lead time as shown in Figure 1.

2. **Forecast verification stats and plotting of outputs**

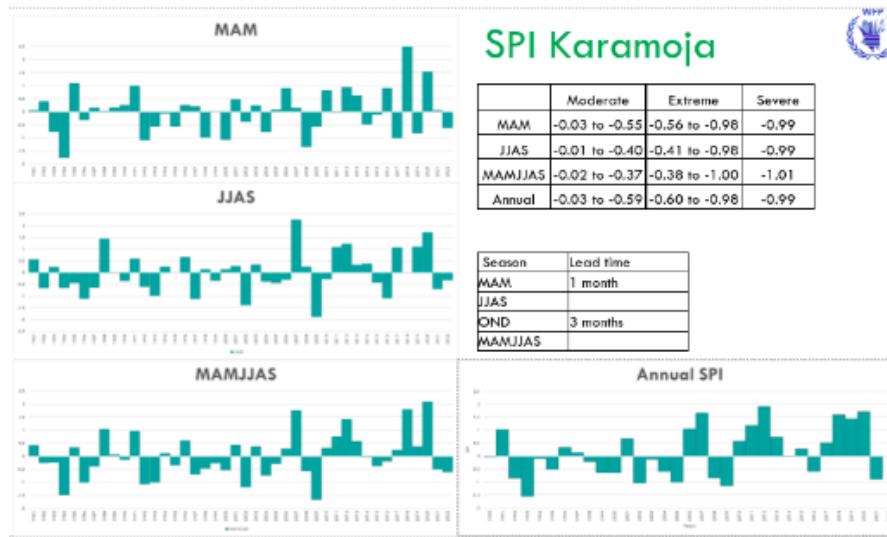


Figure 1.1. Threshold selection for Karamoja region based on long term observed SPI values

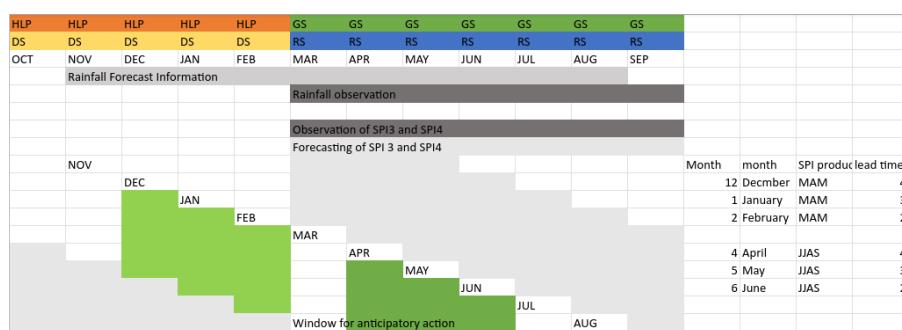


Figure 1.2. Lead time and SPI products available for verification for Karamoja region based on Growing and rainy season

Aligning SPI3/SPI4 values of observation and forecast for each month shown in Figure 1 (Months 11, 12, 1, 2 for SPI MAM). Calculate AUROC score with bootstrapping and other metrics in 2D and 1D forms (https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/run_kmj.py).

Display the decided triggers in heatmap table form (https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/run_heatmap.py).

Create a bar chart plot for observation and forecast with a table showing forecast performance for past years (https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/run_heatmap.py).

Generate a table of other potential triggers that can be chosen based on user needs (https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/run_latex_table.py).

Map the observation and forecast in 2D map format with region shapefile overlay, including members, observation, and forecast empirical probability for each season and lead time (https://github.com/icpac-igad/ibf-thresholds-triggers/blob/xarray-method/run_map.py).

1.3 MAM

The analysis results for selected triggers are shown in Figure 1.3. These trigger values, representing the empirical probability of exceeding given thresholds, can be used with monthly SEAS51 SPI3 forecasts for MAM for the specified lead times. The bar plot in Figure 1.4 further justifies the selected triggers by showing the observed drought categories count (odc) for the analysis period and the overall performance of SPI for MAM by SEAS51 and the chosen trigger. Tables 1.3 to 1.3 present alternative trigger values that meet the conditions set forth by Gabriela et al. (2024) in "Ready, Set, Go! An Anticipatory Action System against Droughts." The maps in Figures 1.5 to 1.7 show time series plots of the dataset used for the forecast verification analysis.

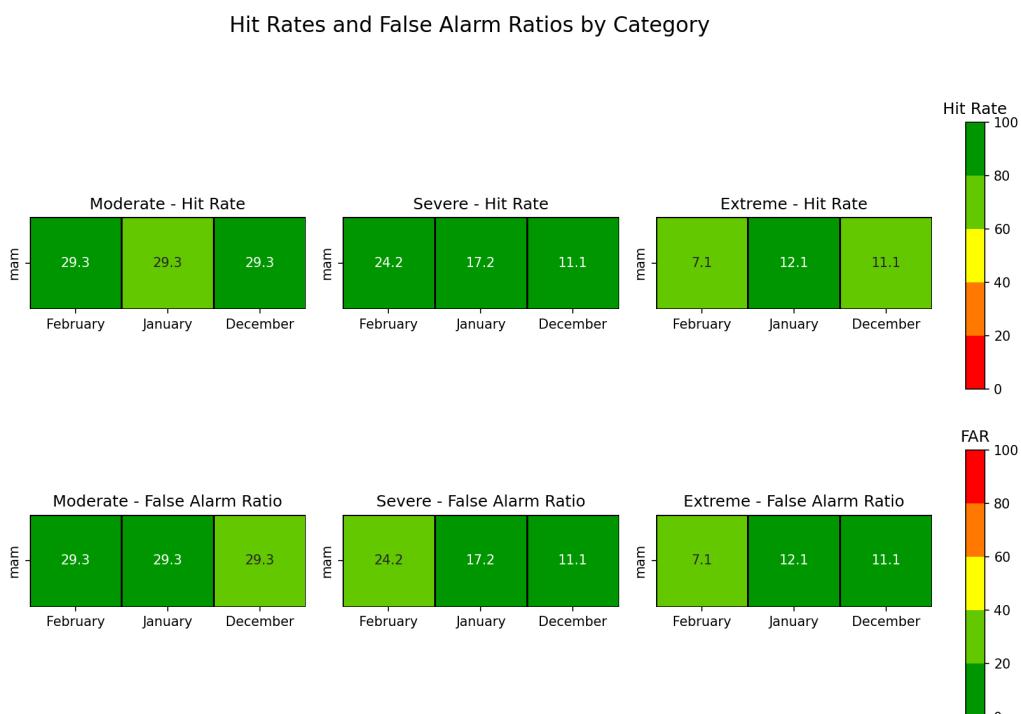


Figure 1.3. Selected MAM triggers for Karamoja

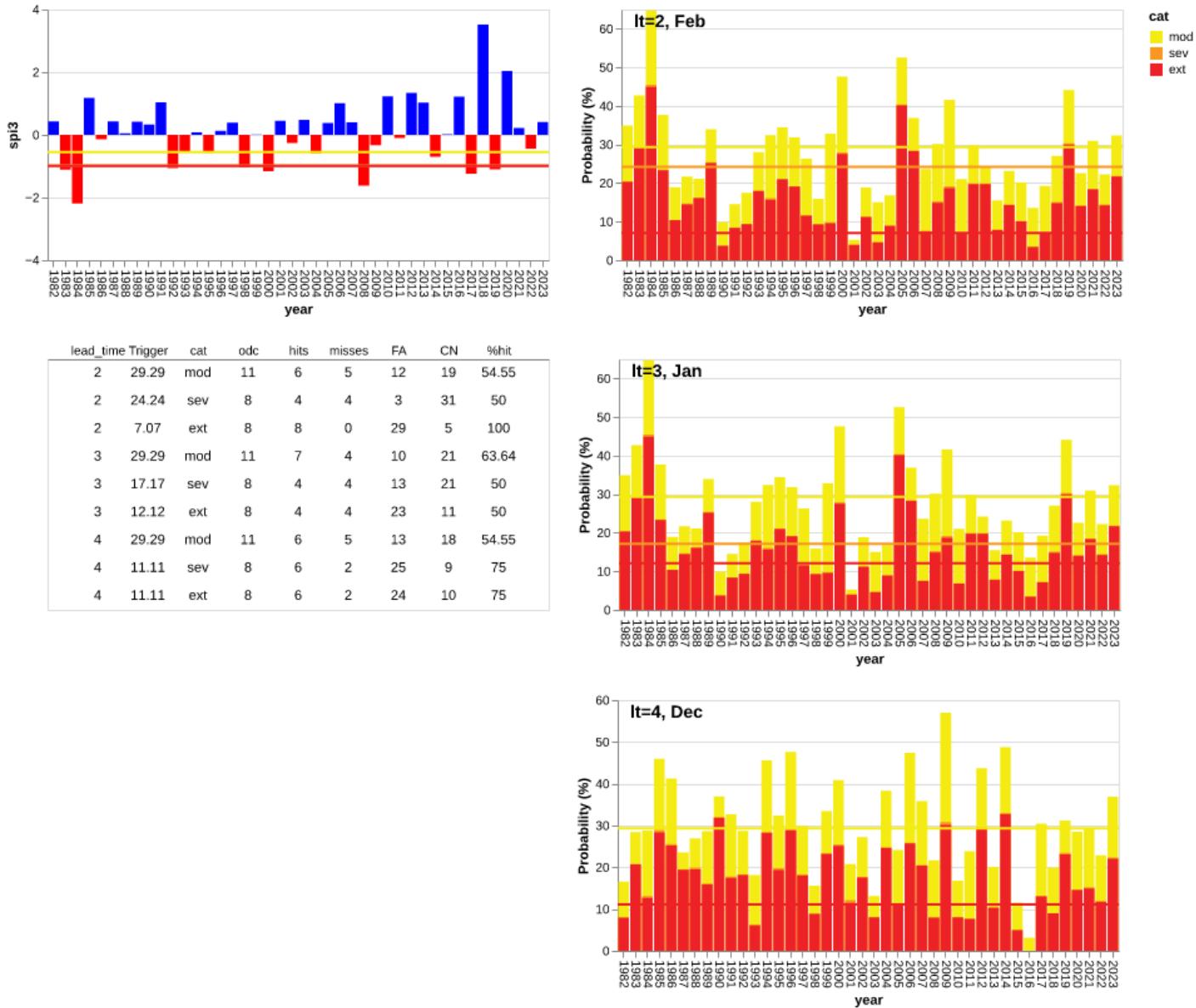


Figure 1.4. Overview of MAM Hit rate(%) and False alarm ratio(%) per SPI indicator, lead time of the forecasting information in months and region wise. The chosen trigger value is displayed within each tile

Table 1.2. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 2

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
0	8.1	16	86.4	7.3	0.9	0.3	0.1	1.0	11	11	0	30	1	100.0	mod	0.0
1	9.1	16	86.4	7.3	0.9	0.3	0.1	1.0	11	11	0	30	1	100.0	mod	0.0
2	10.1	16	86.4	7.3	0.9	0.3	0.1	1.0	11	11	0	29	2	100.0	mod	0.0
3	11.1	16	86.4	7.3	0.9	0.3	0.1	1.0	11	11	0	29	2	100.0	mod	0.0
4	12.1	10	85.0	10.5	0.9	-0.1	-0.1	1.0	11	11	0	29	2	100.0	mod	0.0
5	13.1	10	85.0	10.5	0.9	-0.1	-0.1	1.0	11	11	0	29	2	100.0	mod	0.0
6	14.1	10	85.0	10.5	0.9	-0.1	-0.1	1.0	11	11	0	28	3	100.0	mod	0.0
7	15.2	10	85.0	10.5	0.9	-0.1	-0.1	1.0	11	11	0	26	5	100.0	mod	0.0
8	16.2	35	93.2	9.8	1.0	0.1	0.0	0.9	11	10	1	25	6	90.9	mod	0.0
9	17.2	35	93.2	9.8	1.0	0.1	0.0	0.9	11	9	2	25	6	81.8	mod	0.0
10	20.2	26	98.4	6.2	1.0	-0.0	-0.0	0.8	11	7	4	22	9	63.6	mod	0.0
11	21.2	26	98.4	6.2	1.0	-0.0	-0.0	0.8	11	7	4	20	11	63.6	mod	0.0
12	22.2	26	98.4	6.2	1.0	-0.0	-0.0	0.8	11	7	4	19	12	63.6	mod	0.0
13	23.2	26	98.4	6.2	1.0	-0.0	-0.0	0.8	11	6	5	17	14	54.5	mod	0.0
14	24.2	18	98.1	20.0	1.2	-0.0	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
15	24.2	26	91.9	6.6	1.0	-0.1	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
16	25.3	18	98.1	20.0	1.2	-0.0	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
17	25.3	26	91.9	6.6	1.0	-0.1	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
18	26.3	18	98.1	20.0	1.2	-0.0	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
19	26.3	26	91.9	6.6	1.0	-0.1	-0.0	0.8	11	6	5	15	16	54.5	mod	0.0
20	27.3	18	98.1	20.0	1.2	-0.0	-0.0	0.8	11	6	5	13	18	54.5	mod	0.0
21	27.3	26	91.9	6.6	1.0	-0.1	-0.0	0.8	11	6	5	13	18	54.5	mod	0.0
22	28.3	18	98.1	18.8	1.2	0.1	0.0	0.7	11	6	5	12	19	54.5	mod	0.0
23	29.3	18	98.1	18.8	1.2	0.1	0.0	0.7	11	6	5	12	19	54.5	mod	1.0
24	30.3	18	98.1	18.8	1.2	0.1	0.0	0.7	11	5	6	11	20	45.5	mod	0.0
25	31.3	18	98.1	18.8	1.2	0.1	0.0	0.7	11	5	6	10	21	45.5	mod	0.0
26	32.3	18	94.3	19.4	1.2	0.0	0.0	0.7	11	5	6	9	22	45.5	mod	0.0
27	33.3	18	94.3	19.4	1.2	0.0	0.0	0.7	11	5	6	6	25	45.5	mod	0.0
28	34.3	18	94.3	19.4	1.2	0.0	0.0	0.7	11	5	6	5	26	45.5	mod	0.0
29	35.4	18	94.3	19.4	1.2	0.0	0.0	0.7	11	4	7	4	27	36.4	mod	0.0
30	36.4	1	93.6	30.2	1.3	-0.1	-0.0	0.7	11	4	7	4	27	36.4	mod	0.0
31	36.4	18	90.6	17.2	1.1	0.1	0.1	0.7	11	4	7	4	27	36.4	mod	0.0
32	37.4	1	93.6	30.2	1.3	-0.1	-0.0	0.7	11	4	7	3	28	36.4	mod	0.0
33	37.4	18	90.6	17.2	1.1	0.1	0.1	0.7	11	4	7	3	28	36.4	mod	0.0
34	38.4	1	93.6	30.2	1.3	-0.1	-0.0	0.7	11	4	7	2	29	36.4	mod	0.0
35	38.4	18	90.6	17.2	1.1	0.1	0.1	0.7	11	4	7	2	29	36.4	mod	0.0
36	39.4	1	93.6	30.2	1.3	-0.1	-0.0	0.7	11	4	7	2	29	36.4	mod	0.0
37	39.4	18	90.6	17.2	1.1	0.1	0.1	0.7	11	4	7	2	29	36.4	mod	0.0
38	40.4	18	86.8	14.8	1.0	0.3	0.1	0.6	11	4	7	2	29	36.4	mod	0.0
39	41.4	18	86.8	14.8	1.0	0.3	0.1	0.6	11	4	7	2	29	36.4	mod	0.0
40	41.4	37	88.5	11.5	1.0	0.5	0.2	0.6	11	4	7	2	29	36.4	mod	0.0
41	42.4	18	86.8	14.8	1.0	0.3	0.1	0.6	11	4	7	1	30	36.4	mod	0.0
42	42.4	37	88.5	11.5	1.0	0.5	0.2	0.6	11	4	7	1	30	36.4	mod	0.0
43	43.4	18	86.8	14.8	1.0	0.3	0.1	0.6	11	3	8	1	30	27.3	mod	0.0
44	43.4	37	69.2	5.3	0.7	0.5	0.2	0.6	11	3	8	1	30	27.3	mod	0.0
45	44.4	18	81.1	14.0	0.9	0.3	0.1	0.6	11	2	9	1	30	18.2	mod	0.0
46	44.4	37	69.2	5.3	0.7	0.5	0.2	0.6	11	2	9	1	30	18.2	mod	0.0
47	45.5	18	81.1	14.0	0.9	0.3	0.1	0.6	11	2	9	1	30	18.2	mod	0.0
48	46.5	18	81.1	14.0	0.9	0.3	0.1	0.6	11	2	9	1	30	18.2	mod	0.0
49	47.5	18	81.1	14.0	0.9	0.3	0.1	0.6	11	2	9	1	30	18.2	mod	0.0
50	56.6	2	93.9	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
51	57.6	2	93.9	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0

