

ASCE 7-28 Seismic Subcommittee

6/10/2025

USGS-ground-motions Interactive Maps

Silvia Mazzoni, TC-1

ASCE 7 SSC Meeting 6/10/2025



<https://www.silviamazzoni.com>

The image shows a web browser with two tabs. The first tab, titled 'nehrp-maps | Silvia's Brainery', displays the homepage of 'NEHRP-USGS Interactive Maps'. The homepage includes a navigation bar with links to Home, nehrp-maps, Brainery Apps, Academy, and BraineryByt. The main heading is 'NEHRP-USGS Interactive Maps'. Below the heading, a paragraph explains that the interactive maps provide qualitative values computed using the 2023 National Seismic Hazard Model (NSHM) values, incorporating preliminary, yet-unpublished USGS data proposals working through BSSC PUC (Provisions Update). It states that 160 test sites and NSHM-23 faults have been added for informational purposes only.

What You Can Visualize

- 50-Year Probability of Collapse (PoC) for ASCE 7-22 MCE_R**
 - Available for two site classes (BC, D) and four periods (0.2s, 1.0s, 2.0s, 5.0s).
- ASCE 7-22 MCE_R PSA**
 - Risk-Targeted (1.0% in 50yr PoC) Deterministically capped MCE_R, based on NSHM-2018.
- NSHM-2023 PSA**
 - Risk-targeted PSA with:
 - 1.5% in 50-year PoC
 - 1.0% in 50-year PoC
 - Deterministic 84th percentile PSA, based on 1.0% in 50-year PoC PSHA.
- Ratio of NSHM-2023 PSA to ASCE 7-22 MCE_R PSA**
 - Choose to load only ratio values or both ratio and PSA values.
 - Important: Filter out cases where very small numerators create

The second browser tab, titled 'Silvia's Interactive Maps', shows a map of the United States. The map is titled 'RISK-TARGETED GROUND MOTIONS'. It displays a color-coded map of the United States, with a legend on the right showing 'PSA ratio @ T=0.02s (0.2742-2.893)' and 'Population 10*x'. The map includes a 'CONTROLS' panel on the left and a 'Map Created by © SILVIA MAZZONI, © OpenStreetMap contributors © CartoDB' footer.

Visit Maps

Interactive Maps: [silviamazzoni.com](https://www.silviamazzoni.com)

Selected Map Datasets

- We have two sets of data we want to quantify:
 1. The combined effect of the 2023 NSHM and the new risk target vs. the current MCE_R (ratio of PSA)
 2. The effect of increasing the risk target within the 2023 NSHM (ratio of PSA)
- Data shown on Maps:
 - The entire dataset
 - Location with changes within 20% ($0.8 < \text{ratio} < 1.2$)
 - Location with changes that exceed 20% ($\text{ratio} < 0.8$) – only in 2nd dataset
- These maps are organized by Site Class and by period.
 - Each page represents a site class: from stiffest (BC) to softest (E).
 - The plots in each page represent each period, in increasing order.
 - The first row is for the short-period range, below 1sec.
 - The second row is for the longer period range, 1-10 seconds.

What to observe

- These maps are intended to give a global understanding of the impact of this proposal.
- What we expect:
 - New source models in 2023 NSHM – non-uniform changes across the US
 - New Subduction GMMs – non-uniform changes in the PNW
 - Removal of deterministic capping – increases in PSA in the short-period and stiffer SiteClasses in California, along the SAF
 - Increase in risk target – uniform increase in PSA away from California
- What to do:
 - Flip through the pages to see the general impact of site class and period.
 - You can do a second run through to look at specific locations and cases.
- What I have observed:
 - As expected, the changes vary by geographic location (seismicity), SiteClass, and period.
 - The change in risk target from 1.0 to 1.5% does not lead to a uniform decrease in ground motions everywhere!

Datasets: Ratio of ground motions (PSA)

- **Combined Effect of 2023-NSHM & New Risk Target vs MCE_R :**

PSA **Ratio:** 1.5%poc/50yr NSHM-2023 / ASCE 7-22 MCE_R

1. All Data
2. Filtered $80\% < \text{ratio} < 100\%$
3. California

- **Effect of risk target within 2023 NSHM**

PSA **Ratio:** 1.5%poc/50yr / 1.0%poc/50yr both NSHM-2023

1. All Data
2. Filtered $80\% < \text{ratio} < 100\%$
3. Filtered ratio $< 80\%$

- Site Classes: BC,C,CD,D,DE,E

- Periods: PGA, 0.1,0.2,0.5 1,2,5,10

NOTES on these maps

- Colormap ranges are based on max/min of the entire CONUS data
→ So each map has its own colorscale range
- In all of these ratio maps, I have set 1.0 @ green
 - >1.0 green-yellow-red
 - <1 green-blue-<cyan> (*when the ratio doesn't go far below 0.95, I do not include the cyan*)
- *The main site for these maps has a lot more cases and data with which you can interact.*

Combined Effect of 2023-NSHM & New Risk Target vs MCE_R

Combined Effect of 2023-NSHM & New Risk Target vs MCE_R

PSA **Ratio**

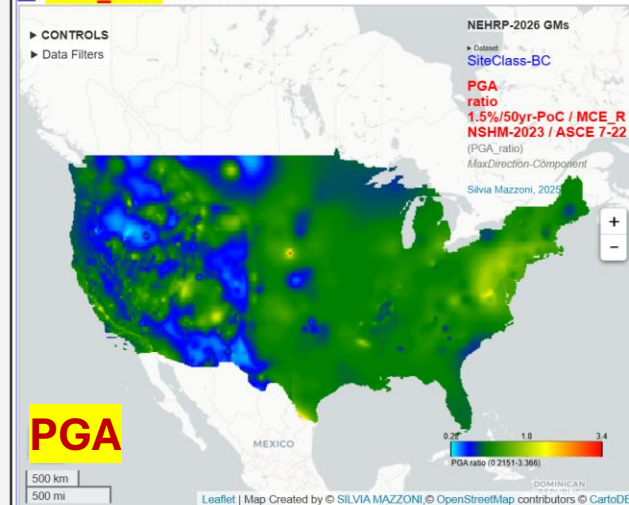
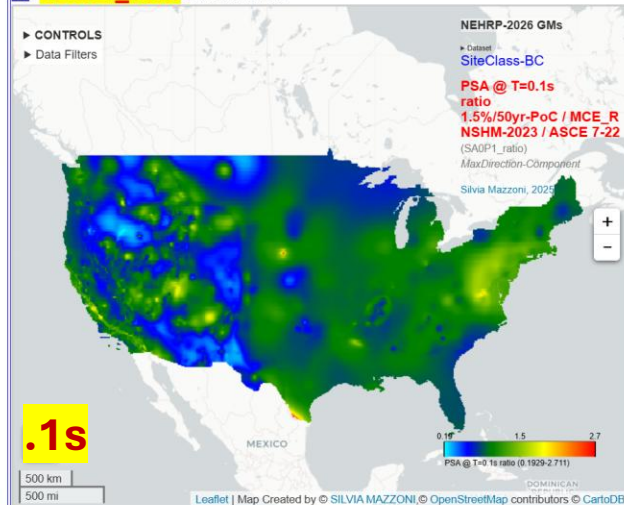
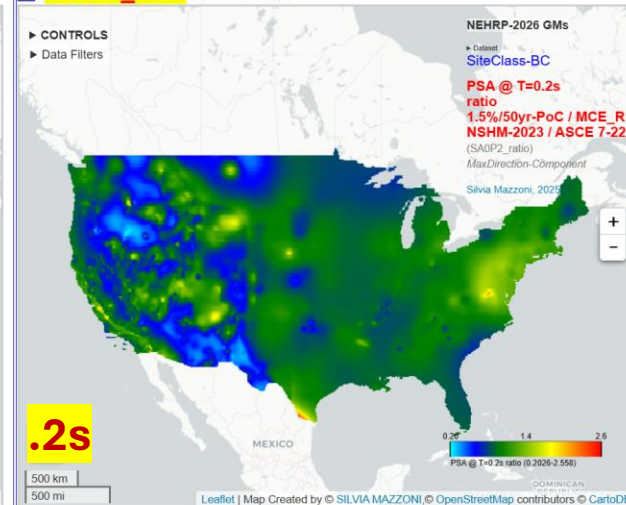
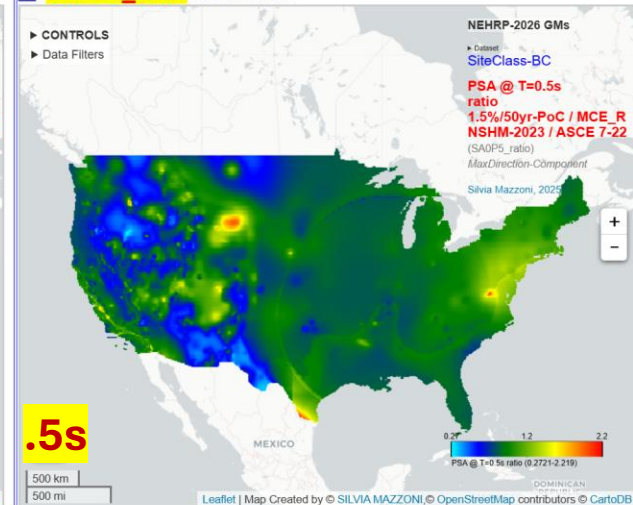
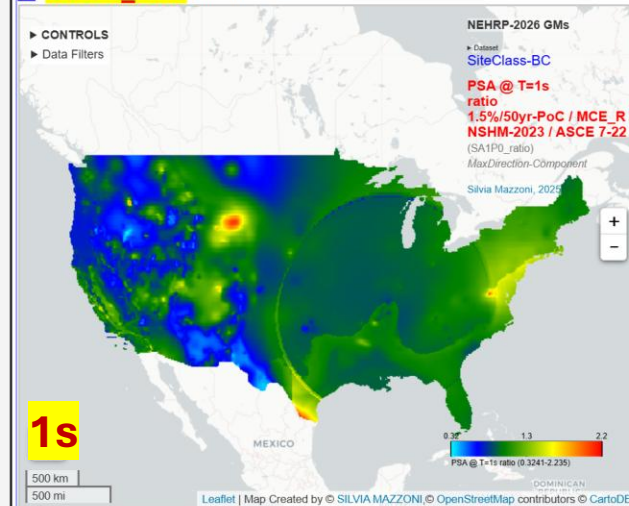
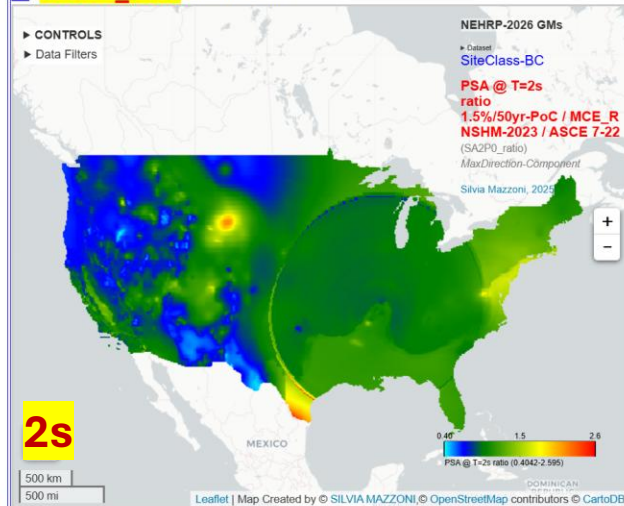
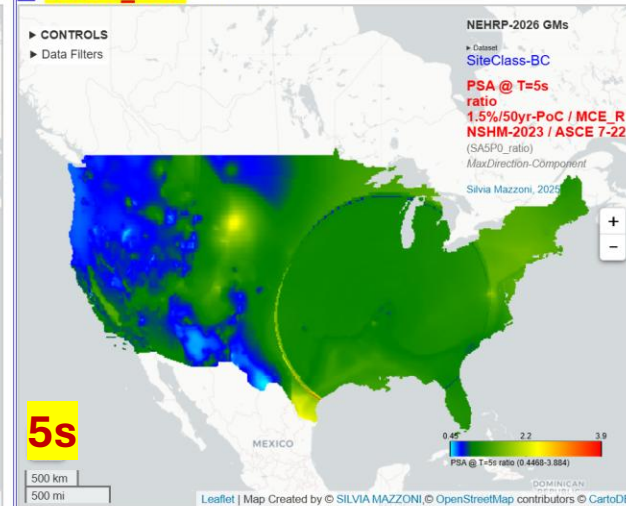
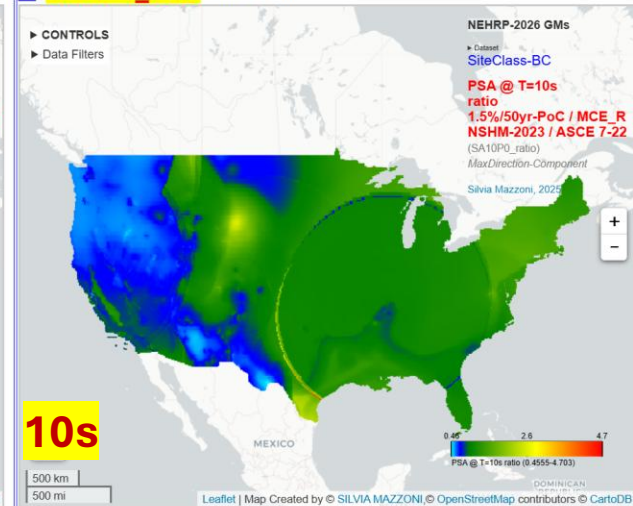
1.5%poc/50yr NSHM-2023

/

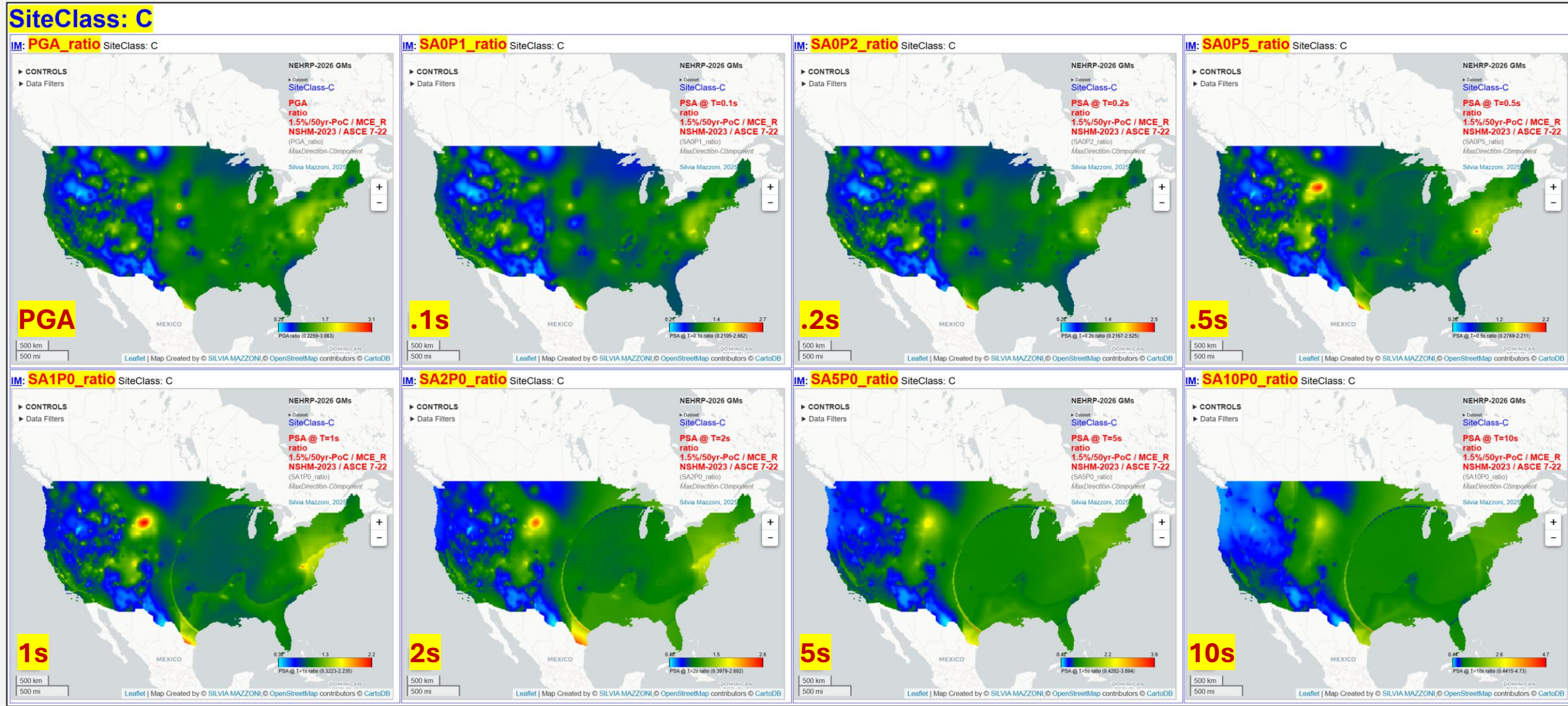
ASCE 7-22 MCE_R

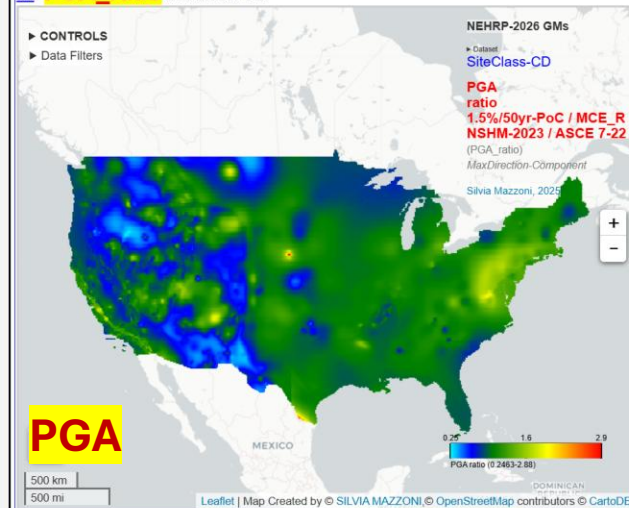
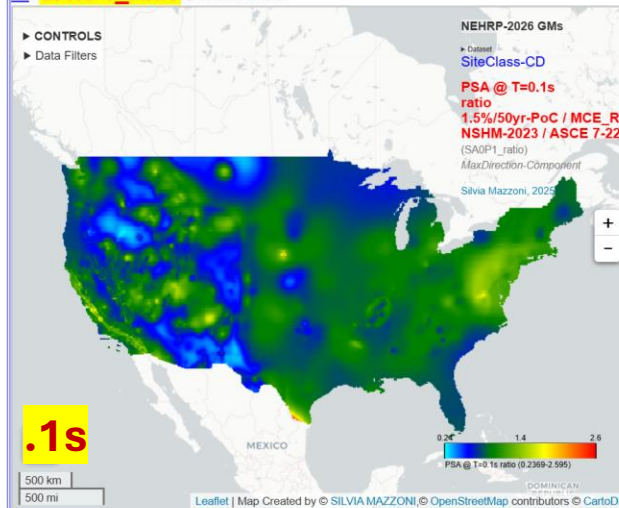
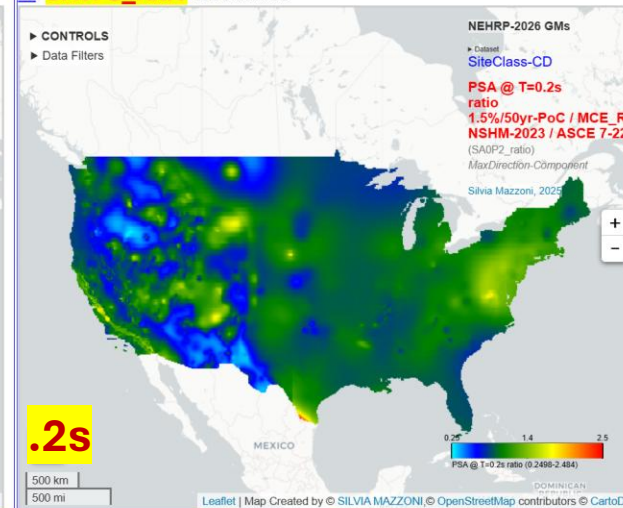
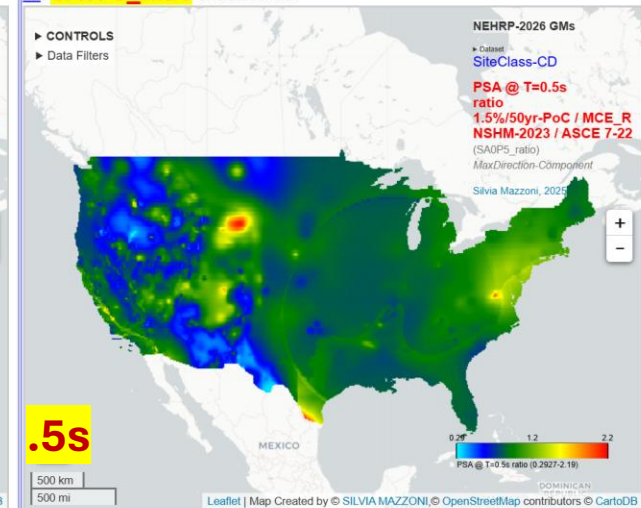
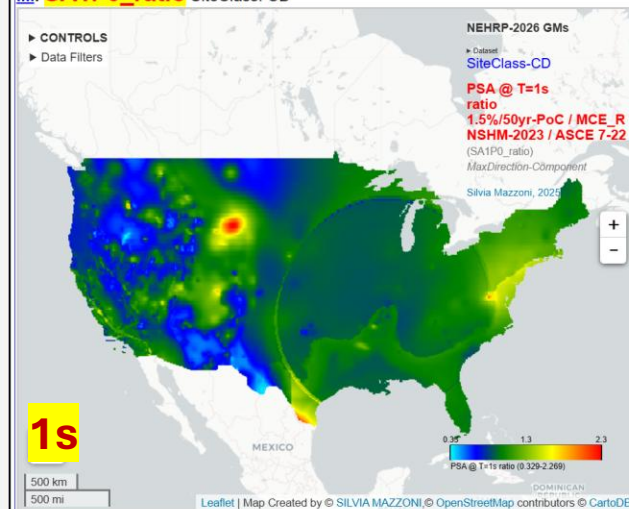
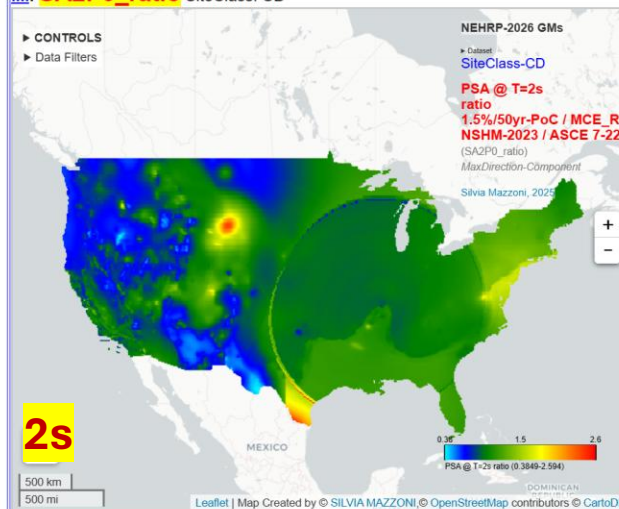
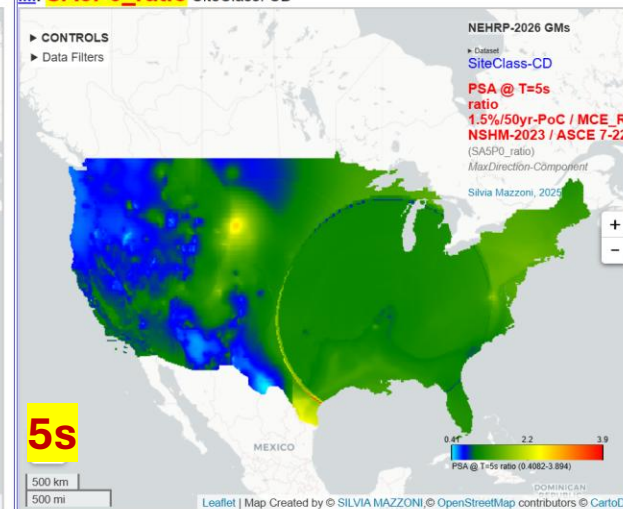
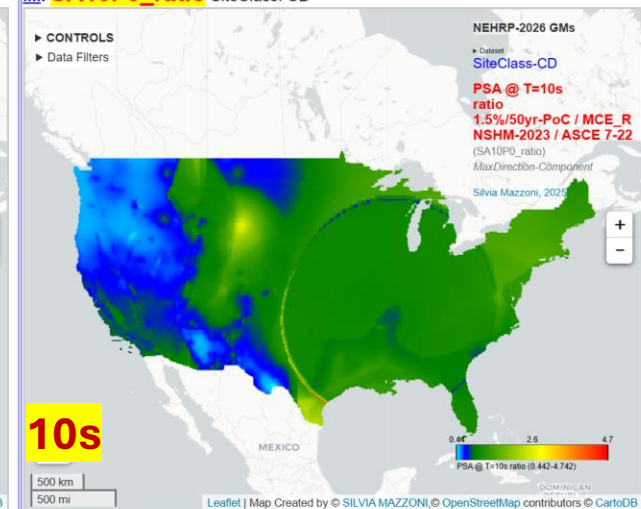
Site Classes: BC,C,CD,D,DE,E