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Table 1.2. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 2

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
52	58.6	2	93.9	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
53	59.6	2	93.9	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
54	60.6	2	86.4	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
55	61.6	2	86.4	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
56	62.6	2	86.4	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
57	63.6	2	86.4	0.0	0.9	nan	0.0	0.5	11	1	10	0	31	9.1	mod	0.0
58	4.0	35	86.0	24.6	1.1	-0.0	-0.0	1.0	8	8	0	31	3	100.0	sev	0.0
59	5.1	35	86.0	24.6	1.1	-0.0	-0.0	1.0	8	8	0	30	4	100.0	sev	0.0
60	6.1	35	76.0	24.0	1.0	0.0	0.0	1.0	8	8	0	30	4	100.0	sev	0.0
61	7.1	35	76.0	24.0	1.0	0.0	0.0	1.0	8	8	0	29	5	100.0	sev	0.0
62	24.2	18	90.2	26.0	1.2	0.4	0.2	0.7	8	4	4	3	31	50.0	sev	1.0
63	25.3	18	90.2	26.0	1.2	0.4	0.2	0.7	8	4	4	3	31	50.0	sev	0.0
64	26.3	18	90.2	26.0	1.2	0.4	0.2	0.7	8	4	4	2	32	50.0	sev	0.0
65	27.3	18	90.2	26.0	1.2	0.4	0.2	0.7	8	4	4	2	32	50.0	sev	0.0
66	32.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
67	33.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
68	34.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
69	35.4	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
70	36.4	2	86.4	0.0	0.9	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
71	37.4	2	86.4	0.0	0.9	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
72	38.4	2	86.4	0.0	0.9	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
73	39.4	2	86.4	0.0	0.9	nan	0.0	0.6	8	1	7	1	33	12.5	sev	0.0
74	40.4	2	69.7	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	sev	0.0
75	41.4	2	69.7	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	sev	0.0
76	42.4	2	69.7	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	sev	0.0
77	43.4	2	69.7	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	sev	0.0
78	4.0	35	86.0	24.6	1.1	-0.0	-0.0	1.0	8	8	0	31	3	100.0	ext	0.0
79	5.1	35	86.0	24.6	1.1	-0.0	-0.0	1.0	8	8	0	30	4	100.0	ext	0.0
80	6.1	35	72.0	23.4	0.9	0.0	0.0	1.0	8	8	0	30	4	100.0	ext	0.0
81	7.1	35	72.0	23.4	0.9	0.0	0.0	1.0	8	8	0	29	5	100.0	ext	1.0
82	24.2	18	85.0	29.2	1.2	0.3	0.2	0.7	8	4	4	3	31	50.0	ext	0.0
83	25.3	18	85.0	29.2	1.2	0.3	0.2	0.7	8	4	4	2	32	50.0	ext	0.0
84	26.3	18	85.0	29.2	1.2	0.3	0.2	0.7	8	4	4	2	32	50.0	ext	0.0
85	27.3	18	85.0	29.2	1.2	0.3	0.2	0.7	8	4	4	2	32	50.0	ext	0.0
86	32.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
87	33.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
88	34.3	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
89	35.4	2	98.5	0.0	1.0	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
90	36.4	2	84.8	0.0	0.8	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
91	37.4	2	84.8	0.0	0.8	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
92	38.4	2	84.8	0.0	0.8	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
93	39.4	2	84.8	0.0	0.8	nan	0.0	0.6	8	1	7	1	33	12.5	ext	0.0
94	40.4	2	68.2	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	ext	0.0
95	41.4	2	68.2	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	ext	0.0
96	42.4	2	68.2	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	ext	0.0
97	43.4	2	68.2	0.0	0.7	nan	0.0	0.5	8	1	7	0	34	12.5	ext	0.0

Table 1.3. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 3

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
0	4.0	16	91.5	11.5	1.0	-0.1	-0.0	1.0	11	11	0	31	0	100.0	mod	0.0
1	5.1	16	91.5	11.5	1.0	-0.1	-0.0	1.0	11	11	0	31	0	100.0	mod	0.0
2	6.1	16	91.5	11.5	1.0	-0.1	-0.0	1.0	11	11	0	31	0	100.0	mod	0.0
3	7.1	16	91.5	11.5	1.0	-0.1	-0.0	1.0	11	11	0	31	0	100.0	mod	0.0
4	12.1	35	67.8	11.1	0.8	-0.0	-0.0	0.9	11	10	1	30	1	90.9	mod	0.0
5	13.1	35	67.8	11.1	0.8	-0.0	-0.0	0.9	11	10	1	30	1	90.9	mod	0.0
6	16.2	1	78.7	27.5	1.1	0.1	0.0	0.9	11	9	2	27	4	81.8	mod	0.0
7	17.2	1	78.7	27.5	1.1	0.1	0.0	0.9	11	8	3	27	4	72.7	mod	0.0
8	18.2	1	78.7	27.5	1.1	0.1	0.0	0.9	11	8	3	25	6	72.7	mod	0.0
9	19.2	1	78.7	27.5	1.1	0.1	0.0	0.9	11	8	3	23	8	72.7	mod	0.0
10	20.2	26	95.2	6.3	1.0	-0.0	-0.0	0.9	11	8	3	21	10	72.7	mod	0.0
11	21.2	26	95.2	6.3	1.0	-0.0	-0.0	0.9	11	8	3	21	10	72.7	mod	0.0
12	22.2	26	95.2	6.3	1.0	-0.0	-0.0	0.8	11	7	4	21	10	63.6	mod	0.0
13	23.2	26	95.2	6.3	1.0	-0.0	-0.0	0.8	11	7	4	20	11	63.6	mod	0.0
14	24.2	26	80.6	7.4	0.9	-0.2	-0.1	0.8	11	7	4	18	13	63.6	mod	0.0
15	25.3	26	80.6	7.4	0.9	-0.2	-0.1	0.8	11	7	4	16	15	63.6	mod	0.0
16	26.3	26	80.6	7.4	0.9	-0.2	-0.1	0.8	11	7	4	12	19	63.6	mod	0.0
17	27.3	26	80.6	7.4	0.9	-0.2	-0.1	0.8	11	7	4	11	20	63.6	mod	0.0
18	28.3	26	67.7	8.7	0.7	-0.3	-0.1	0.7	11	7	4	11	20	63.6	mod	0.0
19	29.3	26	67.7	8.7	0.7	-0.3	-0.1	0.7	11	7	4	10	21	63.6	mod	1.0
20	30.3	26	67.7	8.7	0.7	-0.3	-0.1	0.7	11	6	5	10	21	54.5	mod	0.0
21	31.3	26	67.7	8.7	0.7	-0.3	-0.1	0.7	11	6	5	10	21	54.5	mod	0.0
22	32.3	2	98.5	0.0	1.0	nan	0.0	0.7	11	4	7	9	22	36.4	mod	0.0
23	32.3	18	96.2	20.3	1.2	-0.0	-0.0	0.7	11	4	7	9	22	36.4	mod	0.0
24	33.3	2	98.5	0.0	1.0	nan	0.0	0.7	11	4	7	9	22	36.4	mod	0.0
25	33.3	18	96.2	20.3	1.2	-0.0	-0.0	0.7	11	4	7	9	22	36.4	mod	0.0
26	34.3	2	98.5	0.0	1.0	nan	0.0	0.7	11	3	8	8	23	27.3	mod	0.0
27	34.3	18	96.2	20.3	1.2	-0.0	-0.0	0.7	11	3	8	8	23	27.3	mod	0.0
28	35.4	2	98.5	0.0	1.0	nan	0.0	0.7	11	3	8	8	23	27.3	mod	0.0
29	35.4	18	96.2	20.3	1.2	-0.0	-0.0	0.7	11	3	8	8	23	27.3	mod	0.0
30	36.4	2	71.2	0.0	0.7	nan	0.0	0.6	11	3	8	7	24	27.3	mod	0.0
31	36.4	18	79.2	22.2	1.0	-0.1	-0.1	0.6	11	3	8	7	24	27.3	mod	0.0
32	37.4	2	71.2	0.0	0.7	nan	0.0	0.6	11	3	8	7	24	27.3	mod	0.0
33	37.4	18	79.2	22.2	1.0	-0.1	-0.1	0.6	11	3	8	7	24	27.3	mod	0.0
34	37.4	37	82.7	24.6	1.1	-0.2	-0.1	0.6	11	3	8	7	24	27.3	mod	0.0
35	38.4	2	71.2	0.0	0.7	nan	0.0	0.6	11	3	8	5	26	27.3	mod	0.0
36	38.4	18	79.2	22.2	1.0	-0.1	-0.1	0.6	11	3	8	5	26	27.3	mod	0.0
37	38.4	37	82.7	24.6	1.1	-0.2	-0.1	0.6	11	3	8	5	26	27.3	mod	0.0
38	39.4	2	71.2	0.0	0.7	nan	0.0	0.6	11	3	8	5	26	27.3	mod	0.0
39	39.4	18	79.2	22.2	1.0	-0.1	-0.1	0.6	11	3	8	5	26	27.3	mod	0.0
40	40.4	18	71.7	22.4	0.9	-0.1	-0.1	0.6	11	2	9	4	27	18.2	mod	0.0
41	41.4	18	71.7	22.4	0.9	-0.1	-0.1	0.6	11	1	10	4	27	9.1	mod	0.0
42	42.4	18	71.7	22.4	0.9	-0.1	-0.1	0.6	11	1	10	3	28	9.1	mod	0.0
43	43.4	18	71.7	22.4	0.9	-0.1	-0.1	0.5	11	1	10	2	29	9.1	mod	0.0
44	8.1	26	96.4	17.2	1.2	-0.0	-0.0	0.9	8	6	2	28	6	75.0	sev	0.0
45	8.1	35	70.0	30.0	1.0	-0.2	-0.1	0.9	8	6	2	28	6	75.0	sev	0.0
46	9.1	26	96.4	17.2	1.2	-0.0	-0.0	0.9	8	6	2	27	7	75.0	sev	0.0
47	9.1	35	70.0	30.0	1.0	-0.2	-0.1	0.9	8	6	2	27	7	75.0	sev	0.0
48	10.1	26	96.4	17.2	1.2	-0.0	-0.0	0.8	8	4	4	25	9	50.0	sev	0.0
49	11.1	26	96.4	17.2	1.2	-0.0	-0.0	0.8	8	4	4	25	9	50.0	sev	0.0
50	12.1	26	81.8	19.6	1.0	-0.2	-0.1	0.8	8	4	4	25	9	50.0	sev	0.0
51	13.1	26	81.8	19.6	1.0	-0.2	-0.1	0.8	8	4	4	22	12	50.0	sev	0.0

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Table 1.3. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 3