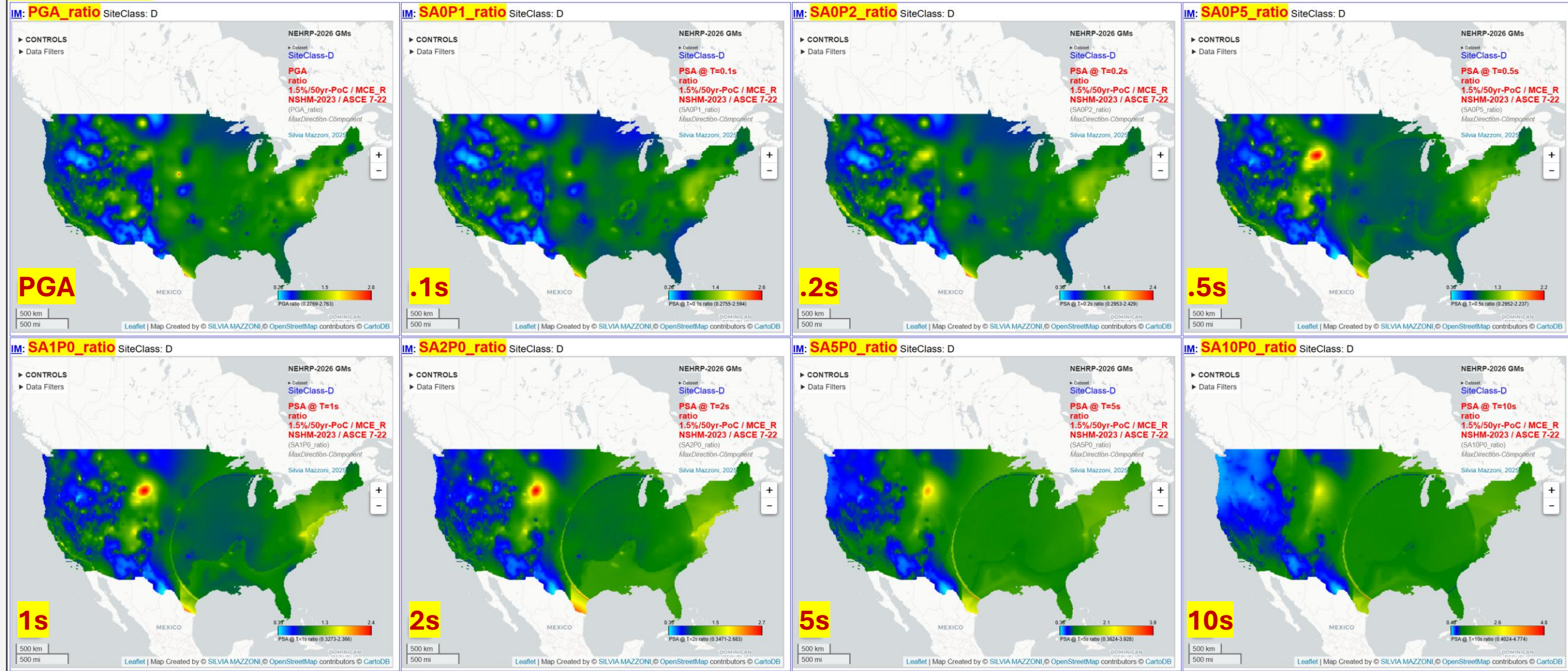
Periods: PGA, 0.1,0.2,0.5 1,2,5,10

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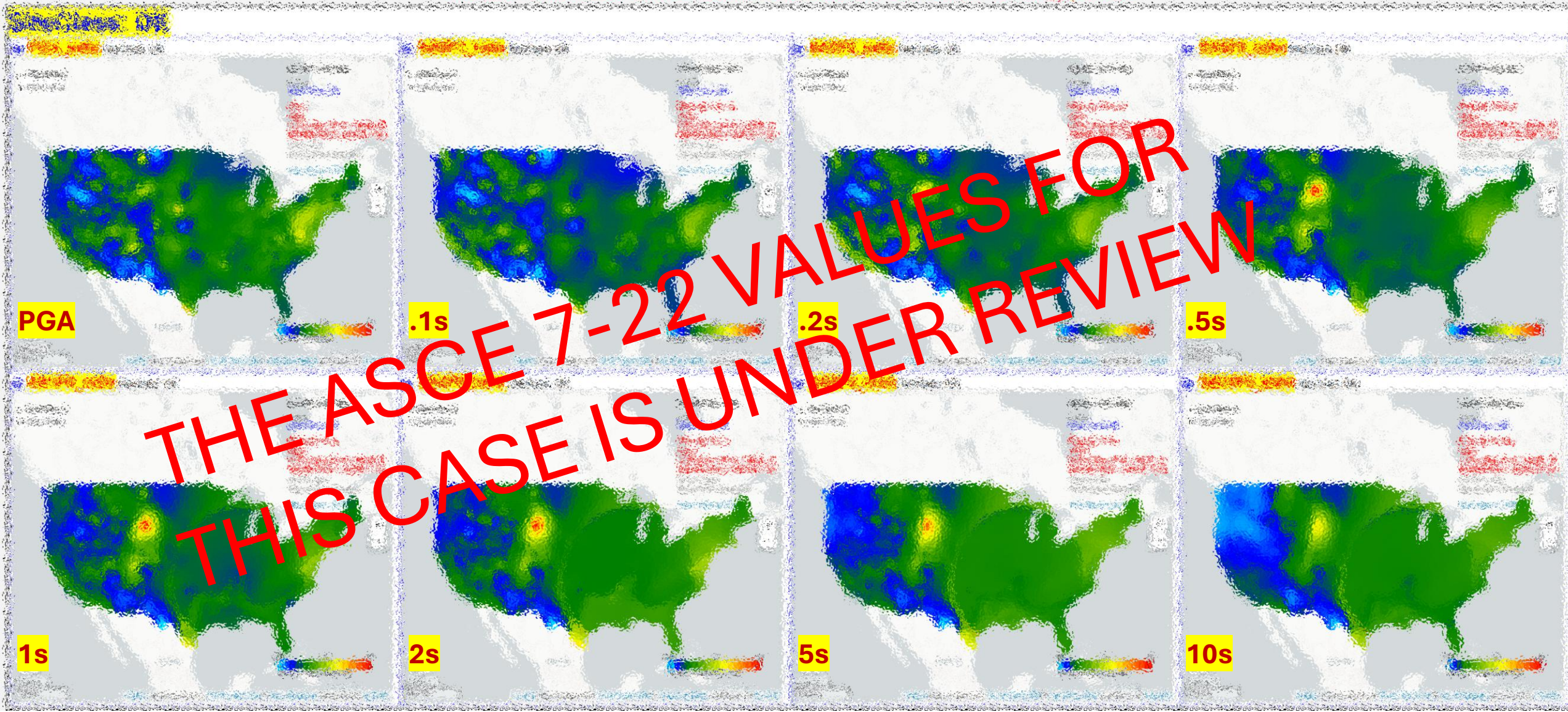
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Seismic Hazard, Ground Motion Response Factor 7.02, NSHM-RTSA, Version



Quantile 1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R



Combined Effect of 2023-NSHM & New Risk Target vs MCE_R

PSA **Ratio**

1.5%poc/50yr NSHM-2023

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ASCE 7-22 MCE_R

+/- 20%

Site Classes: BC,C,CD,D,DE,E

Periods: PGA, 0.1,0.2,0.5 1,2,5,10

1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **BC**

+/-20%

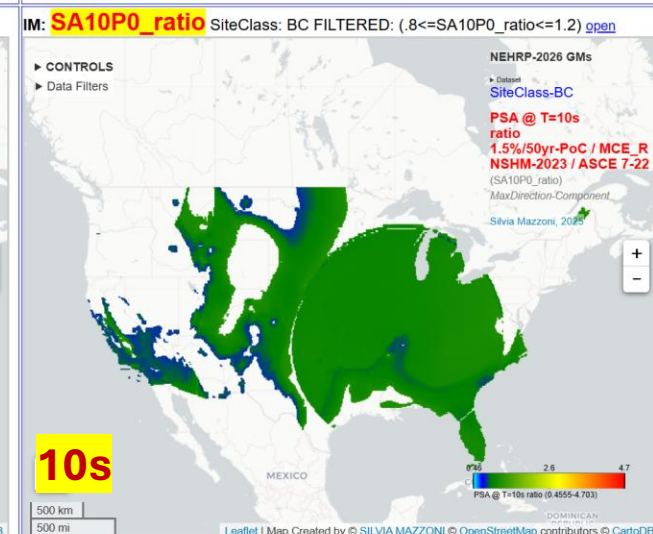
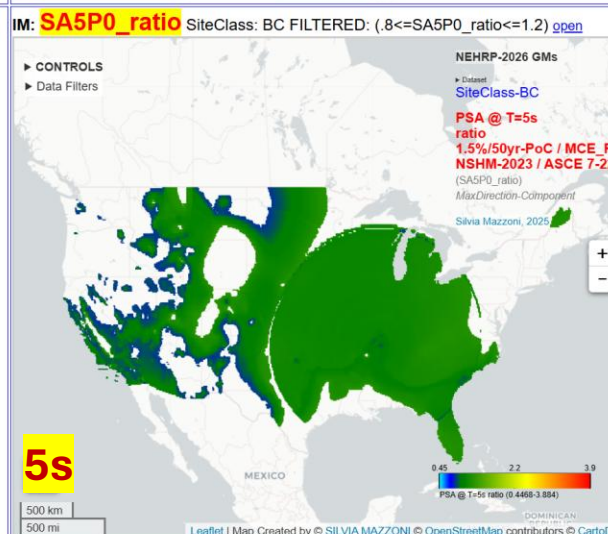
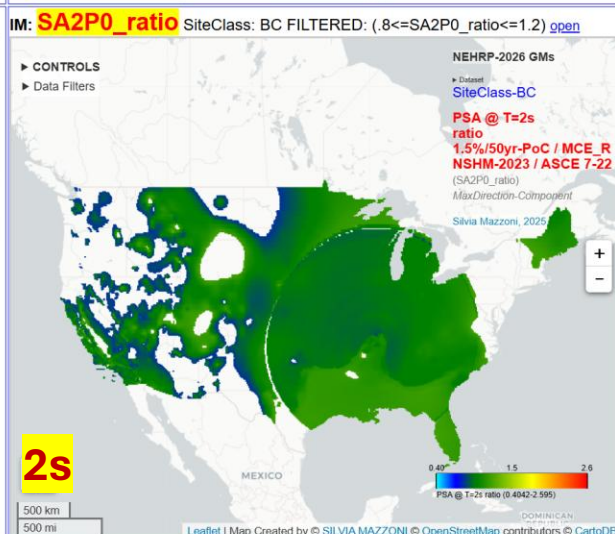
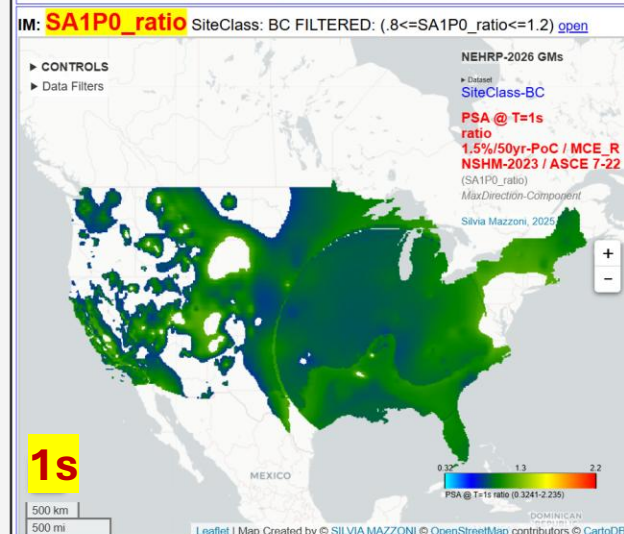
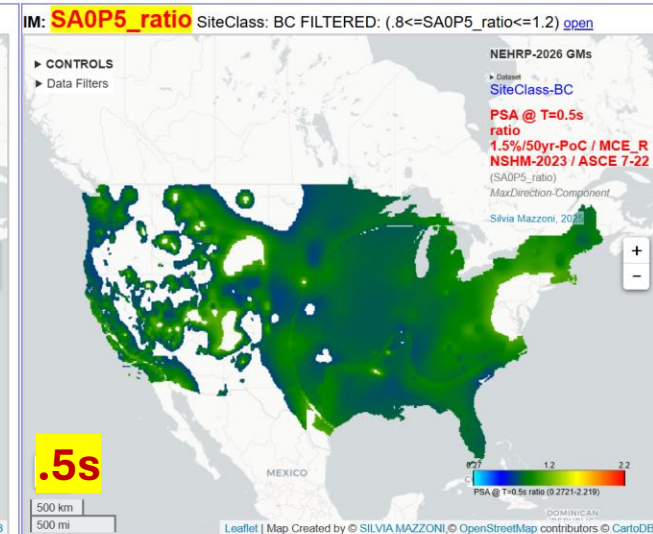
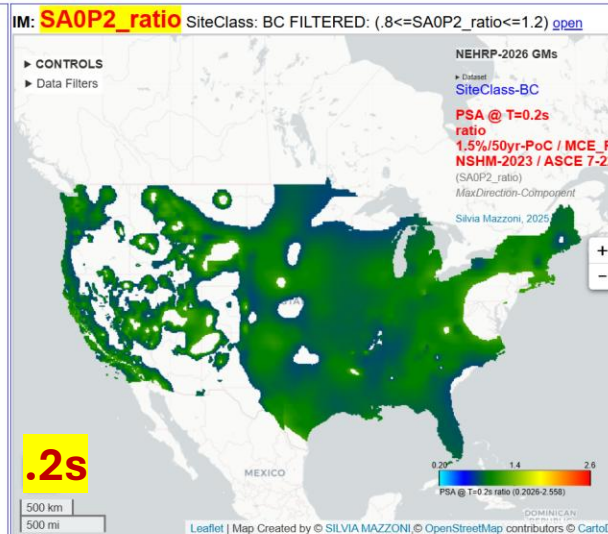
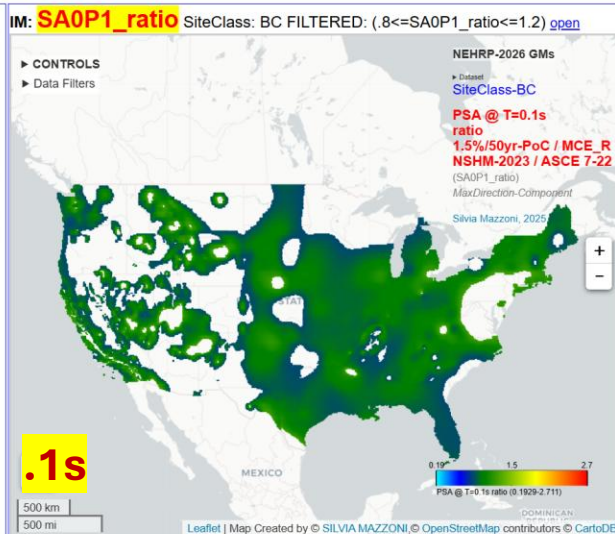
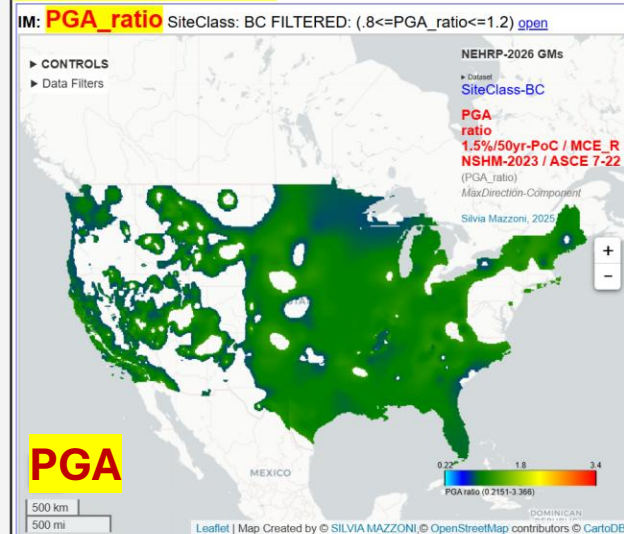
NEHRP-2026 Interactive Maps -- Sets

Silvia Mazzoni, 2025

► CONTROLS

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/ASCE 7-22**, METRIC: **RTSA_1p5in50**

SiteClass: BC



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **C**

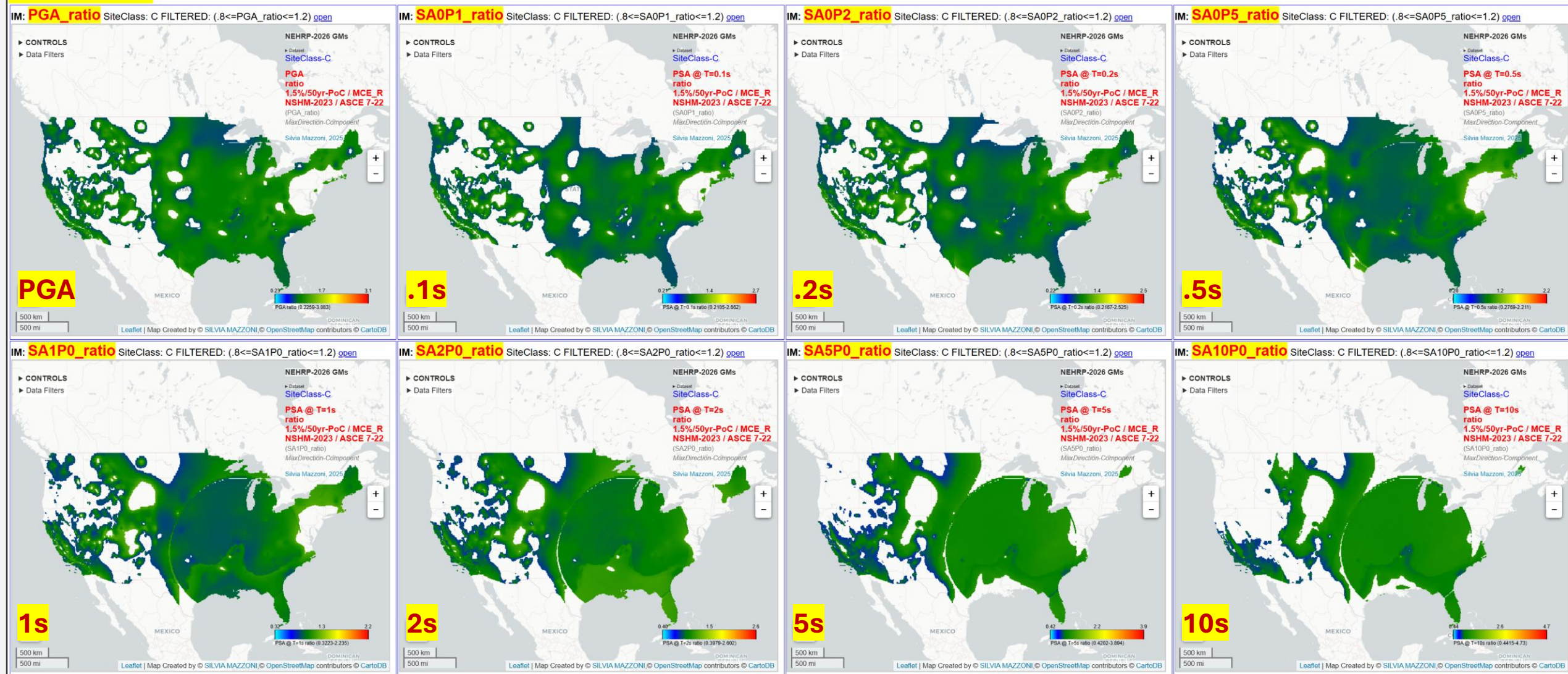
+/-20%

NEHRP-2026 Interactive Maps -- Sets

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► CONTROLS

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/ASCE 7-22**, METRIC: **RTSA_1p5in50**

SiteClass: C



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **CD**

+/-20%

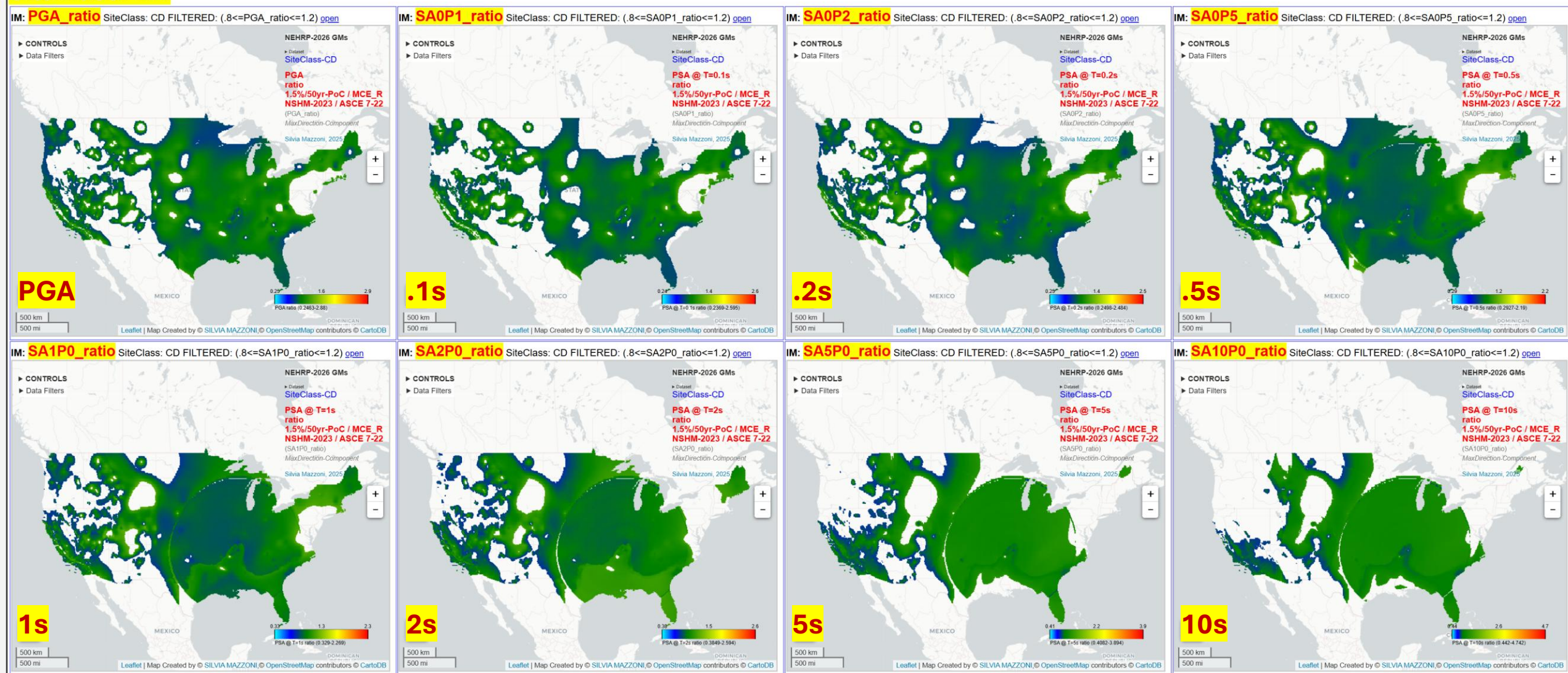
NEHRP-2026 Interactive Maps -- Sets

Silvia Mazzoni, 2025

► CONTROLS

QUANTITY: **PSA**ratio, MODEL: **NSHM-2023/ASCE 7-22**, METRIC: **RTSA_1p5in50**

SiteClass: CD



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **D**

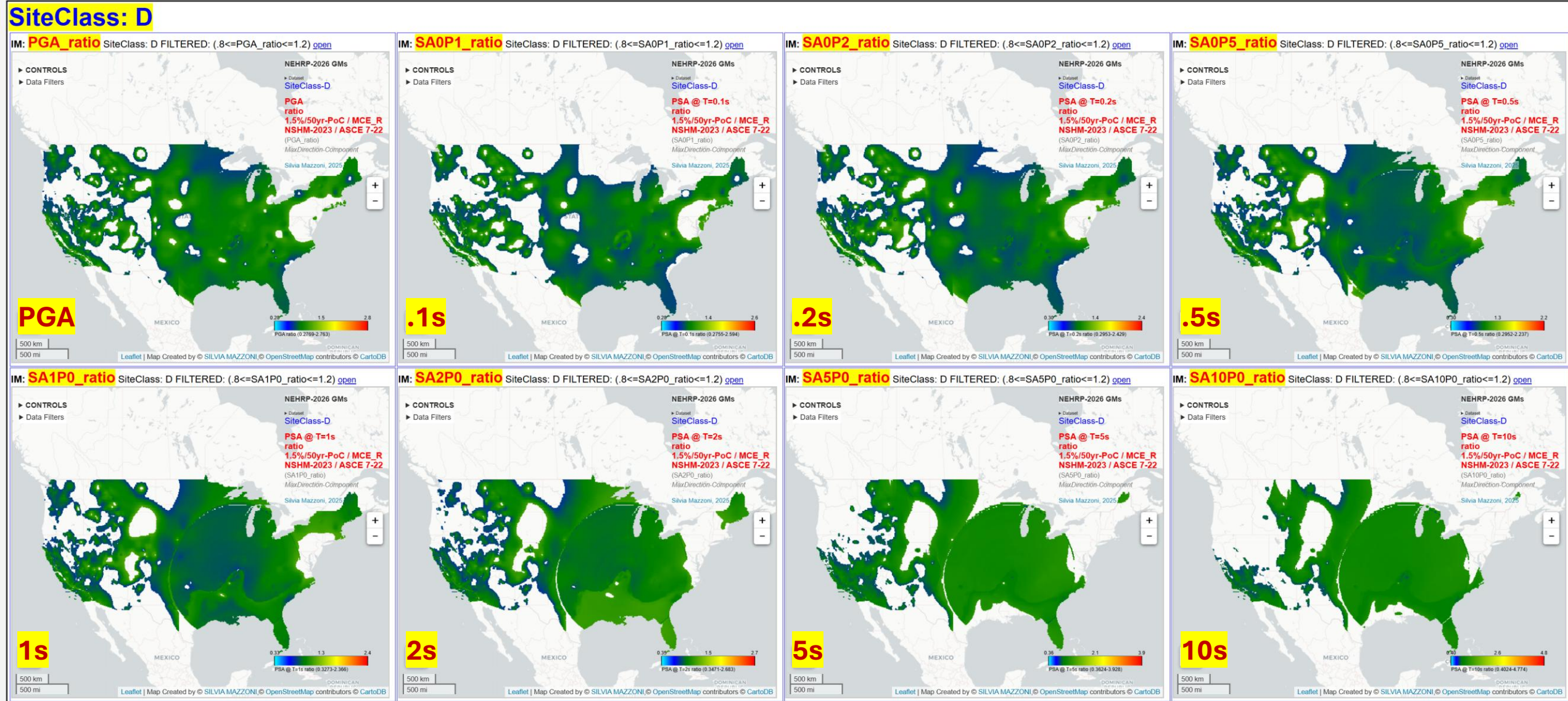
+/-20%

NEHRP-2026 Interactive Maps -- Sets

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► CONTROLS

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1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **DE**