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
52	14.1	26	81.8	19.6	1.0	-0.2	-0.1	0.8	8	4	4	19	15	50.0	sev	0.0
53	15.2	26	81.8	19.6	1.0	-0.2	-0.1	0.8	8	4	4	18	16	50.0	sev	0.0
54	16.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	4	4	17	17	50.0	sev	0.0
55	17.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	4	4	13	21	50.0	sev	1.0
56	18.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	3	5	12	22	37.5	sev	0.0
57	19.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	3	5	10	24	37.5	sev	0.0
58	20.2	2	66.7	0.0	0.7	nan	0.0	0.6	8	3	5	9	25	37.5	sev	0.0
59	21.2	2	66.7	0.0	0.7	nan	0.0	0.6	8	3	5	8	26	37.5	sev	0.0
60	22.2	2	66.7	0.0	0.7	nan	0.0	0.6	8	3	5	8	26	37.5	sev	0.0
61	23.2	2	66.7	0.0	0.7	nan	0.0	0.6	8	3	5	7	27	37.5	sev	0.0
62	28.3	37	78.4	32.6	1.2	0.3	0.2	0.5	8	1	7	4	30	12.5	sev	0.0
63	29.3	37	78.4	32.6	1.2	0.3	0.2	0.5	8	0	8	3	31	0.0	sev	0.0
64	8.1	26	96.4	17.2	1.2	-0.0	-0.0	0.9	8	6	2	27	7	75.0	ext	0.0
65	8.1	35	68.0	29.2	1.0	-0.2	-0.1	0.9	8	6	2	27	7	75.0	ext	0.0
66	9.1	26	96.4	17.2	1.2	-0.0	-0.0	0.9	8	6	2	26	8	75.0	ext	0.0
67	9.1	35	68.0	29.2	1.0	-0.2	-0.1	0.9	8	6	2	26	8	75.0	ext	0.0
68	10.1	26	96.4	17.2	1.2	-0.0	-0.0	0.8	8	4	4	25	9	50.0	ext	0.0
69	11.1	26	96.4	17.2	1.2	-0.0	-0.0	0.8	8	4	4	25	9	50.0	ext	0.0
70	12.1	2	98.5	0.0	1.0	nan	0.0	0.8	8	4	4	23	11	50.0	ext	1.0
71	12.1	26	78.2	17.3	0.9	-0.0	-0.0	0.8	8	4	4	23	11	50.0	ext	0.0
72	13.1	2	98.5	0.0	1.0	nan	0.0	0.8	8	4	4	22	12	50.0	ext	0.0
73	13.1	26	78.2	17.3	0.9	-0.0	-0.0	0.8	8	4	4	22	12	50.0	ext	0.0
74	14.1	2	98.5	0.0	1.0	nan	0.0	0.8	8	4	4	19	15	50.0	ext	0.0
75	14.1	26	78.2	17.3	0.9	-0.0	-0.0	0.8	8	4	4	19	15	50.0	ext	0.0
76	15.2	2	98.5	0.0	1.0	nan	0.0	0.8	8	4	4	18	16	50.0	ext	0.0
77	15.2	26	78.2	17.3	0.9	-0.0	-0.0	0.8	8	4	4	18	16	50.0	ext	0.0
78	16.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	4	4	16	18	50.0	ext	0.0
79	17.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	3	5	12	22	37.5	ext	0.0
80	18.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	3	5	11	23	37.5	ext	0.0
81	19.2	2	92.4	0.0	0.9	nan	0.0	0.7	8	3	5	10	24	37.5	ext	0.0
82	20.2	2	65.2	0.0	0.7	nan	0.0	0.6	8	3	5	9	25	37.5	ext	0.0
83	21.2	2	65.2	0.0	0.7	nan	0.0	0.6	8	3	5	8	26	37.5	ext	0.0
84	22.2	2	65.2	0.0	0.7	nan	0.0	0.6	8	3	5	7	27	37.5	ext	0.0
85	23.2	2	65.2	0.0	0.7	nan	0.0	0.6	8	2	6	6	28	25.0	ext	0.0

Table 1.4. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 4

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
0	16.2	26	93.5	6.5	1.0	-0.1	-0.0	1.0	11	10	1	28	3	90.9	mod	0.0
1	17.2	26	93.5	6.5	1.0	-0.1	-0.0	1.0	11	10	1	26	5	90.9	mod	0.0
2	18.2	26	93.5	6.5	1.0	-0.1	-0.0	1.0	11	10	1	26	5	90.9	mod	0.0
3	19.2	26	93.5	6.5	1.0	-0.1	-0.0	1.0	11	10	1	25	6	90.9	mod	0.0
4	20.2	1	95.7	29.7	1.4	-0.0	-0.0	0.9	11	10	1	23	8	90.9	mod	0.0
5	20.2	2	93.9	0.0	0.9	nan	0.0	0.9	11	10	1	23	8	90.9	mod	0.0
6	20.2	10	96.7	9.4	1.1	-0.0	-0.0	0.9	11	10	1	23	8	90.9	mod	0.0
7	20.2	35	98.3	10.8	1.1	-0.0	-0.0	0.9	11	10	1	23	8	90.9	mod	0.0
8	21.2	1	95.7	29.7	1.4	-0.0	-0.0	0.9	11	10	1	22	9	90.9	mod	0.0
9	21.2	2	93.9	0.0	0.9	nan	0.0	0.9	11	10	1	22	9	90.9	mod	0.0
10	21.2	10	96.7	9.4	1.1	-0.0	-0.0	0.9	11	10	1	22	9	90.9	mod	0.0
11	21.2	35	98.3	10.8	1.1	-0.0	-0.0	0.9	11	10	1	22	9	90.9	mod	0.0

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Table 1.4. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 4

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
12	22.2	1	95.7	29.7	1.4	-0.0	-0.0	0.9	11	9	2	22	9	81.8	mod	0.0
13	22.2	2	93.9	0.0	0.9	nan	0.0	0.9	11	9	2	22	9	81.8	mod	0.0
14	22.2	10	96.7	9.4	1.1	-0.0	-0.0	0.9	11	9	2	22	9	81.8	mod	0.0
15	22.2	35	98.3	10.8	1.1	-0.0	-0.0	0.9	11	9	2	22	9	81.8	mod	0.0
16	23.2	1	95.7	29.7	1.4	-0.0	-0.0	0.9	11	9	2	21	10	81.8	mod	0.0
17	23.2	2	93.9	0.0	0.9	nan	0.0	0.9	11	9	2	21	10	81.8	mod	0.0
18	23.2	10	96.7	9.4	1.1	-0.0	-0.0	0.9	11	9	2	21	10	81.8	mod	0.0
19	23.2	35	98.3	10.8	1.1	-0.0	-0.0	0.9	11	9	2	21	10	81.8	mod	0.0
20	24.2	1	72.3	12.8	0.8	0.5	0.2	0.8	11	9	2	18	13	81.8	mod	0.0
21	24.2	2	75.8	0.0	0.8	nan	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
22	24.2	10	71.7	8.5	0.8	0.1	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
23	24.2	35	83.1	12.5	0.9	-0.2	-0.1	0.8	11	9	2	18	13	81.8	mod	0.0
24	25.3	1	72.3	12.8	0.8	0.5	0.2	0.8	11	9	2	18	13	81.8	mod	0.0
25	25.3	2	75.8	0.0	0.8	nan	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
26	25.3	10	71.7	8.5	0.8	0.1	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
27	25.3	35	83.1	12.5	0.9	-0.2	-0.1	0.8	11	9	2	18	13	81.8	mod	0.0
28	26.3	1	72.3	12.8	0.8	0.5	0.2	0.8	11	9	2	18	13	81.8	mod	0.0
29	26.3	2	75.8	0.0	0.8	nan	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
30	26.3	10	71.7	8.5	0.8	0.1	0.0	0.8	11	9	2	18	13	81.8	mod	0.0
31	26.3	35	83.1	12.5	0.9	-0.2	-0.1	0.8	11	9	2	18	13	81.8	mod	0.0
32	27.3	1	72.3	12.8	0.8	0.5	0.2	0.8	11	9	2	16	15	81.8	mod	0.0
33	27.3	2	75.8	0.0	0.8	nan	0.0	0.8	11	9	2	16	15	81.8	mod	0.0
34	27.3	10	71.7	8.5	0.8	0.1	0.0	0.8	11	9	2	16	15	81.8	mod	0.0
35	27.3	35	83.1	12.5	0.9	-0.2	-0.1	0.8	11	9	2	16	15	81.8	mod	0.0
36	28.3	18	98.1	20.0	1.2	-0.0	-0.0	0.7	11	9	2	16	15	81.8	mod	0.0
37	29.3	18	98.1	20.0	1.2	-0.0	-0.0	0.7	11	6	5	13	18	54.5	mod	1.0
38	30.3	18	98.1	20.0	1.2	-0.0	-0.0	0.7	11	6	5	12	19	54.5	mod	0.0
39	31.3	18	98.1	20.0	1.2	-0.0	-0.0	0.7	11	4	7	12	19	36.4	mod	0.0
40	32.3	18	84.9	21.1	1.1	-0.1	-0.0	0.6	11	4	7	12	19	36.4	mod	0.0
41	33.3	18	84.9	21.1	1.1	-0.1	-0.0	0.6	11	3	8	11	20	27.3	mod	0.0
42	34.3	18	84.9	21.1	1.1	-0.1	-0.0	0.6	11	3	8	10	21	27.3	mod	0.0
43	35.4	18	84.9	21.1	1.1	-0.1	-0.0	0.6	11	3	8	10	21	27.3	mod	0.0
44	36.4	18	71.7	19.1	0.9	0.0	0.0	0.6	11	3	8	9	22	27.3	mod	0.0
45	37.4	18	71.7	19.1	0.9	0.0	0.0	0.6	11	3	8	7	24	27.3	mod	0.0
46	38.4	18	71.7	19.1	0.9	0.0	0.0	0.6	11	2	9	7	24	18.2	mod	0.0
47	39.4	18	71.7	19.1	0.9	0.0	0.0	0.6	11	2	9	7	24	18.2	mod	0.0
48	4.0	2	90.9	0.0	0.9	nan	0.0	1.0	8	8	0	33	1	100.0	sev	0.0
49	4.0	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	33	1	100.0	sev	0.0
50	5.1	2	90.9	0.0	0.9	nan	0.0	1.0	8	8	0	32	2	100.0	sev	0.0
51	5.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	32	2	100.0	sev	0.0
52	6.1	2	90.9	0.0	0.9	nan	0.0	1.0	8	8	0	32	2	100.0	sev	0.0
53	6.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	32	2	100.0	sev	0.0
54	7.1	2	90.9	0.0	0.9	nan	0.0	1.0	8	8	0	31	3	100.0	sev	0.0
55	7.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	31	3	100.0	sev	0.0
56	8.1	2	69.7	0.0	0.7	nan	0.0	0.9	8	7	1	27	7	87.5	sev	0.0
57	8.1	35	92.0	19.3	1.1	0.2	0.1	0.9	8	7	1	27	7	87.5	sev	0.0
58	9.1	2	69.7	0.0	0.7	nan	0.0	0.9	8	6	2	26	8	75.0	sev	0.0
59	9.1	35	92.0	19.3	1.1	0.2	0.1	0.9	8	6	2	26	8	75.0	sev	0.0
60	10.1	2	69.7	0.0	0.7	nan	0.0	0.9	8	6	2	26	8	75.0	sev	0.0
61	10.1	35	92.0	19.3	1.1	0.2	0.1	0.9	8	6	2	25	9	75.0	sev	0.0
62	11.1	2	69.7	0.0	0.7	nan	0.0	0.9	8	6	2	25	9	75.0	sev	0.0
63	11.1	35	92.0	19.3	1.1	0.2	0.1	0.9	8	6	2	25	9	75.0	sev	1.0

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Table 1.4. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season MAM-spi3 at region Karamoja with lead time 4

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
64	16.2	10	68.4	29.7	1.0	0.3	0.1	0.7	8	4	4	19	15	50.0	sev	0.0
65	17.2	10	68.4	29.7	1.0	0.3	0.1	0.7	8	4	4	19	15	50.0	sev	0.0
66	18.2	10	68.4	29.7	1.0	0.3	0.1	0.7	8	4	4	17	17	50.0	sev	0.0
67	19.2	10	68.4	29.7	1.0	0.3	0.1	0.7	8	3	5	16	18	37.5	sev	0.0
68	4.0	2	87.9	0.0	0.9	nan	0.0	1.0	8	8	0	33	1	100.0	ext	0.0
69	4.0	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	33	1	100.0	ext	0.0
70	5.1	2	87.9	0.0	0.9	nan	0.0	1.0	8	8	0	32	2	100.0	ext	0.0
71	5.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	32	2	100.0	ext	0.0
72	6.1	2	87.9	0.0	0.9	nan	0.0	1.0	8	8	0	32	2	100.0	ext	0.0
73	6.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	32	2	100.0	ext	0.0
74	7.1	2	87.9	0.0	0.9	nan	0.0	1.0	8	8	0	31	3	100.0	ext	0.0
75	7.1	26	90.9	18.0	1.1	-0.1	-0.1	1.0	8	8	0	31	3	100.0	ext	0.0
76	8.1	2	68.2	0.0	0.7	nan	0.0	0.9	8	7	1	27	7	87.5	ext	0.0
77	8.1	35	92.0	17.9	1.1	0.3	0.2	0.9	8	7	1	27	7	87.5	ext	0.0
78	9.1	2	68.2	0.0	0.7	nan	0.0	0.9	8	6	2	26	8	75.0	ext	0.0
79	9.1	35	92.0	17.9	1.1	0.3	0.2	0.9	8	6	2	26	8	75.0	ext	0.0
80	10.1	2	68.2	0.0	0.7	nan	0.0	0.9	8	6	2	26	8	75.0	ext	0.0
81	10.1	35	92.0	17.9	1.1	0.3	0.2	0.9	8	6	2	26	8	75.0	ext	0.0
82	11.1	2	68.2	0.0	0.7	nan	0.0	0.9	8	6	2	24	10	75.0	ext	1.0
83	11.1	35	92.0	17.9	1.1	0.3	0.2	0.9	8	6	2	24	10	75.0	ext	0.0
84	16.2	10	67.6	32.4	1.0	0.3	0.1	0.7	8	4	4	19	15	50.0	ext	0.0
85	17.2	10	67.6	32.4	1.0	0.3	0.1	0.7	8	4	4	19	15	50.0	ext	0.0
86	18.2	10	67.6	32.4	1.0	0.3	0.1	0.7	8	3	5	16	18	37.5	ext	0.0
87	19.2	10	67.6	32.4	1.0	0.3	0.1	0.7	8	3	5	16	18	37.5	ext	0.0