+/-20%

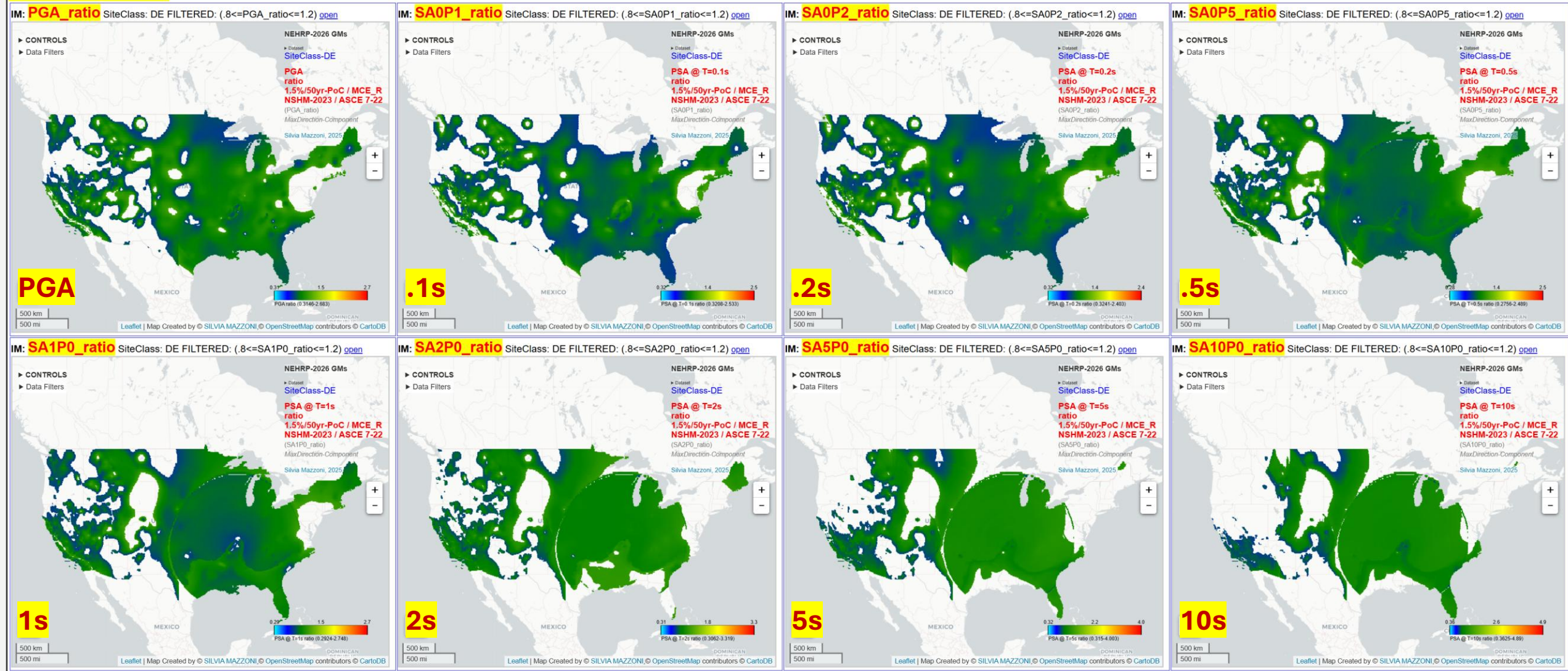
NEHRP-2026 Interactive Maps -- Sets

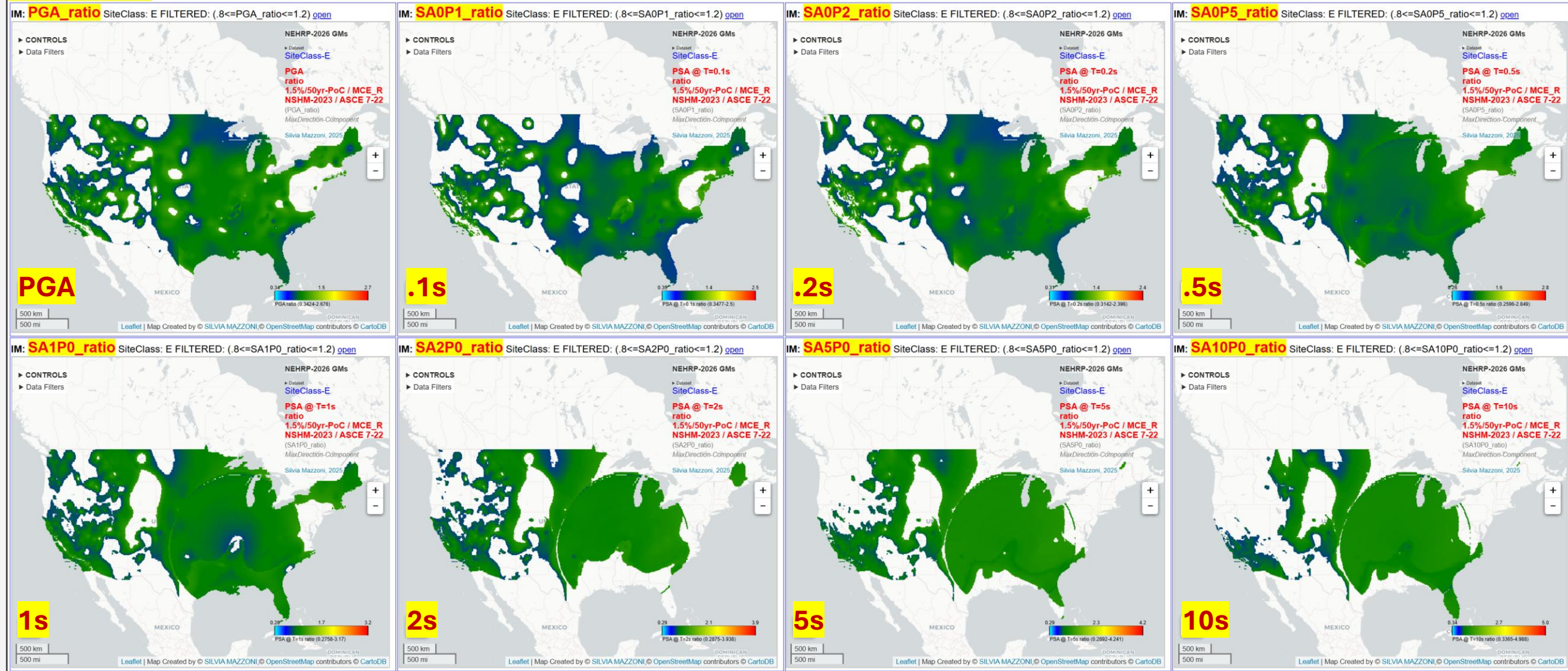
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► CONTROLS

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SiteClass: DE



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Combined Effect of 2023-NSHM & New Risk Target vs MCE_R

PSA **Ratio**

1.5%poc/50yr NSHM-2023

/

ASCE 7-22 MCE_R

Site Classes: BC,C,CD,D,DE,E

Periods: PGA, 0.1,0.2,0.5 1,2,5,10

California

1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

SiteClass: **BC**

NEHRP-2026 Interactive Maps -- Compare Sets

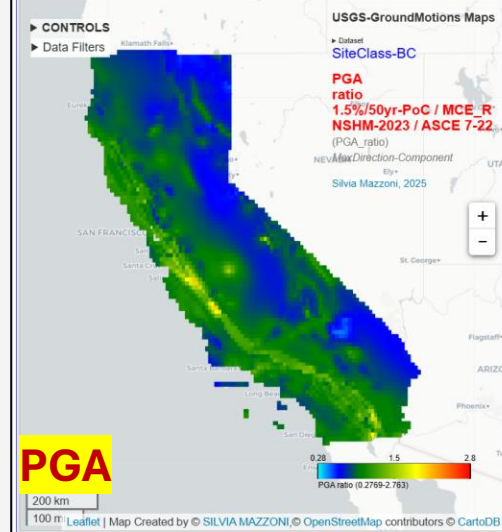
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► CONTROLS

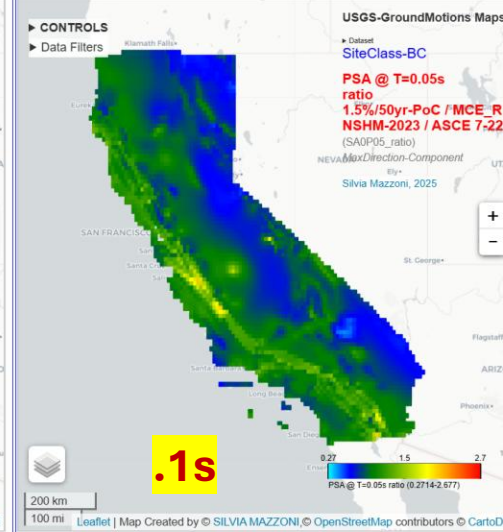
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Soil-Class: BC

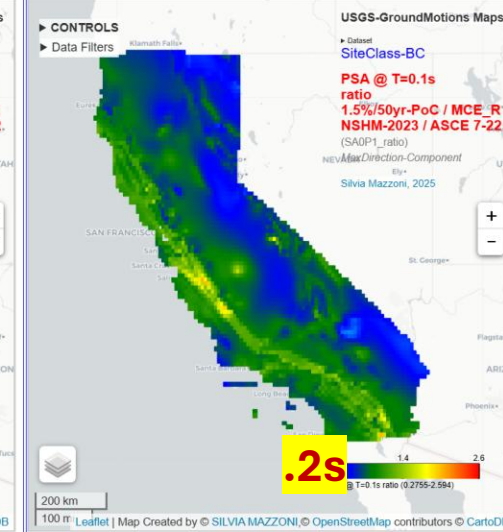
IM: PGA_ratio Soil-Class: BC [open in new page](#)



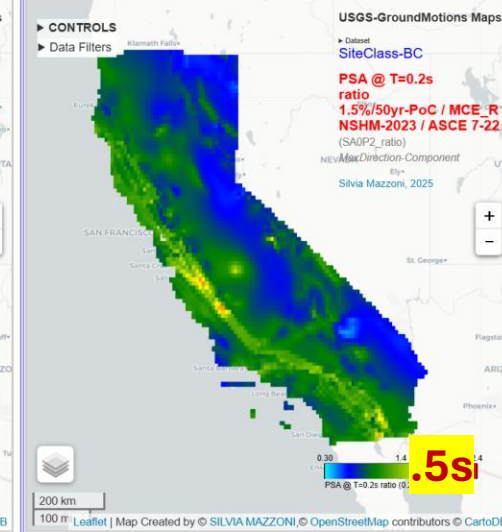
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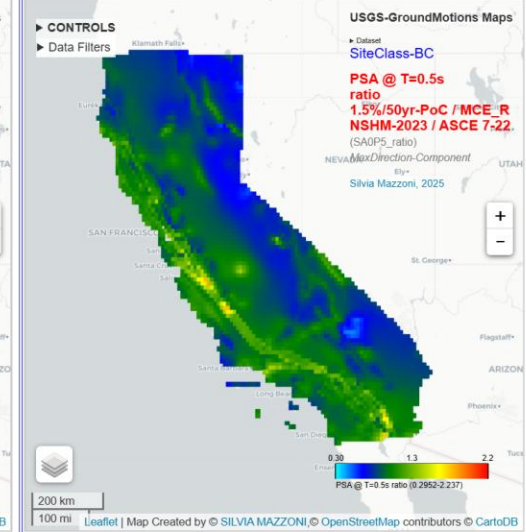
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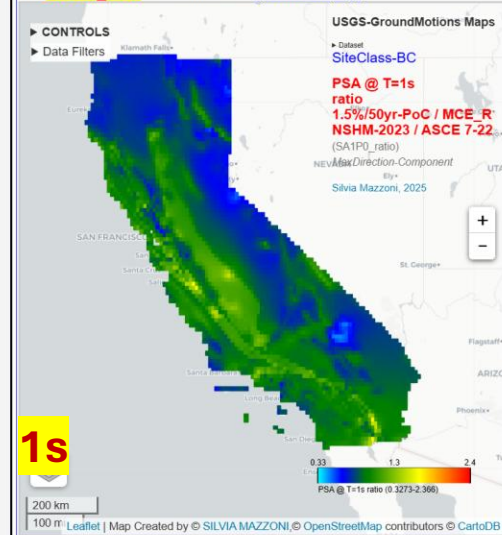
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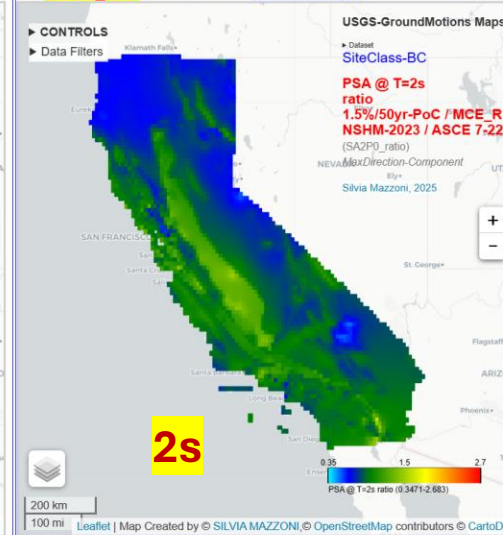
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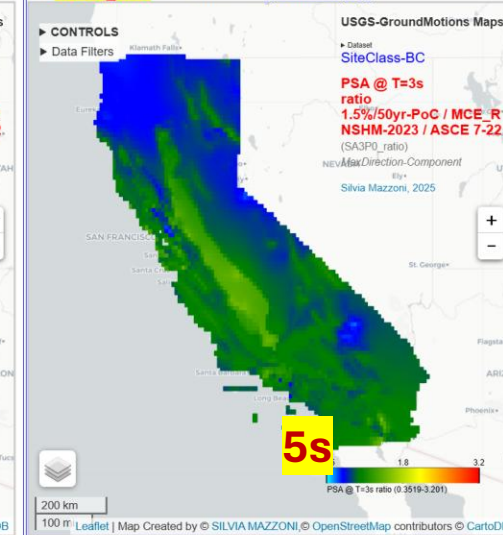
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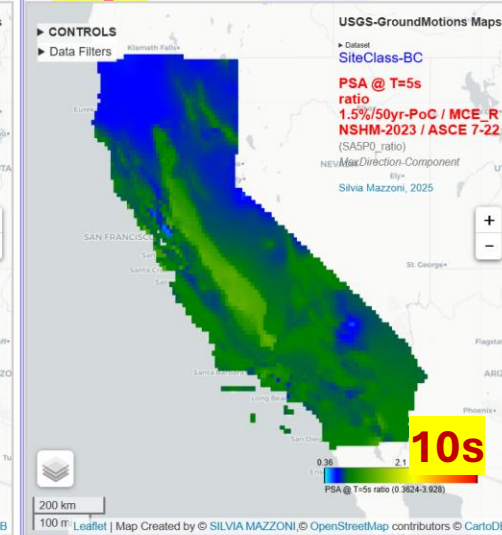
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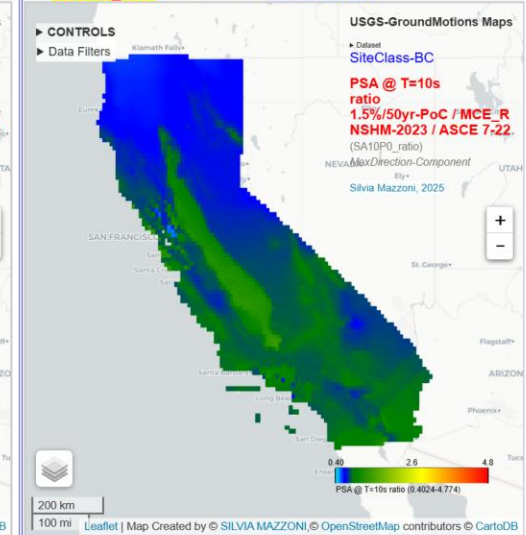
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IM: SA5P0_ratio Soil-Class: BC [open in new page](#)



IM: SA10P0_ratio Soil-Class: BC [open in new page](#)



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

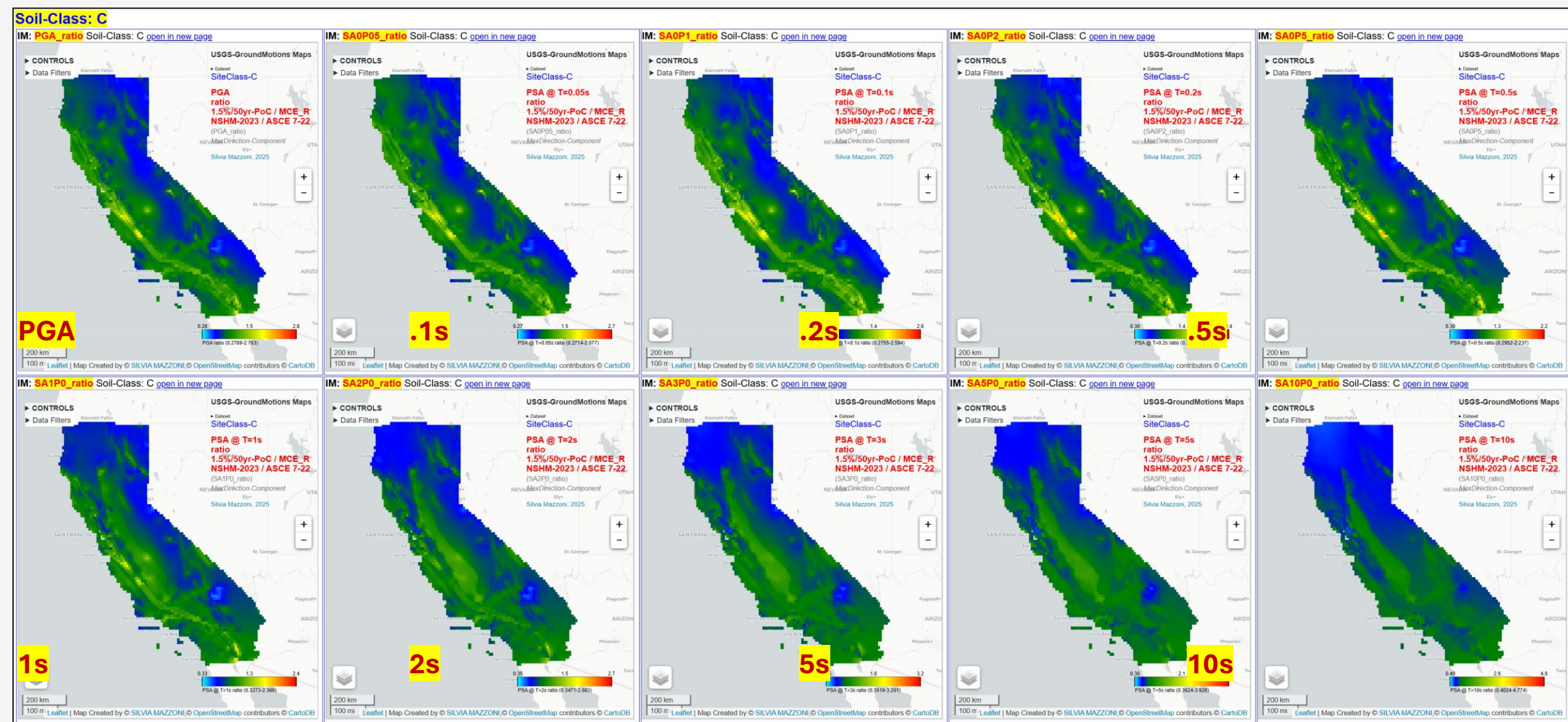
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NEHRP-2026 Interactive Maps -- Compare Sets

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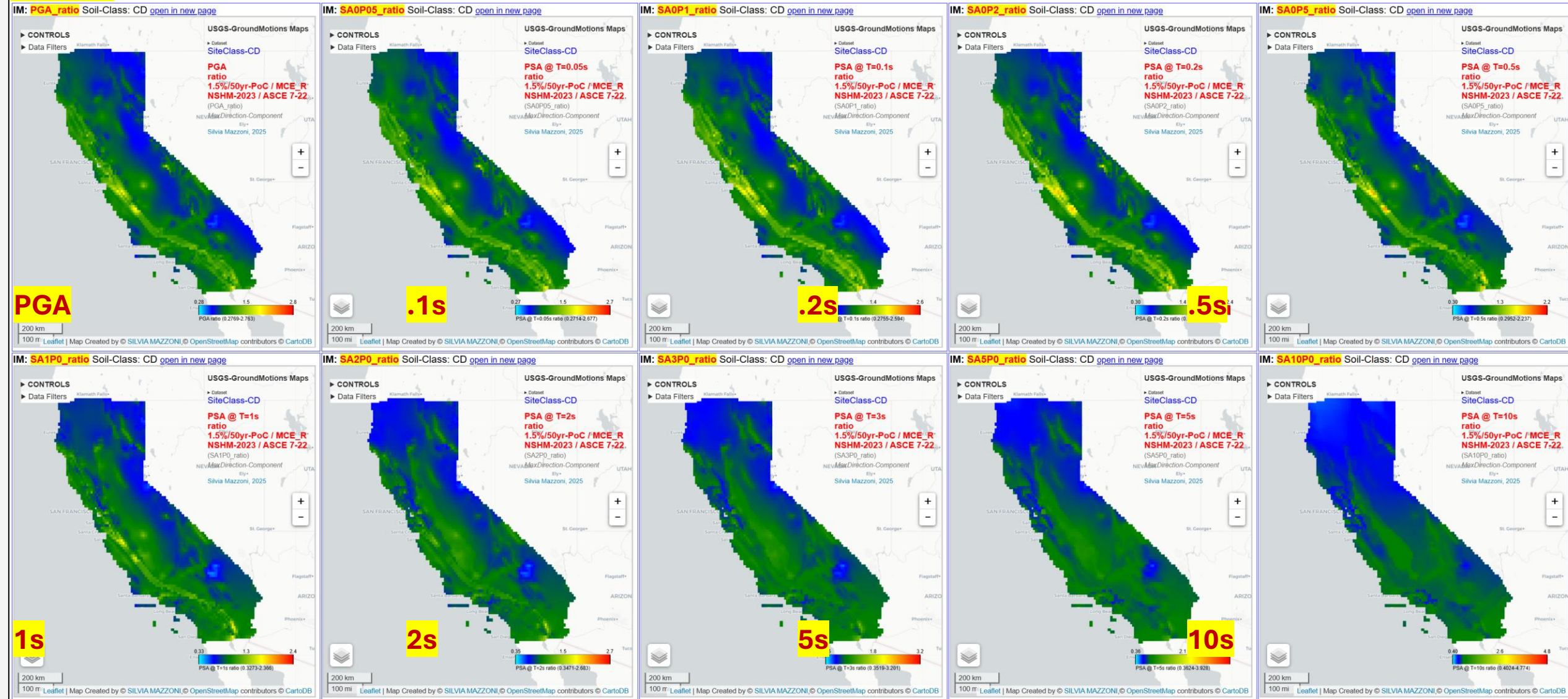
► CONTROLS

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QUANTITY: PSARatio, MODEL: NSHM-2023/ASCE 7-22, METRIC: RTSA_1p5in50

Soil-Class: CD



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

D

NEHRP-2026 Interactive Maps -- Compare Sets

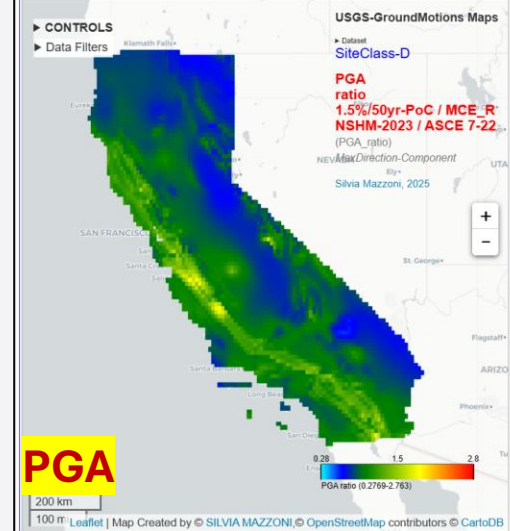
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► CONTROLS