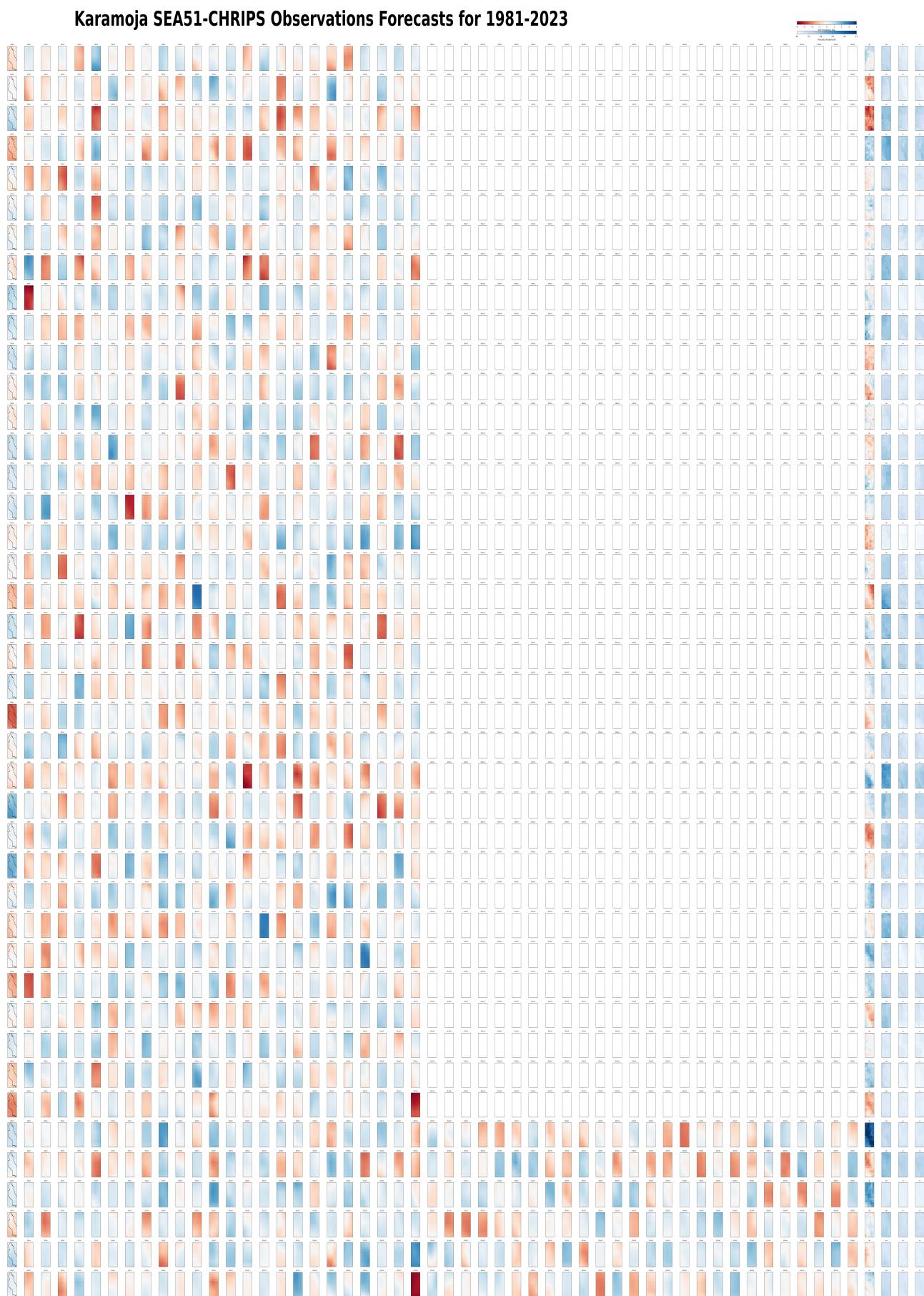


Figure 1.5. Time series map plot of MAM for Karamoja region for the lead time 3

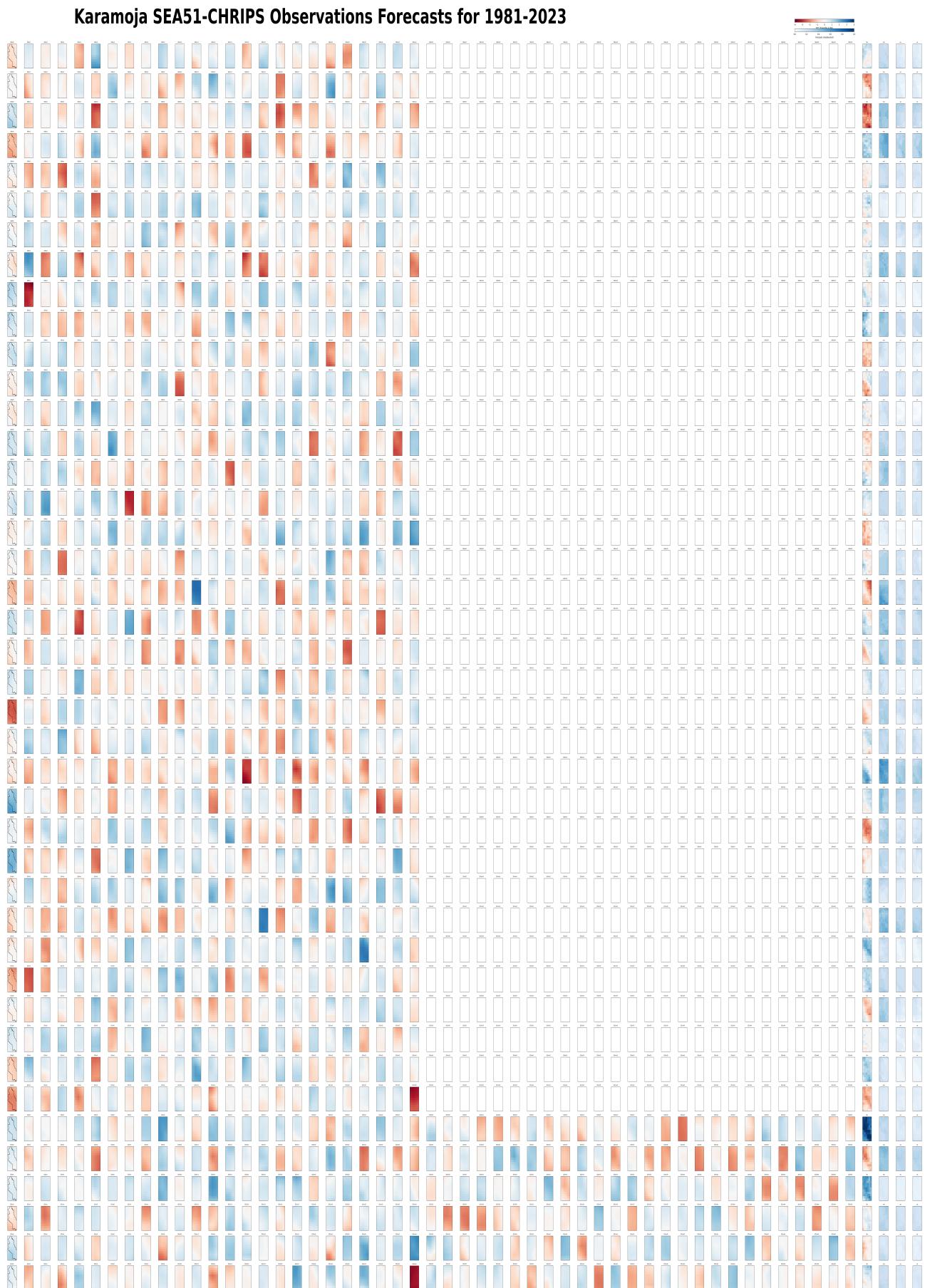


Figure 1.6. Time series map plot of MAM for Karamoja region for the lead time 3

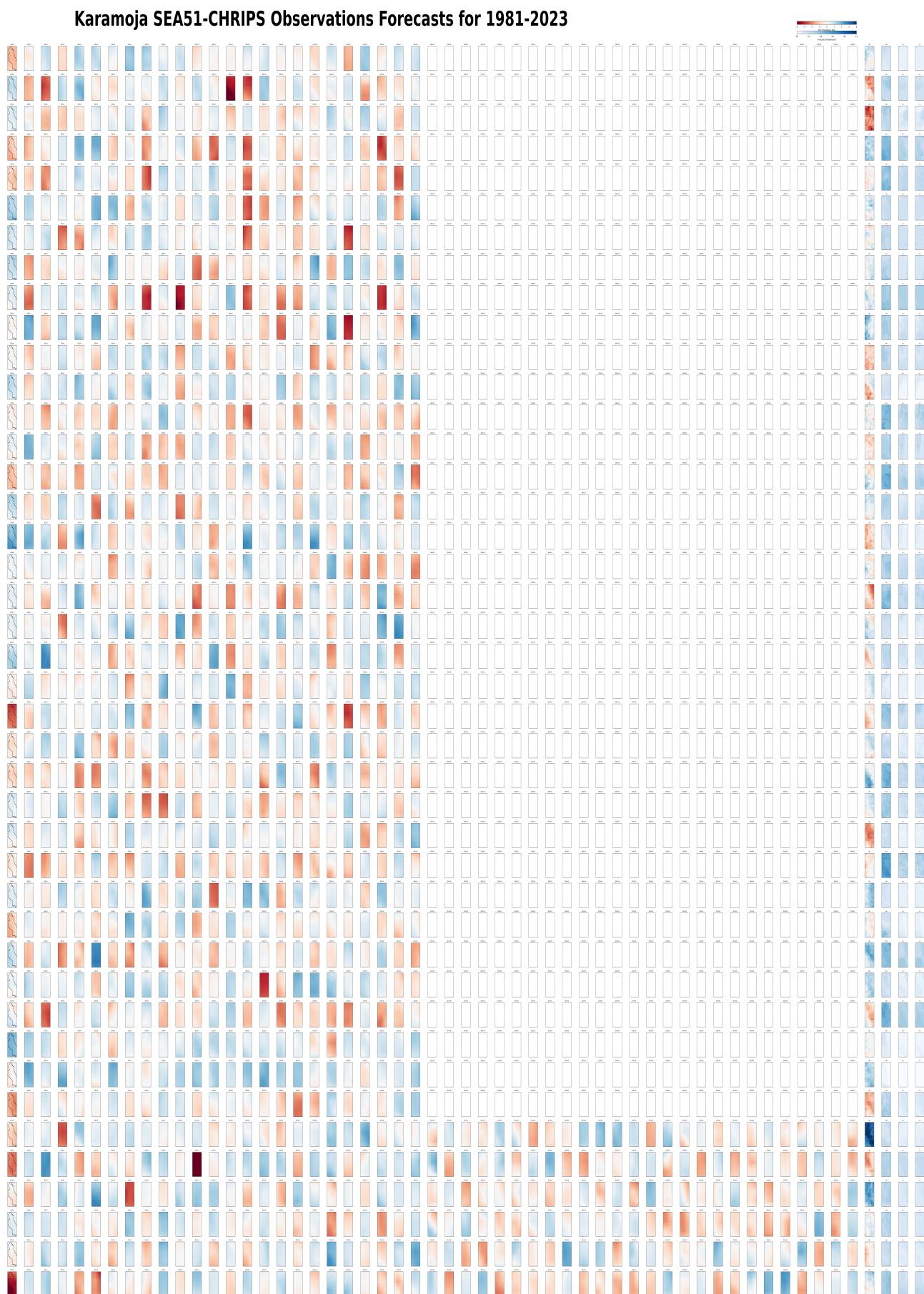


Figure 1.7. Time series map plot of MAM for Karamoja region for the lead time 4

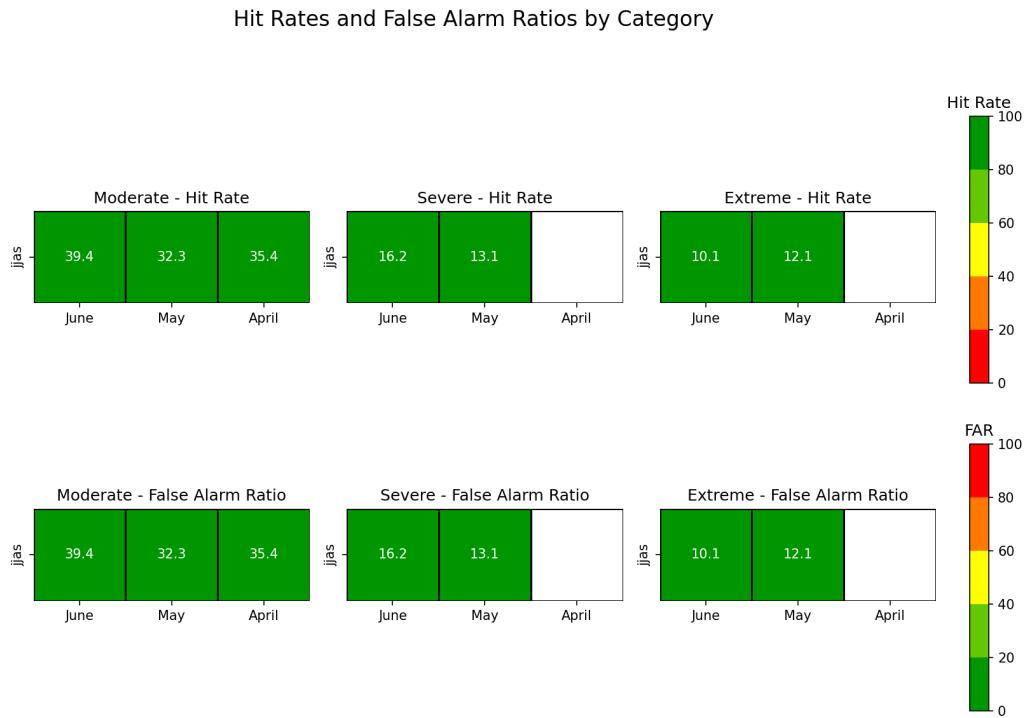


Figure 1.8. Selected JJAS triggers for Karamjоа

1.4 JJAS

The following figures and tables show the analysis related to the June, July, August, and September season SPI4. The outcome of the analysis on selected triggers is shown in Figure 1.8. These trigger values, representing the empirical probability of exceeding given thresholds, can be used along with monthly SEAS51 SPI4 forecasts for JJAS for the given lead time. The bar plot in Figure 1.9 further justifies the selected triggers by showing observed drought categories count (odc) for the analysis period and the overall performance of SPI for JJAS by SEAS51 and the chosen trigger. Tables 1.4 to 1.4 present the availability of alternative trigger values. The maps in Figures 1.5 to 1.7 show the time series plot of the dataset used for forecast verification analysis.

It can be noted that the forecast quality is poorer compared to MAM forecasts, and trigger values are not available for the "Severe" threshold category. This can potentially be improved by bias correction or post-processing methods.

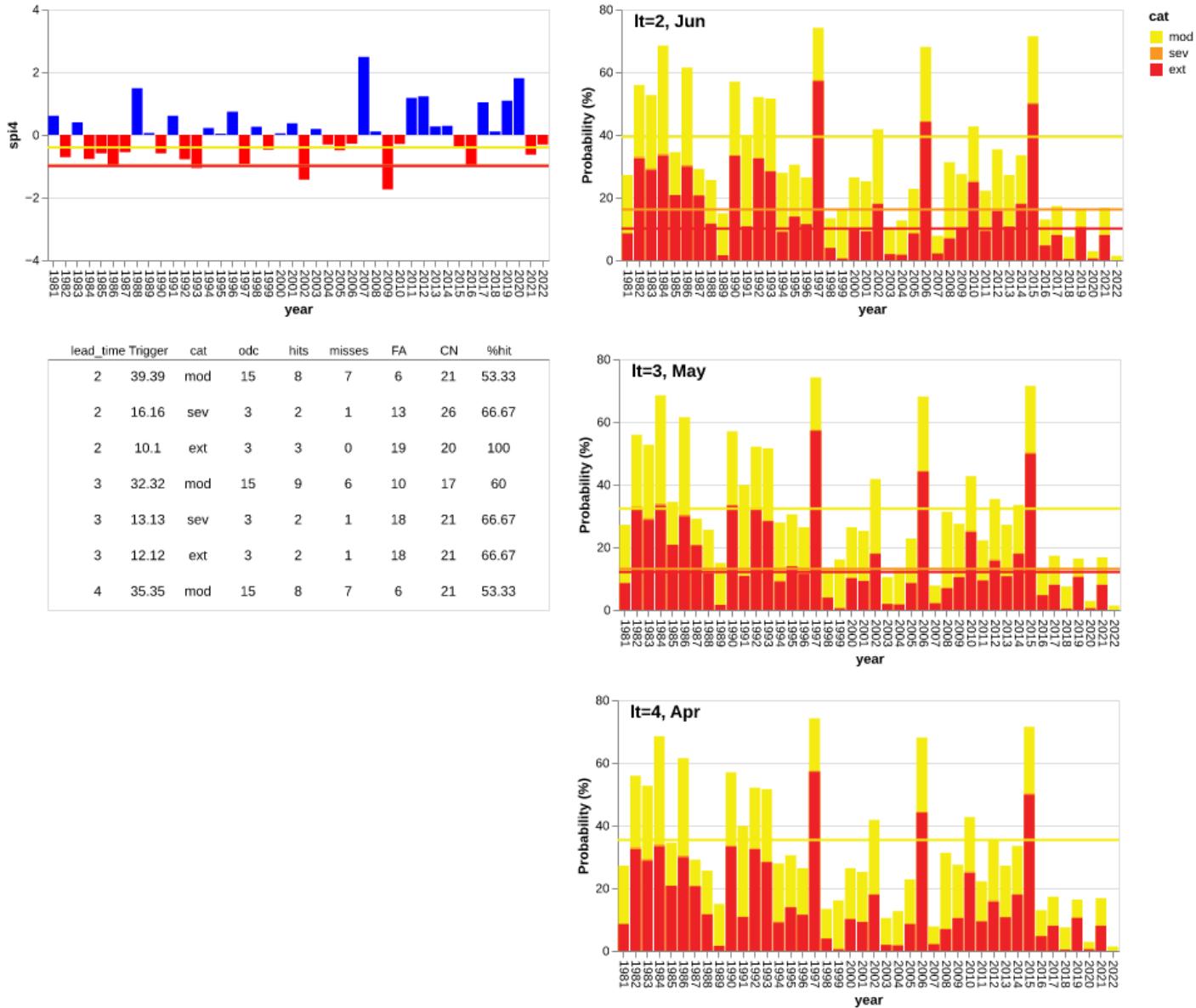


Figure 1.9. Overview of JJAS Hit rate(%) and False alarm ratio(%) per SPI indicator, lead time of the forecasting information in months and region wise. The chosen trigger value is displayed within each tile

Table 1.5. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 2

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
0	1.0	35	82.3	5.6	0.9	0.1	0.0	1.0	15	15	0	26	1	100.0	mod	0.0
1	2.0	35	82.3	5.6	0.9	0.1	0.0	1.0	15	15	0	24	3	100.0	mod	0.0
2	3.0	35	82.3	5.6	0.9	0.1	0.0	1.0	15	15	0	24	3	100.0	mod	0.0
3	8.1	4	97.9	29.2	1.4	-0.0	-0.0	0.9	15	13	2	21	6	86.7	mod	0.0
4	9.1	4	97.9	29.2	1.4	-0.0	-0.0	0.9	15	13	2	20	7	86.7	mod	0.0
5	10.1	4	97.9	29.2	1.4	-0.0	-0.0	0.9	15	13	2	20	7	86.7	mod	0.0
6	11.1	4	97.9	29.2	1.4	-0.0	-0.0	0.9	15	13	2	18	9	86.7	mod	0.0
7	16.2	18	97.4	24.0	1.3	0.5	0.3	0.9	15	12	3	16	11	80.0	mod	0.0
8	16.2	24	97.4	33.9	1.5	0.3	0.2	0.9	15	12	3	16	11	80.0	mod	0.0
9	17.2	18	97.4	24.0	1.3	0.5	0.3	0.9	15	12	3	15	12	80.0	mod	0.0
10	17.2	24	97.4	33.9	1.5	0.3	0.2	0.9	15	12	3	15	12	80.0	mod	0.0
11	18.2	18	97.4	24.0	1.3	0.5	0.3	0.9	15	12	3	14	13	80.0	mod	0.0
12	18.2	24	97.4	33.9	1.5	0.3	0.2	0.9	15	12	3	14	13	80.0	mod	0.0
13	19.2	18	97.4	24.0	1.3	0.5	0.3	0.9	15	12	3	14	13	80.0	mod	0.0
14	19.2	24	97.4	33.9	1.5	0.3	0.2	0.9	15	12	3	14	13	80.0	mod	0.0
15	24.2	1	94.4	19.0	1.2	-0.1	-0.0	0.8	15	10	5	11	16	66.7	mod	0.0
16	25.3	1	94.4	19.0	1.2	-0.1	-0.0	0.8	15	10	5	11	16	66.7	mod	0.0
17	26.3	1	94.4	19.0	1.2	-0.1	-0.0	0.8	15	10	5	11	16	66.7	mod	0.0
18	27.3	1	94.4	19.0	1.2	-0.1	-0.0	0.8	15	10	5	11	16	66.7	mod	0.0
19	28.3	1	79.6	21.8	1.0	-0.2	-0.1	0.8	15	10	5	11	16	66.7	mod	0.0
20	29.3	1	79.6	21.8	1.0	-0.2	-0.1	0.8	15	10	5	11	16	66.7	mod	0.0
21	30.3	1	79.6	21.8	1.0	-0.2	-0.1	0.8	15	10	5	11	16	66.7	mod	0.0
22	31.3	1	79.6	21.8	1.0	-0.2	-0.1	0.8	15	10	5	11	16	66.7	mod	0.0
23	32.3	12	98.2	15.6	1.2	0.1	0.1	0.8	15	10	5	9	18	66.7	mod	0.0
24	32.3	21	95.5	0.0	1.0	nan	0.0	0.8	15	10	5	9	18	66.7	mod	0.0
25	33.3	12	98.2	15.6	1.2	0.1	0.1	0.8	15	10	5	9	18	66.7	mod	0.0
26	33.3	21	95.5	0.0	1.0	nan	0.0	0.8	15	10	5	9	18	66.7	mod	0.0
27	34.3	12	98.2	15.6	1.2	0.1	0.1	0.8	15	10	5	9	18	66.7	mod	0.0
28	34.3	21	95.5	0.0	1.0	nan	0.0	0.8	15	10	5	9	18	66.7	mod	0.0
29	35.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	10	5	8	19	66.7	mod	0.0
30	35.4	21	95.5	0.0	1.0	nan	0.0	0.8	15	10	5	8	19	66.7	mod	0.0
31	36.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	9	6	7	20	60.0	mod	0.0
32	36.4	21	71.2	0.0	0.7	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
33	36.4	28	98.5	0.0	1.0	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
34	37.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	9	6	7	20	60.0	mod	0.0
35	37.4	21	71.2	0.0	0.7	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
36	37.4	28	98.5	0.0	1.0	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
37	38.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	9	6	7	20	60.0	mod	0.0
38	38.4	21	71.2	0.0	0.7	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
39	38.4	28	98.5	0.0	1.0	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
40	39.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	8	7	6	21	53.3	mod	1.0
41	39.4	21	71.2	0.0	0.7	nan	0.0	0.8	15	8	7	6	21	53.3	mod	0.0
42	39.4	28	98.5	0.0	1.0	nan	0.0	0.8	15	8	7	6	21	53.3	mod	0.0
43	40.4	12	89.1	14.0	1.0	0.2	0.1	0.7	15	7	8	6	21	46.7	mod	0.0
44	40.4	28	81.8	0.0	0.8	nan	0.0	0.7	15	7	8	6	21	46.7	mod	0.0
45	41.4	12	89.1	14.0	1.0	0.2	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
46	41.4	28	81.8	0.0	0.8	nan	0.0	0.7	15	6	9	5	22	40.0	mod	0.0
47	42.4	12	89.1	14.0	1.0	0.2	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
48	42.4	28	81.8	0.0	0.8	nan	0.0	0.7	15	6	9	5	22	40.0	mod	0.0
49	43.4	12	89.1	14.0	1.0	0.2	0.1	0.7	15	6	9	4	23	40.0	mod	0.0
50	43.4	28	81.8	0.0	0.8	nan	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
51	44.4	11	90.7	16.9	1.1	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0

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Table 1.5. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 2

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
52	44.4	12	67.3	14.0	0.8	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
53	44.4	28	72.7	0.0	0.7	nan	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
54	45.5	11	90.7	16.9	1.1	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
55	45.5	12	67.3	14.0	0.8	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
56	45.5	28	72.7	0.0	0.7	nan	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
57	46.5	11	90.7	16.9	1.1	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
58	46.5	12	67.3	14.0	0.8	0.1	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
59	46.5	28	72.7	0.0	0.7	nan	0.0	0.7	15	6	9	4	23	40.0	mod	0.0
60	47.5	11	90.7	16.9	1.1	0.1	0.0	0.7	15	5	10	4	23	33.3	mod	0.0
61	47.5	12	67.3	14.0	0.8	0.1	0.0	0.7	15	5	10	4	23	33.3	mod	0.0
62	47.5	28	72.7	0.0	0.7	nan	0.0	0.7	15	5	10	4	23	33.3	mod	0.0
63	48.5	11	88.9	17.2	1.1	0.1	0.0	0.6	15	4	11	4	23	26.7	mod	0.0
64	49.5	11	88.9	17.2	1.1	0.1	0.0	0.6	15	4	11	3	24	26.7	mod	0.0
65	50.5	11	88.9	17.2	1.1	0.1	0.0	0.6	15	4	11	3	24	26.7	mod	0.0
66	51.5	11	88.9	17.2	1.1	0.1	0.0	0.6	15	3	12	3	24	20.0	mod	0.0
67	52.5	3	98.1	5.5	1.0	0.8	0.4	0.6	15	3	12	1	26	20.0	mod	0.0
68	52.5	11	83.3	16.7	1.0	0.1	0.0	0.6	15	3	12	1	26	20.0	mod	0.0
69	53.5	3	98.1	5.5	1.0	0.8	0.4	0.6	15	3	12	1	26	20.0	mod	0.0
70	53.5	11	83.3	16.7	1.0	0.1	0.0	0.6	15	3	12	1	26	20.0	mod	0.0
71	54.5	3	98.1	5.5	1.0	0.8	0.4	0.6	15	3	12	1	26	20.0	mod	0.0
72	54.5	11	83.3	16.7	1.0	0.1	0.0	0.6	15	3	12	1	26	20.0	mod	0.0
73	55.6	3	98.1	5.5	1.0	0.8	0.4	0.6	15	3	12	1	26	20.0	mod	0.0
74	55.6	11	83.3	16.7	1.0	0.1	0.0	0.6	15	3	12	1	26	20.0	mod	0.0
75	56.6	3	88.7	4.1	0.9	0.7	0.3	0.6	15	3	12	1	26	20.0	mod	0.0
76	56.6	11	72.2	17.0	0.9	0.1	0.0	0.6	15	3	12	1	26	20.0	mod	0.0
77	57.6	3	88.7	4.1	0.9	0.7	0.3	0.6	15	3	12	0	27	20.0	mod	0.0
78	57.6	11	72.2	17.0	0.9	0.1	0.0	0.6	15	3	12	0	27	20.0	mod	0.0
79	58.6	3	88.7	4.1	0.9	0.7	0.3	0.6	15	3	12	0	27	20.0	mod	0.0
80	58.6	11	72.2	17.0	0.9	0.1	0.0	0.6	15	3	12	0	27	20.0	mod	0.0
81	59.6	3	88.7	4.1	0.9	0.7	0.3	0.6	15	3	12	0	27	20.0	mod	0.0
82	59.6	11	72.2	17.0	0.9	0.1	0.0	0.6	15	3	12	0	27	20.0	mod	0.0
83	1.0	35	86.2	13.8	1.0	0.8	0.4	1.0	3	3	0	35	4	100.0	sev	0.0
84	2.0	35	86.2	13.8	1.0	0.8	0.4	1.0	3	3	0	30	9	100.0	sev	0.0
85	3.0	35	86.2	13.8	1.0	0.8	0.4	1.0	3	3	0	29	10	100.0	sev	0.0
86	8.1	28	90.8	1.7	0.9	-0.1	-0.0	0.9	3	3	0	20	19	100.0	sev	0.0
87	9.1	28	90.8	1.7	0.9	-0.1	-0.0	0.9	3	3	0	20	19	100.0	sev	0.0
88	10.1	28	90.8	1.7	0.9	-0.1	-0.0	0.9	3	3	0	19	20	100.0	sev	0.0
89	11.1	28	90.8	1.7	0.9	-0.1	-0.0	0.9	3	3	0	17	22	100.0	sev	0.0
90	12.1	21	98.4	7.7	1.1	-0.0	-0.0	0.8	3	3	0	17	22	100.0	sev	0.0
91	12.1	28	66.2	0.0	0.7	0.7	0.0	0.8	3	3	0	17	22	100.0	sev	0.0
92	13.1	21	98.4	7.7	1.1	-0.0	-0.0	0.8	3	3	0	15	24	100.0	sev	0.0
93	13.1	28	66.2	0.0	0.7	0.7	0.0	0.8	3	3	0	15	24	100.0	sev	0.0
94	14.1	21	98.4	7.7	1.1	-0.0	-0.0	0.8	3	3	0	15	24	100.0	sev	0.0
95	14.1	28	66.2	0.0	0.7	0.7	0.0	0.8	3	3	0	15	24	100.0	sev	0.0
96	15.2	21	98.4	7.7	1.1	-0.0	-0.0	0.8	3	3	0	15	24	100.0	sev	0.0
97	15.2	28	66.2	0.0	0.7	0.7	0.0	0.8	3	3	0	15	24	100.0	sev	0.0
98	16.2	21	95.1	7.9	1.0	-0.0	-0.0	0.8	3	2	1	13	26	66.7	sev	1.0
99	17.2	21	95.1	7.9	1.0	-0.0	-0.0	0.8	3	2	1	12	27	66.7	sev	0.0
100	18.2	21	95.1	7.9	1.0	-0.0	-0.0	0.8	3	2	1	12	27	66.7	sev	0.0
101	19.2	21	95.1	7.9	1.0	-0.0	-0.0	0.8	3	2	1	11	28	66.7	sev	0.0
102	20.2	21	77.0	4.1	0.8	0.4	0.1	0.7	3	2	1	11	28	66.7	sev	0.0
103	21.2	21	77.0	4.1	0.8	0.4	0.1	0.7	3	2	1	10	29	66.7	sev	0.0