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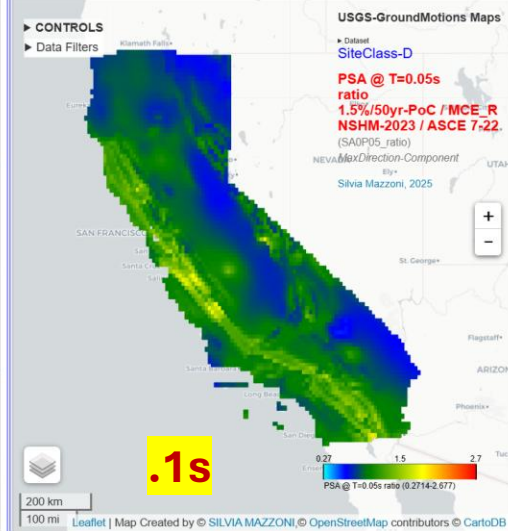
Soil-Class: D

IM: **PGA_ratio** Soil-Class: D [open in new page](#)



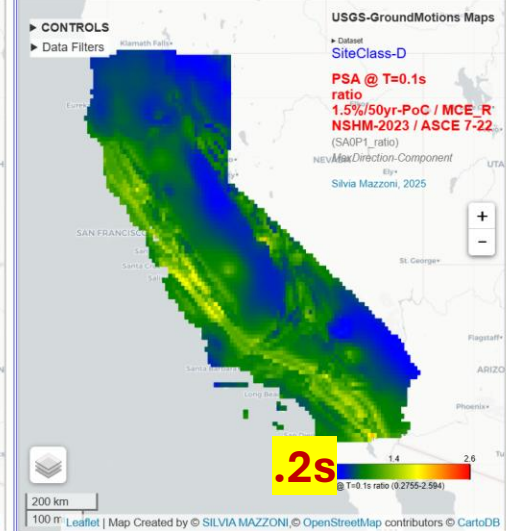
PGA

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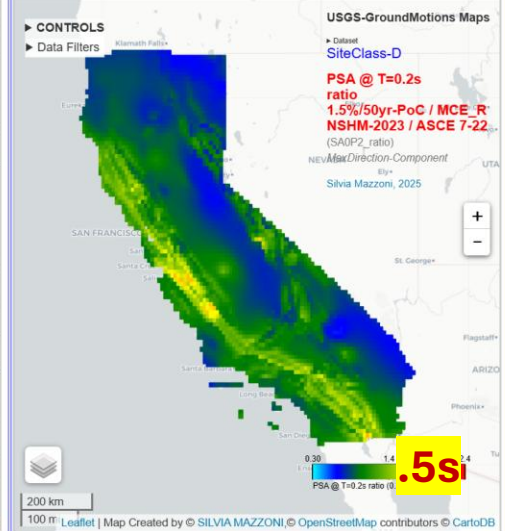
.1s

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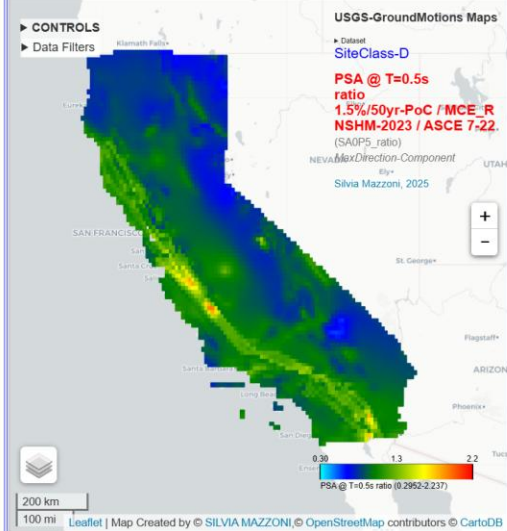
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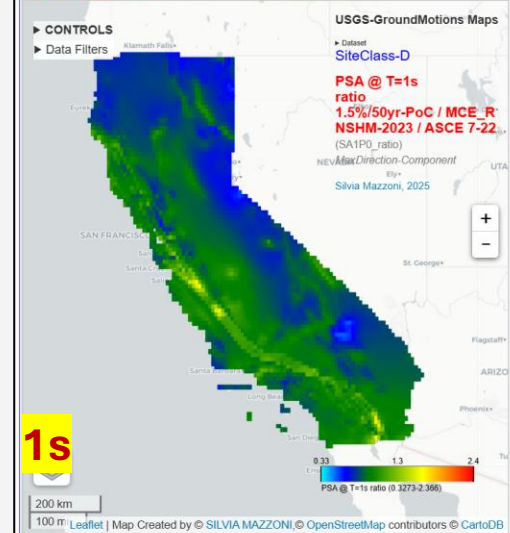


.5s

IM: **SA0P5_ratio** Soil-Class: D [open in new page](#)

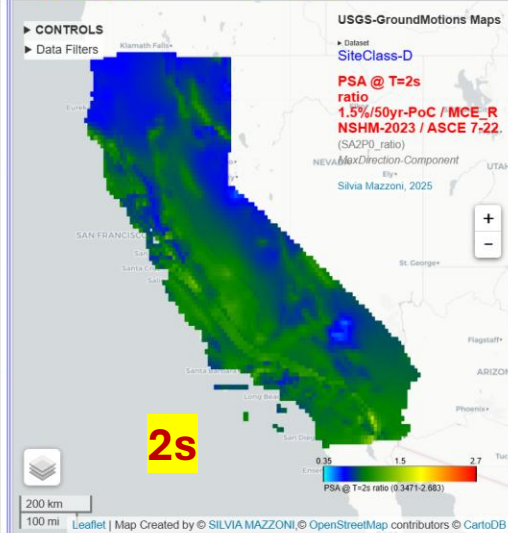


IM: **SA1P0_ratio** Soil-Class: D [open in new page](#)



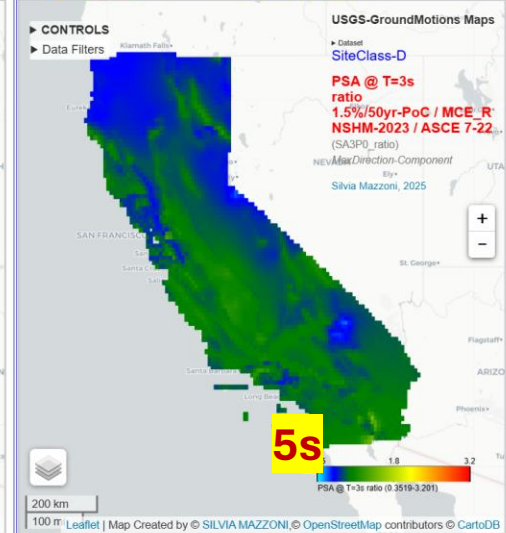
1s

IM: **SA2P0_ratio** Soil-Class: D [open in new page](#)



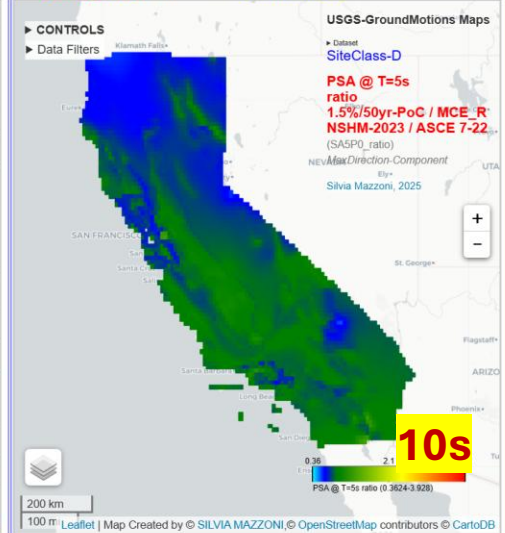
2s

IM: **SA3P0_ratio** Soil-Class: D [open in new page](#)



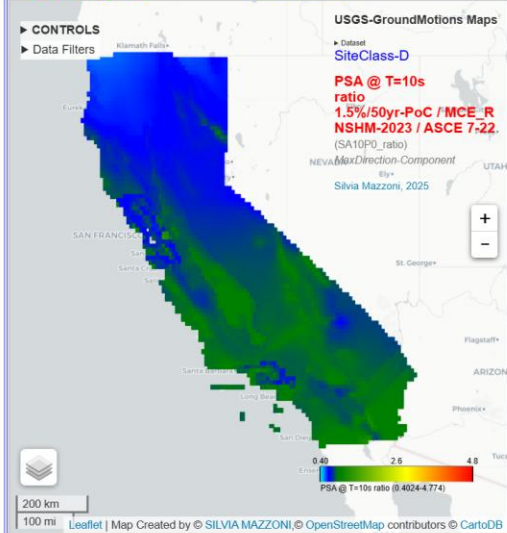
5s

IM: **SA5P0_ratio** Soil-Class: D [open in new page](#)



10s

IM: **SA10P0_ratio** Soil-Class: D [open in new page](#)



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

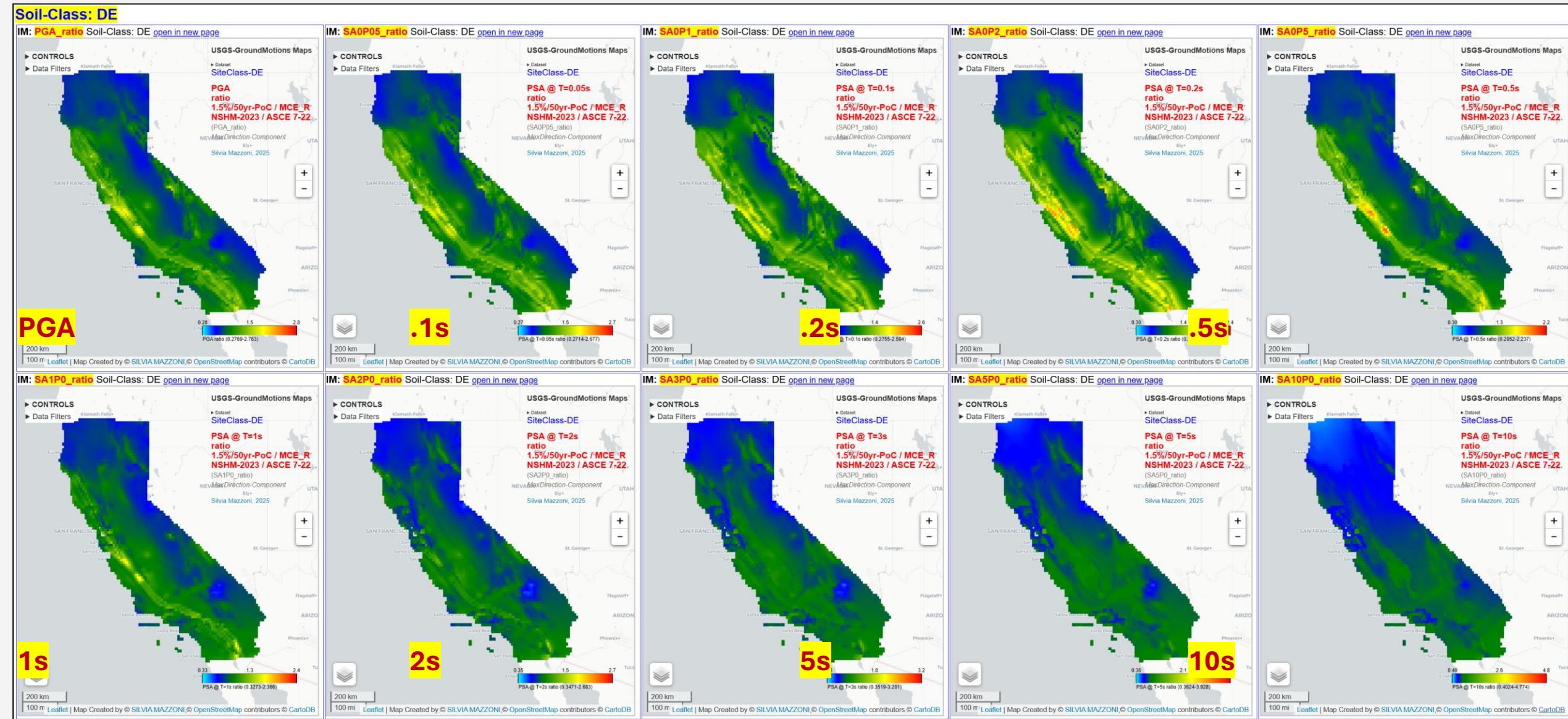
DE

NEHRP-2026 Interactive Maps -- Compare Sets

By Silvia Mazzoni, 2025 [Click here for the Main Page](#)

► CONTROLS

QUANTITY: PSARatio, MODEL: NSHM-2023/ASCE 7-22, METRIC: RTSA_1p5in50



1.5% PoC 2023NSHM-RTSA / ASCE7-22 MCE_R

E

NEHRP-2026 Interactive Maps -- Compare Sets

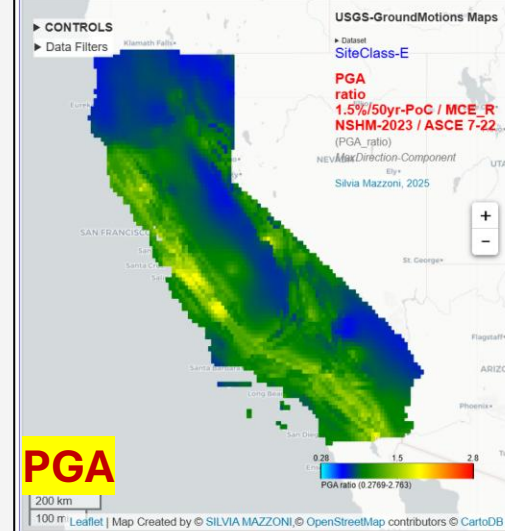
By Silvia Mazzoni, 2025 [Click here for the Main Page](#)