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Table 1.5. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 2

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
104	22.2	21	77.0	4.1	0.8	0.4	0.1	0.7	3	2	1	9	30	66.7	sev	0.0
105	23.2	21	77.0	4.1	0.8	0.4	0.1	0.7	3	2	1	8	31	66.7	sev	0.0
106	1.0	35	82.1	14.8	1.0	0.7	0.4	1.0	3	3	0	35	4	100.0	ext	0.0
107	2.0	35	82.1	14.8	1.0	0.7	0.4	1.0	3	3	0	30	9	100.0	ext	0.0
108	3.0	35	82.1	14.8	1.0	0.7	0.4	1.0	3	3	0	29	10	100.0	ext	0.0
109	8.1	28	84.6	1.8	0.9	-0.2	-0.0	0.8	3	3	0	20	19	100.0	ext	0.0
110	9.1	28	84.6	1.8	0.9	-0.2	-0.0	0.8	3	3	0	20	19	100.0	ext	0.0
111	10.1	28	84.6	1.8	0.9	-0.2	-0.0	0.8	3	3	0	19	20	100.0	ext	1.0
112	11.1	28	84.6	1.8	0.9	-0.2	-0.0	0.8	3	3	0	17	22	100.0	ext	0.0
113	12.1	21	98.3	9.2	1.1	-0.0	-0.0	0.8	3	3	0	17	22	100.0	ext	0.0
114	13.1	21	98.3	9.2	1.1	-0.0	-0.0	0.8	3	3	0	15	24	100.0	ext	0.0
115	14.1	21	98.3	9.2	1.1	-0.0	-0.0	0.8	3	3	0	15	24	100.0	ext	0.0
116	15.2	21	98.3	9.2	1.1	-0.0	-0.0	0.8	3	2	1	14	25	66.7	ext	0.0
117	16.2	21	91.7	9.8	1.0	-0.1	-0.0	0.8	3	2	1	12	27	66.7	ext	0.0
118	17.2	21	91.7	9.8	1.0	-0.1	-0.0	0.8	3	2	1	12	27	66.7	ext	0.0
119	18.2	21	91.7	9.8	1.0	-0.1	-0.0	0.8	3	2	1	12	27	66.7	ext	0.0
120	19.2	21	91.7	9.8	1.0	-0.1	-0.0	0.8	3	2	1	11	28	66.7	ext	0.0
121	20.2	21	68.3	6.8	0.7	0.2	0.0	0.7	3	2	1	10	29	66.7	ext	0.0
122	21.2	21	68.3	6.8	0.7	0.2	0.0	0.7	3	2	1	9	30	66.7	ext	0.0
123	22.2	21	68.3	6.8	0.7	0.2	0.0	0.7	3	2	1	9	30	66.7	ext	0.0
124	23.2	21	68.3	6.8	0.7	0.2	0.0	0.7	3	2	1	7	32	66.7	ext	0.0

Table 1.6. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 3

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
0	1.0	35	98.4	6.2	1.0	-0.0	-0.0	1.0	15	15	0	27	0	100.0	mod	0.0
1	2.0	35	98.4	6.2	1.0	-0.0	-0.0	1.0	15	15	0	25	2	100.0	mod	0.0
2	3.0	35	98.4	6.2	1.0	-0.0	-0.0	1.0	15	15	0	25	2	100.0	mod	0.0
3	4.0	35	88.7	0.0	0.9	0.9	0.2	1.0	15	15	0	25	2	100.0	mod	0.0
4	5.1	35	88.7	0.0	0.9	0.9	0.2	1.0	15	15	0	25	2	100.0	mod	0.0
5	6.1	35	88.7	0.0	0.9	0.9	0.2	1.0	15	15	0	23	4	100.0	mod	0.0
6	7.1	35	88.7	0.0	0.9	0.9	0.2	1.0	15	15	0	21	6	100.0	mod	0.0
7	8.1	35	71.0	0.0	0.7	0.7	0.1	0.9	15	14	1	21	6	93.3	mod	0.0
8	9.1	35	71.0	0.0	0.7	0.7	0.1	0.9	15	14	1	21	6	93.3	mod	0.0
9	10.1	35	71.0	0.0	0.7	0.7	0.1	0.9	15	14	1	21	6	93.3	mod	0.0
10	11.1	35	71.0	0.0	0.7	0.7	0.1	0.9	15	14	1	21	6	93.3	mod	0.0
11	12.1	23	70.8	32.0	1.0	0.5	0.3	0.9	15	12	3	20	7	80.0	mod	0.0
12	13.1	23	70.8	32.0	1.0	0.5	0.3	0.9	15	12	3	19	8	80.0	mod	0.0
13	14.1	23	70.8	32.0	1.0	0.5	0.3	0.9	15	12	3	16	11	80.0	mod	0.0
14	15.2	23	70.8	32.0	1.0	0.5	0.3	0.9	15	11	4	16	11	73.3	mod	0.0
15	20.2	28	71.2	0.0	0.7	nan	0.0	0.8	15	11	4	14	13	73.3	mod	0.0
16	21.2	28	71.2	0.0	0.7	nan	0.0	0.8	15	11	4	14	13	73.3	mod	0.0
17	22.2	28	71.2	0.0	0.7	nan	0.0	0.8	15	11	4	14	13	73.3	mod	0.0
18	23.2	28	71.2	0.0	0.7	nan	0.0	0.8	15	11	4	14	13	73.3	mod	0.0
19	24.2	12	98.2	14.3	1.1	0.2	0.1	0.8	15	10	5	12	15	66.7	mod	0.0
20	24.2	21	97.0	0.0	1.0	nan	0.0	0.8	15	10	5	12	15	66.7	mod	0.0
21	25.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	11	16	60.0	mod	0.0
22	25.3	21	97.0	0.0	1.0	nan	0.0	0.8	15	9	6	11	16	60.0	mod	0.0
23	26.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	11	16	60.0	mod	0.0
24	26.3	21	97.0	0.0	1.0	nan	0.0	0.8	15	9	6	11	16	60.0	mod	0.0

Continued on next page

Table 1.6. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 3

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
25	27.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	11	16	60.0	mod	0.0
26	27.3	21	97.0	0.0	1.0	nan	0.0	0.8	15	9	6	11	16	60.0	mod	0.0
27	28.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	10	17	60.0	mod	0.0
28	28.3	21	69.7	0.0	0.7	nan	0.0	0.8	15	9	6	10	17	60.0	mod	0.0
29	29.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	10	17	60.0	mod	0.0
30	29.3	21	69.7	0.0	0.7	nan	0.0	0.8	15	9	6	10	17	60.0	mod	0.0
31	30.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	10	17	60.0	mod	0.0
32	30.3	21	69.7	0.0	0.7	nan	0.0	0.8	15	9	6	10	17	60.0	mod	0.0
33	31.3	12	98.2	14.3	1.1	0.2	0.1	0.8	15	9	6	10	17	60.0	mod	0.0
34	31.3	21	69.7	0.0	0.7	nan	0.0	0.8	15	9	6	10	17	60.0	mod	0.0
35	32.3	12	94.5	13.3	1.1	0.2	0.1	0.8	15	9	6	10	17	60.0	mod	1.0
36	33.3	12	94.5	13.3	1.1	0.2	0.1	0.8	15	7	8	10	17	46.7	mod	0.0
37	34.3	12	94.5	13.3	1.1	0.2	0.1	0.8	15	7	8	9	18	46.7	mod	0.0
38	35.4	12	94.5	13.3	1.1	0.2	0.1	0.8	15	7	8	9	18	46.7	mod	0.0
39	36.4	3	86.8	20.7	1.1	-0.1	-0.0	0.7	15	7	8	9	18	46.7	mod	0.0
40	36.4	9	68.1	25.6	0.9	0.1	0.0	0.7	15	7	8	9	18	46.7	mod	0.0
41	36.4	12	94.5	13.3	1.1	0.2	0.1	0.7	15	7	8	9	18	46.7	mod	0.0
42	37.4	3	86.8	20.7	1.1	-0.1	-0.0	0.7	15	7	8	6	21	46.7	mod	0.0
43	37.4	9	68.1	25.6	0.9	0.1	0.0	0.7	15	7	8	6	21	46.7	mod	0.0
44	37.4	12	94.5	13.3	1.1	0.2	0.1	0.7	15	7	8	6	21	46.7	mod	0.0
45	38.4	3	86.8	20.7	1.1	-0.1	-0.0	0.7	15	7	8	6	21	46.7	mod	0.0
46	38.4	9	68.1	25.6	0.9	0.1	0.0	0.7	15	7	8	6	21	46.7	mod	0.0
47	38.4	12	94.5	13.3	1.1	0.2	0.1	0.7	15	7	8	6	21	46.7	mod	0.0
48	39.4	3	86.8	20.7	1.1	-0.1	-0.0	0.7	15	7	8	5	22	46.7	mod	0.0
49	39.4	9	68.1	25.6	0.9	0.1	0.0	0.7	15	7	8	5	22	46.7	mod	0.0
50	39.4	12	94.5	13.3	1.1	0.2	0.1	0.7	15	7	8	5	22	46.7	mod	0.0
51	40.4	3	67.9	25.0	0.9	-0.2	-0.1	0.7	15	6	9	5	22	40.0	mod	0.0
52	40.4	5	97.7	32.3	1.4	0.1	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
53	40.4	12	92.7	13.6	1.1	0.2	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
54	40.4	20	80.0	33.3	1.2	0.8	0.4	0.7	15	6	9	5	22	40.0	mod	0.0
55	41.4	3	67.9	25.0	0.9	-0.2	-0.1	0.7	15	6	9	5	22	40.0	mod	0.0
56	41.4	5	97.7	32.3	1.4	0.1	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
57	41.4	12	92.7	13.6	1.1	0.2	0.1	0.7	15	6	9	5	22	40.0	mod	0.0
58	41.4	20	80.0	33.3	1.2	0.8	0.4	0.7	15	6	9	5	22	40.0	mod	0.0
59	42.4	3	67.9	25.0	0.9	-0.2	-0.1	0.7	15	6	9	4	23	40.0	mod	0.0
60	42.4	5	97.7	32.3	1.4	0.1	0.1	0.7	15	6	9	4	23	40.0	mod	0.0
61	42.4	12	92.7	13.6	1.1	0.2	0.1	0.7	15	6	9	4	23	40.0	mod	0.0
62	42.4	20	80.0	33.3	1.2	0.8	0.4	0.7	15	6	9	4	23	40.0	mod	0.0
63	43.4	3	67.9	25.0	0.9	-0.2	-0.1	0.7	15	6	9	3	24	40.0	mod	0.0
64	43.4	5	97.7	32.3	1.4	0.1	0.1	0.7	15	6	9	3	24	40.0	mod	0.0
65	43.4	12	92.7	13.6	1.1	0.2	0.1	0.7	15	6	9	3	24	40.0	mod	0.0
66	43.4	20	80.0	33.3	1.2	0.8	0.4	0.7	15	6	9	3	24	40.0	mod	0.0
67	44.4	5	79.1	33.3	1.2	0.1	0.0	0.7	15	5	10	3	24	33.3	mod	0.0
68	44.4	12	85.5	11.3	1.0	0.3	0.1	0.7	15	5	10	3	24	33.3	mod	0.0
69	45.5	5	79.1	33.3	1.2	0.1	0.0	0.7	15	5	10	3	24	33.3	mod	0.0
70	45.5	12	85.5	11.3	1.0	0.3	0.1	0.7	15	5	10	3	24	33.3	mod	0.0
71	46.5	5	79.1	33.3	1.2	0.1	0.0	0.7	15	5	10	3	24	33.3	mod	0.0
72	46.5	12	85.5	11.3	1.0	0.3	0.1	0.7	15	5	10	3	24	33.3	mod	0.0
73	47.5	5	79.1	33.3	1.2	0.1	0.0	0.7	15	5	10	3	24	33.3	mod	0.0
74	47.5	12	85.5	11.3	1.0	0.3	0.1	0.7	15	5	10	3	24	33.3	mod	0.0
75	48.5	1	94.4	17.7	1.1	0.0	0.0	0.6	15	5	10	3	24	33.3	mod	0.0
76	48.5	12	83.6	11.5	0.9	0.3	0.1	0.6	15	5	10	3	24	33.3	mod	0.0

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Table 1.6. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 3

tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td	
77	49.5	1	94.4	17.7	1.1	0.0	0.0	0.6	15	4	11	3	24	26.7	mod	0.0
78	49.5	12	83.6	11.5	0.9	0.3	0.1	0.6	15	4	11	3	24	26.7	mod	0.0
79	50.5	1	94.4	17.7	1.1	0.0	0.0	0.6	15	4	11	3	24	26.7	mod	0.0
80	50.5	12	83.6	11.5	0.9	0.3	0.1	0.6	15	4	11	3	24	26.7	mod	0.0
81	51.5	1	94.4	17.7	1.1	0.0	0.0	0.6	15	4	11	3	24	26.7	mod	0.0
82	51.5	12	83.6	11.5	0.9	0.3	0.1	0.6	15	4	11	3	24	26.7	mod	0.0
83	52.5	1	77.8	14.3	0.9	0.2	0.1	0.6	15	3	12	3	24	20.0	mod	0.0
84	53.5	1	77.8	14.3	0.9	0.2	0.1	0.6	15	3	12	3	24	20.0	mod	0.0
85	54.5	1	77.8	14.3	0.9	0.2	0.1	0.6	15	3	12	3	24	20.0	mod	0.0
86	55.6	1	77.8	14.3	0.9	0.2	0.1	0.6	15	3	12	3	24	20.0	mod	0.0
87	56.6	11	88.9	17.2	1.1	0.1	0.0	0.6	15	3	12	3	24	20.0	mod	0.0
88	57.6	11	88.9	17.2	1.1	0.1	0.0	0.6	15	3	12	3	24	20.0	mod	0.0
89	58.6	11	88.9	17.2	1.1	0.1	0.0	0.6	15	2	13	3	24	13.3	mod	0.0
90	59.6	11	88.9	17.2	1.1	0.1	0.0	0.6	15	2	13	2	25	13.3	mod	0.0
91	76.8	16	95.7	31.2	1.4	-0.0	-0.0	0.5	15	1	14	0	27	6.7	mod	0.0
92	77.8	16	95.7	31.2	1.4	-0.0	-0.0	0.5	15	1	14	0	27	6.7	mod	0.0
93	78.8	16	95.7	31.2	1.4	-0.0	-0.0	0.5	15	1	14	0	27	6.7	mod	0.0
94	79.8	16	95.7	31.2	1.4	-0.0	-0.0	0.5	15	1	14	0	27	6.7	mod	0.0
95	80.8	16	93.5	29.5	1.3	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
96	81.8	16	93.5	29.5	1.3	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
97	82.8	16	93.5	29.5	1.3	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
98	83.8	16	93.5	29.5	1.3	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
99	84.8	16	87.0	29.8	1.2	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
100	85.9	16	87.0	29.8	1.2	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
101	86.9	16	87.0	29.8	1.2	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
102	87.9	16	87.0	29.8	1.2	0.0	0.0	0.5	15	1	14	0	27	6.7	mod	0.0
103	88.9	16	65.2	34.8	1.0	-0.1	-0.1	0.5	15	1	14	0	27	6.7	mod	0.0
104	89.9	16	65.2	34.8	1.0	-0.1	-0.1	0.5	15	1	14	0	27	6.7	mod	0.0
105	90.9	16	65.2	34.8	1.0	-0.1	-0.1	0.5	15	15	0	27	0	100.0	mod	0.0
106	91.9	16	65.2	34.8	1.0	-0.1	-0.1	0.5	15	15	0	27	0	100.0	mod	0.0
107	1.0	35	96.6	30.0	1.4	0.6	0.3	0.9	3	3	0	36	3	100.0	sev	0.0
108	2.0	35	96.6	30.0	1.4	0.6	0.3	0.9	3	3	0	33	6	100.0	sev	0.0
109	3.0	35	96.6	30.0	1.4	0.6	0.3	0.9	3	2	1	29	10	66.7	sev	0.0
110	12.1	21	96.7	7.8	1.0	-0.0	-0.0	0.8	3	2	1	18	21	66.7	sev	0.0
111	13.1	21	96.7	7.8	1.0	-0.0	-0.0	0.8	3	2	1	18	21	66.7	sev	1.0
112	14.1	21	96.7	7.8	1.0	-0.0	-0.0	0.8	3	1	2	18	21	33.3	sev	0.0
113	15.2	21	96.7	7.8	1.0	-0.0	-0.0	0.8	3	1	2	16	23	33.3	sev	0.0
114	16.2	21	77.0	2.1	0.8	0.6	0.1	0.7	3	1	2	14	25	33.3	sev	0.0
115	17.2	21	77.0	2.1	0.8	0.6	0.1	0.7	3	1	2	14	25	33.3	sev	0.0
116	18.2	21	77.0	2.1	0.8	0.6	0.1	0.7	3	1	2	14	25	33.3	sev	0.0
117	19.2	21	77.0	2.1	0.8	0.6	0.1	0.7	3	0	3	12	27	0.0	sev	0.0
118	1.0	35	96.4	32.5	1.4	0.6	0.3	0.9	3	3	0	35	4	100.0	ext	0.0
119	2.0	35	96.4	32.5	1.4	0.6	0.3	0.9	3	3	0	33	6	100.0	ext	0.0
120	3.0	35	96.4	32.5	1.4	0.6	0.3	0.9	3	2	1	29	10	66.7	ext	0.0
121	12.1	21	96.7	9.4	1.1	-0.0	-0.0	0.8	3	2	1	18	21	66.7	ext	1.0
122	13.1	21	96.7	9.4	1.1	-0.0	-0.0	0.8	3	1	2	18	21	33.3	ext	0.0
123	14.1	21	96.7	9.4	1.1	-0.0	-0.0	0.8	3	1	2	18	21	33.3	ext	0.0
124	15.2	21	96.7	9.4	1.1	-0.0	-0.0	0.8	3	1	2	15	24	33.3	ext	0.0
125	16.2	21	76.7	4.2	0.8	0.4	0.1	0.7	3	1	2	14	25	33.3	ext	0.0
126	17.2	21	76.7	4.2	0.8	0.4	0.1	0.7	3	1	2	14	25	33.3	ext	0.0
127	18.2	21	76.7	4.2	0.8	0.4	0.1	0.7	3	1	2	14	25	33.3	ext	0.0
128	19.2	21	76.7	4.2	0.8	0.4	0.1	0.7	3	0	3	11	28	0.0	ext	0.0

Table 1.7. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 4

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
0	8.1	35	71.0	2.2	0.7	0.5	0.1	1.0	15	15	0	23	4	100.0	mod	0.0
1	9.1	35	71.0	2.2	0.7	0.5	0.1	1.0	15	15	0	23	4	100.0	mod	0.0
2	10.1	35	71.0	2.2	0.7	0.5	0.1	1.0	15	15	0	23	4	100.0	mod	0.0
3	11.1	35	71.0	2.2	0.7	0.5	0.1	1.0	15	15	0	22	5	100.0	mod	0.0
4	20.2	28	98.5	0.0	1.0	nan	0.0	0.9	15	12	3	17	10	80.0	mod	0.0
5	21.2	28	98.5	0.0	1.0	nan	0.0	0.9	15	12	3	17	10	80.0	mod	0.0
6	22.2	28	98.5	0.0	1.0	nan	0.0	0.9	15	12	3	16	11	80.0	mod	0.0
7	23.2	28	98.5	0.0	1.0	nan	0.0	0.9	15	11	4	16	11	73.3	mod	0.0
8	24.2	28	72.7	0.0	0.7	nan	0.0	0.8	15	11	4	16	11	73.3	mod	0.0
9	25.3	28	72.7	0.0	0.7	nan	0.0	0.8	15	11	4	15	12	73.3	mod	0.0
10	26.3	28	72.7	0.0	0.7	nan	0.0	0.8	15	11	4	14	13	73.3	mod	0.0
11	27.3	28	72.7	0.0	0.7	nan	0.0	0.8	15	11	4	10	17	73.3	mod	0.0
12	28.3	4	95.7	25.0	1.3	0.2	0.1	0.8	15	10	5	9	18	66.7	mod	0.0
13	28.3	21	86.4	0.0	0.9	nan	0.0	0.8	15	10	5	9	18	66.7	mod	0.0
14	29.3	4	95.7	25.0	1.3	0.2	0.1	0.8	15	9	6	9	18	60.0	mod	0.0
15	29.3	21	86.4	0.0	0.9	nan	0.0	0.8	15	9	6	9	18	60.0	mod	0.0
16	30.3	4	95.7	25.0	1.3	0.2	0.1	0.8	15	9	6	9	18	60.0	mod	0.0
17	30.3	21	86.4	0.0	0.9	nan	0.0	0.8	15	9	6	9	18	60.0	mod	0.0
18	31.3	4	95.7	25.0	1.3	0.2	0.1	0.8	15	9	6	7	20	60.0	mod	0.0
19	31.3	21	86.4	0.0	0.9	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
20	32.3	21	81.8	0.0	0.8	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
21	33.3	21	81.8	0.0	0.8	nan	0.0	0.8	15	9	6	7	20	60.0	mod	0.0
22	34.3	21	81.8	0.0	0.8	nan	0.0	0.8	15	9	6	6	21	60.0	mod	0.0
23	35.4	21	81.8	0.0	0.8	nan	0.0	0.8	15	8	7	6	21	53.3	mod	1.0
24	36.4	1	96.3	18.8	1.2	-0.0	-0.0	0.8	15	8	7	5	22	53.3	mod	0.0
25	36.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	8	7	5	22	53.3	mod	0.0
26	36.4	21	78.8	0.0	0.8	nan	0.0	0.8	15	8	7	5	22	53.3	mod	0.0
27	37.4	1	96.3	18.8	1.2	-0.0	-0.0	0.8	15	8	7	5	22	53.3	mod	0.0
28	37.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	8	7	5	22	53.3	mod	0.0
29	37.4	21	78.8	0.0	0.8	nan	0.0	0.8	15	8	7	5	22	53.3	mod	0.0
30	38.4	1	96.3	18.8	1.2	-0.0	-0.0	0.8	15	8	7	5	22	53.3	mod	0.0
31	38.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	8	7	5	22	53.3	mod	0.0
32	38.4	21	78.8	0.0	0.8	nan	0.0	0.8	15	8	7	5	22	53.3	mod	0.0
33	39.4	1	96.3	18.8	1.2	-0.0	-0.0	0.8	15	8	7	5	22	53.3	mod	0.0
34	39.4	12	98.2	15.6	1.2	0.1	0.1	0.8	15	8	7	5	22	53.3	mod	0.0
35	39.4	21	78.8	0.0	0.8	nan	0.0	0.8	15	8	7	5	22	53.3	mod	0.0
36	40.4	1	85.2	20.7	1.1	-0.1	-0.1	0.7	15	8	7	4	23	53.3	mod	0.0
37	40.4	11	96.3	17.5	1.2	0.0	0.0	0.7	15	8	7	4	23	53.3	mod	0.0
38	40.4	12	98.2	12.9	1.1	0.3	0.2	0.7	15	8	7	4	23	53.3	mod	0.0
39	41.4	1	85.2	20.7	1.1	-0.1	-0.1	0.7	15	8	7	4	23	53.3	mod	0.0
40	41.4	11	96.3	17.5	1.2	0.0	0.0	0.7	15	8	7	4	23	53.3	mod	0.0
41	41.4	12	98.2	12.9	1.1	0.3	0.2	0.7	15	8	7	4	23	53.3	mod	0.0
42	42.4	1	85.2	20.7	1.1	-0.1	-0.1	0.7	15	7	8	4	23	46.7	mod	0.0
43	42.4	11	96.3	17.5	1.2	0.0	0.0	0.7	15	7	8	4	23	46.7	mod	0.0
44	42.4	12	98.2	12.9	1.1	0.3	0.2	0.7	15	7	8	4	23	46.7	mod	0.0
45	43.4	1	85.2	20.7	1.1	-0.1	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
46	43.4	11	96.3	17.5	1.2	0.0	0.0	0.7	15	7	8	3	24	46.7	mod	0.0
47	43.4	12	98.2	12.9	1.1	0.3	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
48	44.4	1	81.5	21.4	1.0	-0.2	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
49	44.4	11	72.2	20.4	0.9	-0.1	-0.0	0.7	15	7	8	3	24	46.7	mod	0.0
50	44.4	12	83.6	8.0	0.9	0.5	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
51	45.5	1	81.5	21.4	1.0	-0.2	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0

Continued on next page

Table 1.7. Available triggers with >0.5 AUROC, >50% HR, <35% FAR for season JJAS-spi4 at region Karamoja with lead time 4

	tv	year#	hr	far	bs	hk	hs	au	odc	h	m	FA	CN	h%	cat	td
52	45.5	11	72.2	20.4	0.9	-0.1	-0.0	0.7	15	7	8	3	24	46.7	mod	0.0
53	45.5	12	83.6	8.0	0.9	0.5	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
54	46.5	1	81.5	21.4	1.0	-0.2	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
55	46.5	11	72.2	20.4	0.9	-0.1	-0.0	0.7	15	7	8	3	24	46.7	mod	0.0
56	46.5	12	83.6	8.0	0.9	0.5	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
57	47.5	1	81.5	21.4	1.0	-0.2	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
58	47.5	11	72.2	20.4	0.9	-0.1	-0.0	0.7	15	7	8	3	24	46.7	mod	0.0
59	47.5	12	83.6	8.0	0.9	0.5	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
60	48.5	1	74.1	23.1	1.0	-0.3	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
61	48.5	9	89.4	27.6	1.2	0.1	0.0	0.7	15	7	8	3	24	46.7	mod	0.0
62	48.5	12	78.2	4.4	0.8	0.6	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
63	49.5	1	74.1	23.1	1.0	-0.3	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
64	49.5	9	89.4	27.6	1.2	0.1	0.0	0.7	15	7	8	3	24	46.7	mod	0.0
65	49.5	12	78.2	4.4	0.8	0.6	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
66	50.5	1	74.1	23.1	1.0	-0.3	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
67	50.5	9	89.4	27.6	1.2	0.1	0.0	0.7	15	7	8	3	24	46.7	mod	0.0
68	50.5	12	78.2	4.4	0.8	0.6	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
69	51.5	1	74.1	23.1	1.0	-0.3	-0.1	0.7	15	7	8	3	24	46.7	mod	0.0
70	51.5	9	89.4	27.6	1.2	0.1	0.0	0.7	15	7	8	3	24	46.7	mod	0.0
71	51.5	12	78.2	4.4	0.8	0.6	0.2	0.7	15	7	8	3	24	46.7	mod	0.0
72	56.6	5	90.7	27.8	1.3	0.3	0.1	0.6	15	4	11	2	25	26.7	mod	0.0
73	57.6	5	90.7	27.8	1.3	0.3	0.1	0.6	15	3	12	2	25	20.0	mod	0.0
74	58.6	5	90.7	27.8	1.3	0.3	0.1	0.6	15	3	12	2	25	20.0	mod	0.0
75	59.6	5	90.7	27.8	1.3	0.3	0.1	0.6	15	3	12	2	25	20.0	mod	0.0
76	60.6	3	98.1	20.0	1.2	-0.0	-0.0	0.6	15	3	12	2	25	20.0	mod	0.0
77	61.6	3	98.1	20.0	1.2	-0.0	-0.0	0.6	15	2	13	2	25	13.3	mod	0.0
78	62.6	3	98.1	20.0	1.2	-0.0	-0.0	0.6	15	2	13	2	25	13.3	mod	0.0
79	63.6	3	98.1	20.0	1.2	-0.0	-0.0	0.6	15	2	13	2	25	13.3	mod	0.0
80	68.7	16	84.8	26.4	1.2	0.1	0.1	0.5	15	1	14	1	26	6.7	mod	0.0
81	69.7	16	84.8	26.4	1.2	0.1	0.1	0.5	15	1	14	1	26	6.7	mod	0.0
82	70.7	16	84.8	26.4	1.2	0.1	0.1	0.5	15	1	14	1	26	6.7	mod	0.0
83	71.7	16	84.8	26.4	1.2	0.1	0.1	0.5	15	1	14	0	27	6.7	mod	0.0
84	72.7	16	65.2	23.1	0.8	0.2	0.1	0.5	15	1	14	0	27	6.7	mod	0.0
85	73.7	16	65.2	23.1	0.8	0.2	0.1	0.5	15	1	14	0	27	6.7	mod	0.0
86	74.7	16	65.2	23.1	0.8	0.2	0.1	0.5	15	15	0	27	0	100.0	mod	0.0
87	75.8	16	65.2	23.1	0.8	0.2	0.1	0.5	15	15	0	27	0	100.0	mod	0.0

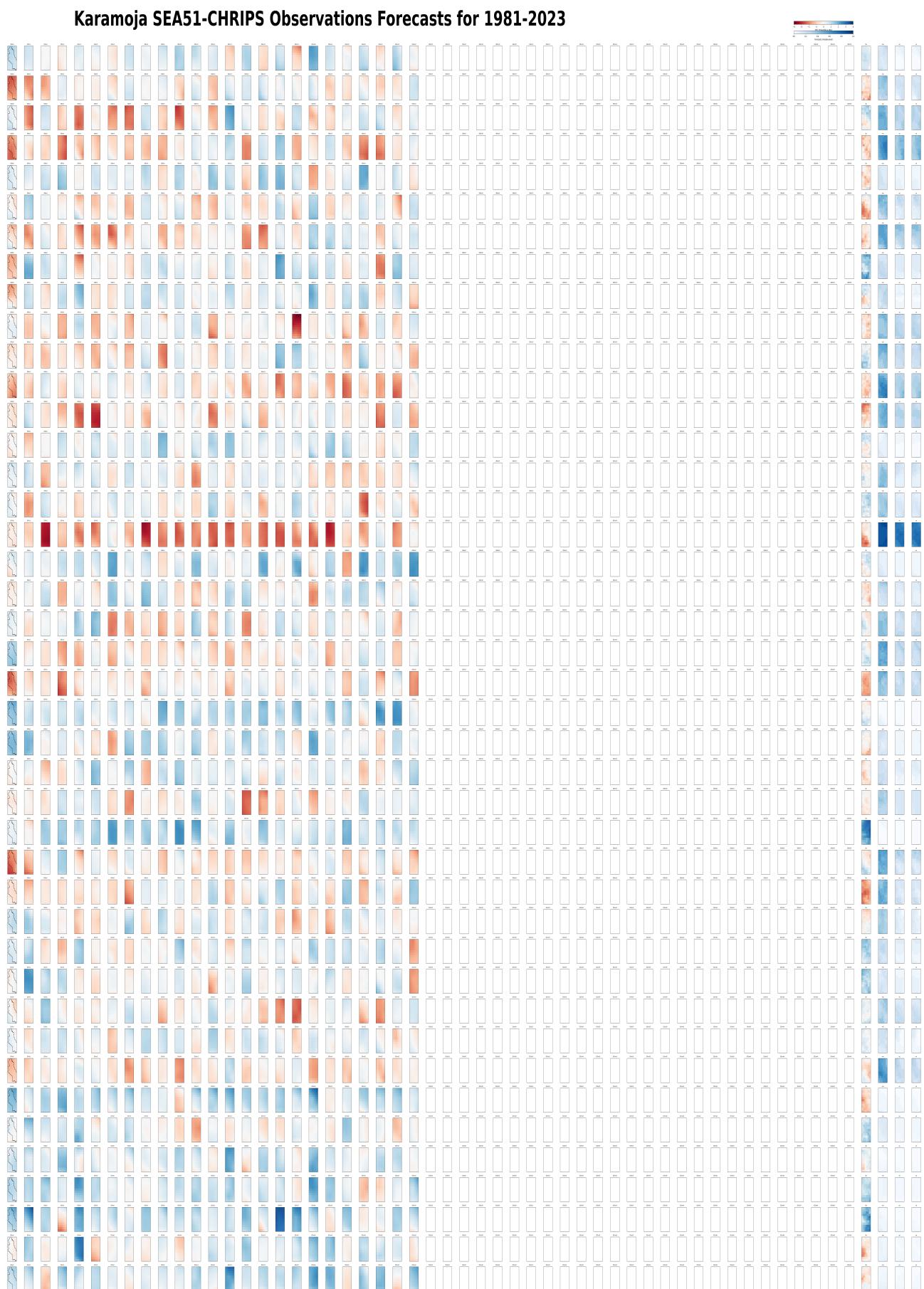


Figure 1.10. Time series map plot of JJAS for Karamoja region for the lead time 2

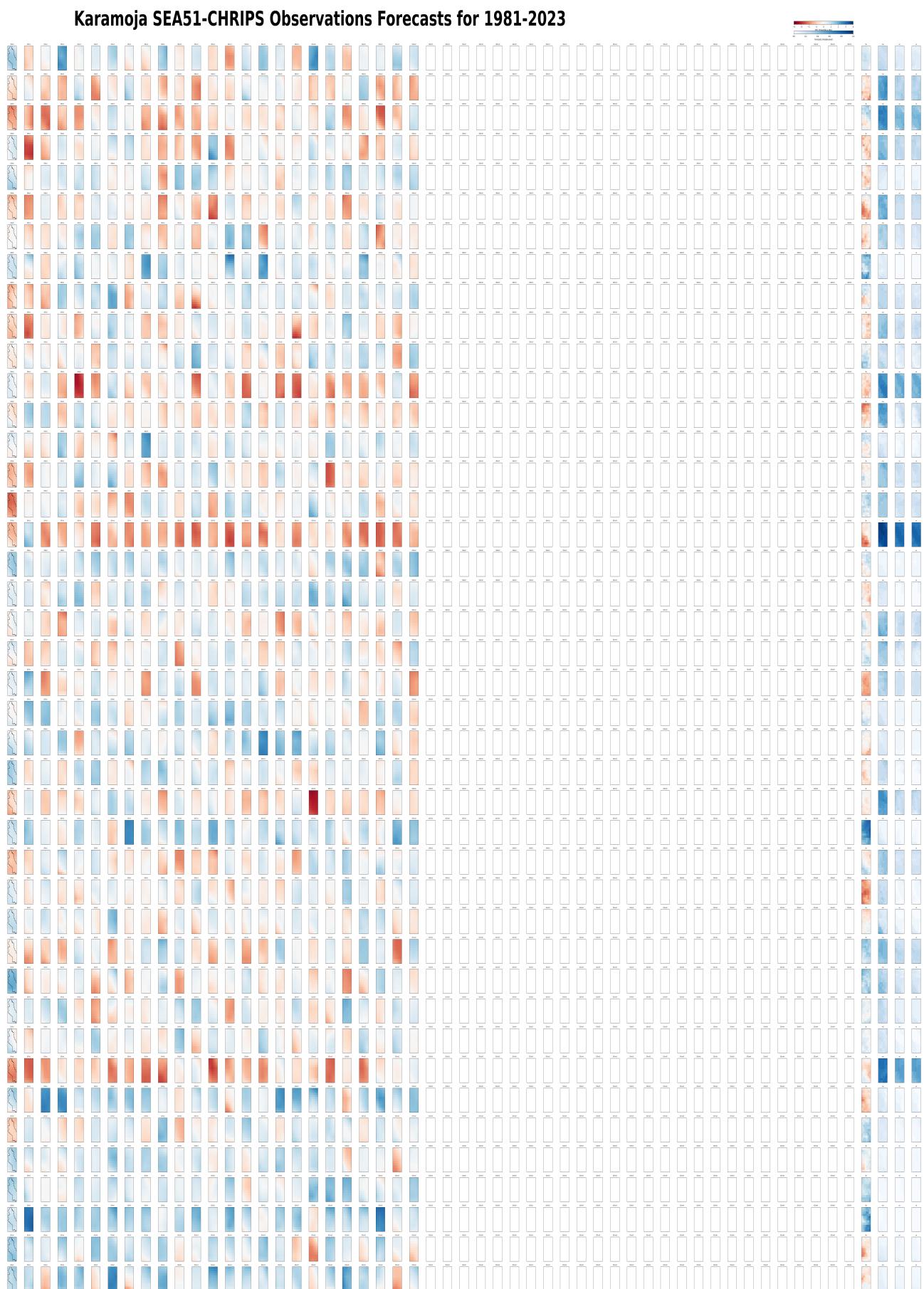


Figure 1.11. Time series map plot of JJAS for Karamoja region for the lead time 3

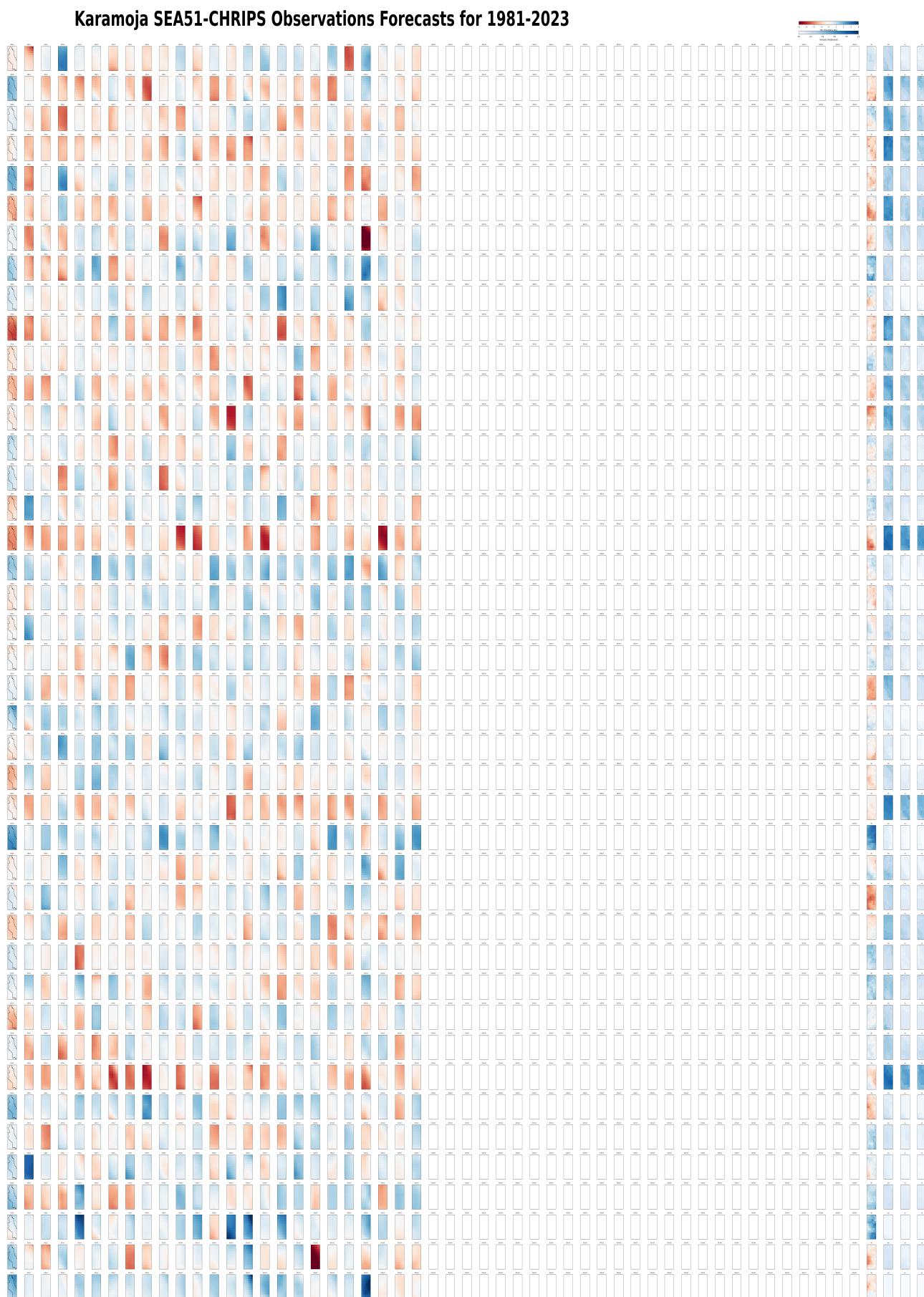


Figure 1.12. Time series map plot of JJAS for Karamoja region for the lead time 4