► CONTROLS

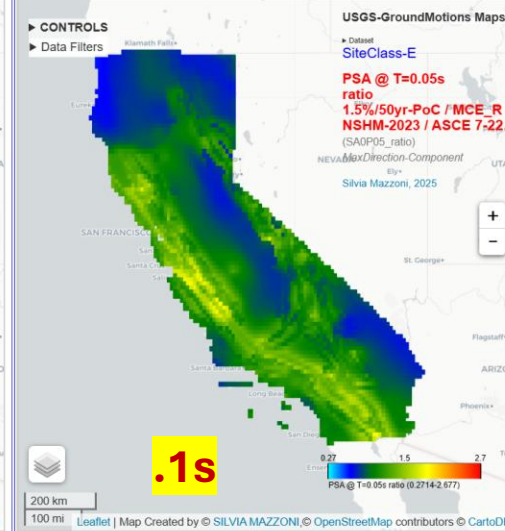
QUANTITY: PSARatio, MODEL: NSHM-2023/ASCE 7-22, METRIC: RTSA_1p5in50

Soil-Class: E

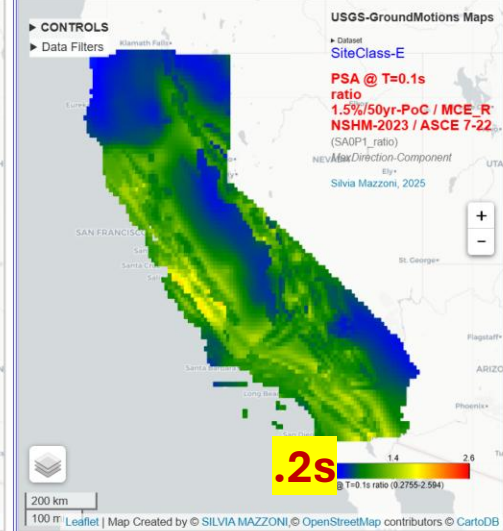
IM: PGA_ratio Soil-Class: E [open in new page](#)



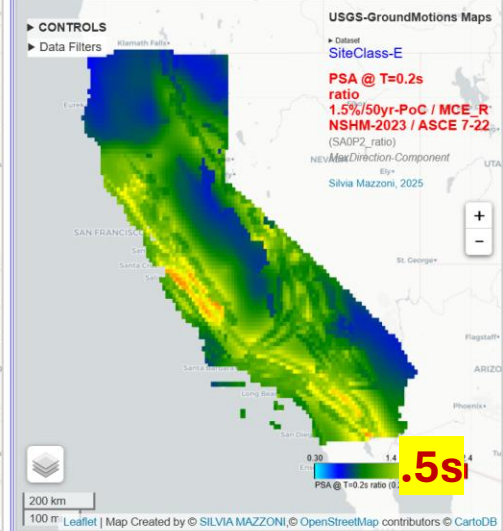
IM: SA0P05_ratio Soil-Class: E [open in new page](#)



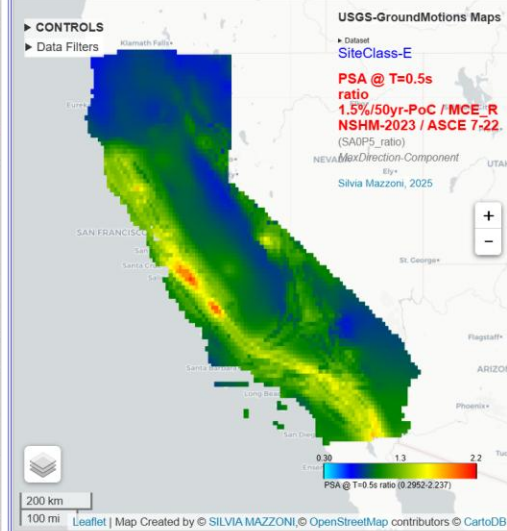
IM: SA0P1_ratio Soil-Class: E [open in new page](#)



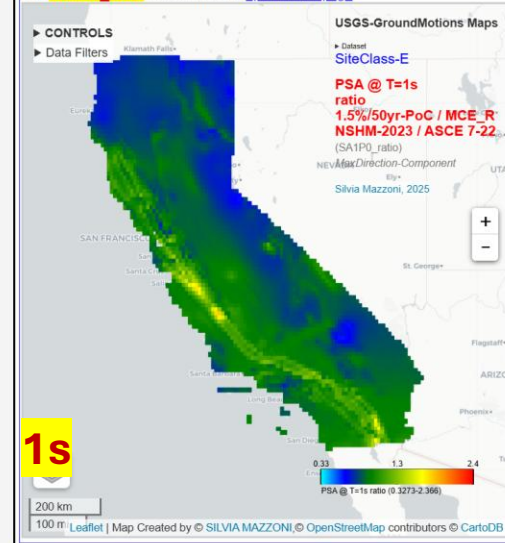
IM: SA0P2_ratio Soil-Class: E [open in new page](#)



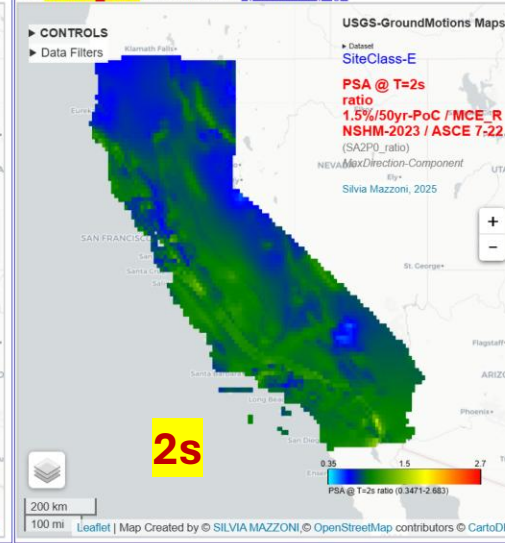
IM: SA0P5_ratio Soil-Class: E [open in new page](#)



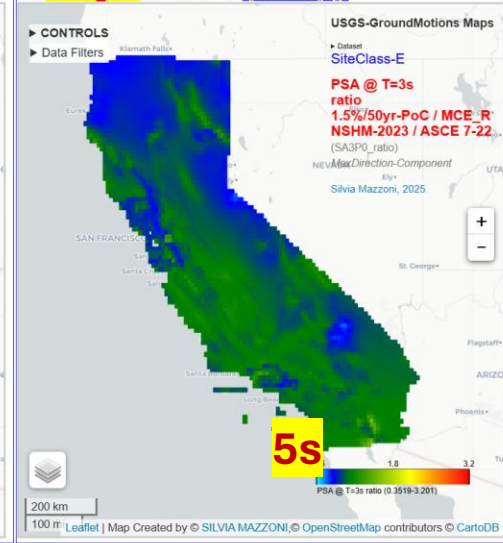
IM: SA1P0_ratio Soil-Class: E [open in new page](#)



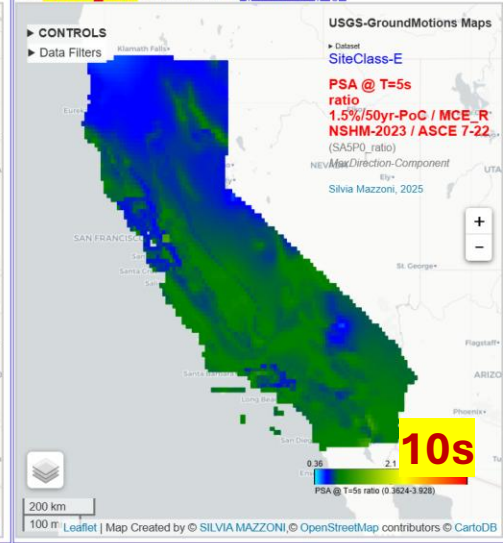
IM: SA2P0_ratio Soil-Class: E [open in new page](#)



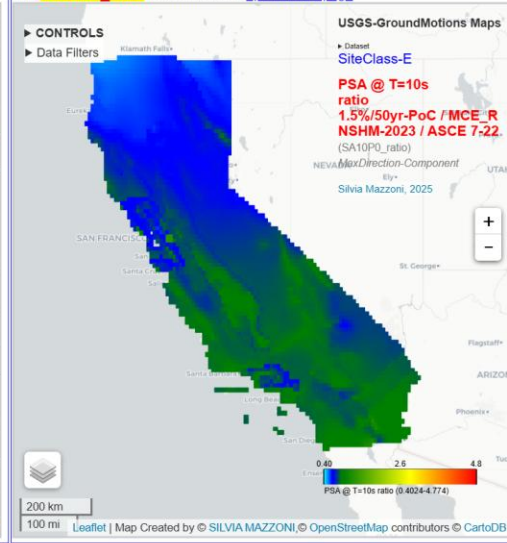
IM: SA3P0_ratio Soil-Class: E [open in new page](#)



IM: SA5P0_ratio Soil-Class: E [open in new page](#)



IM: SA10P0_ratio Soil-Class: E [open in new page](#)



Effect of risk target within 2023 NSHM

Effect of risk target within 2023 NSHM

PSA Ratio

1.5%poc/50yr / 1.0%poc/50yr

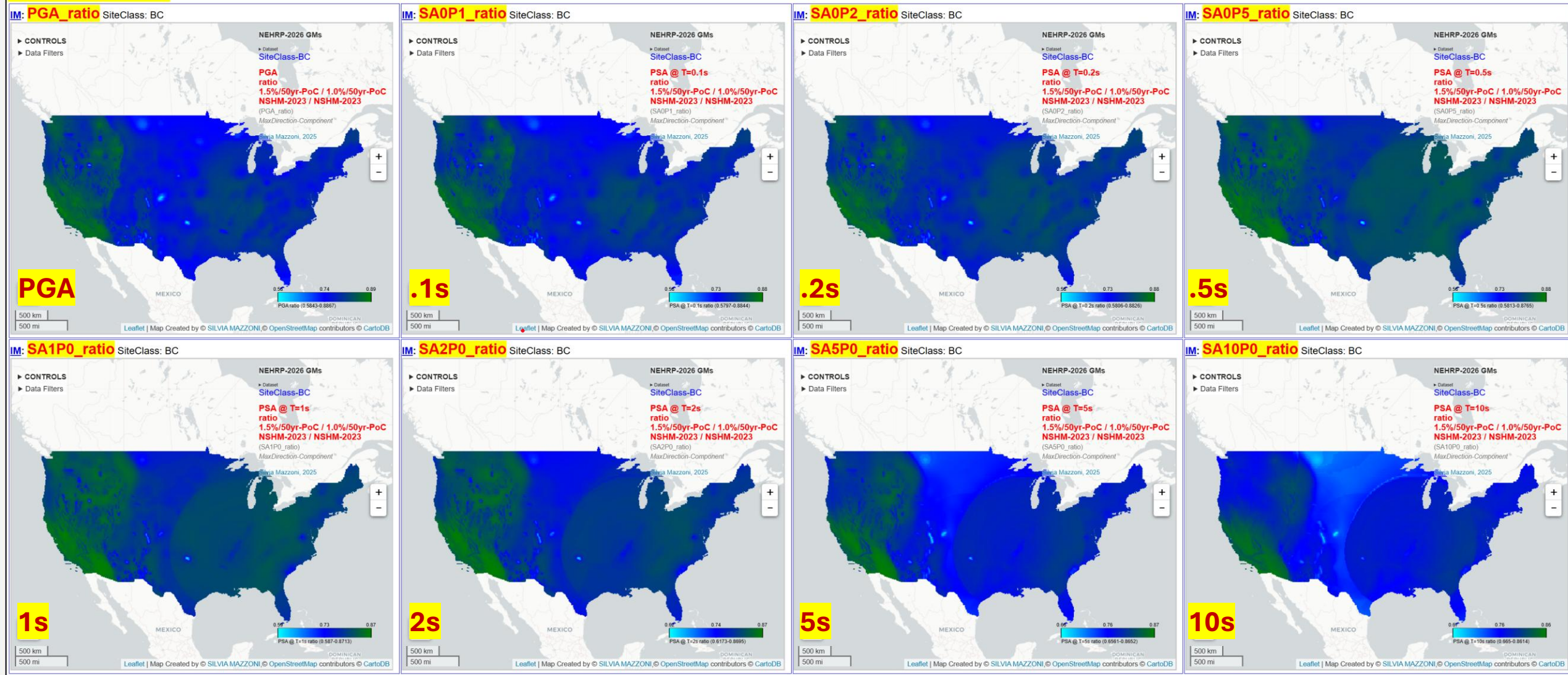
NSHM-2023

Site Classes: BC,C,CD,D,DE,E

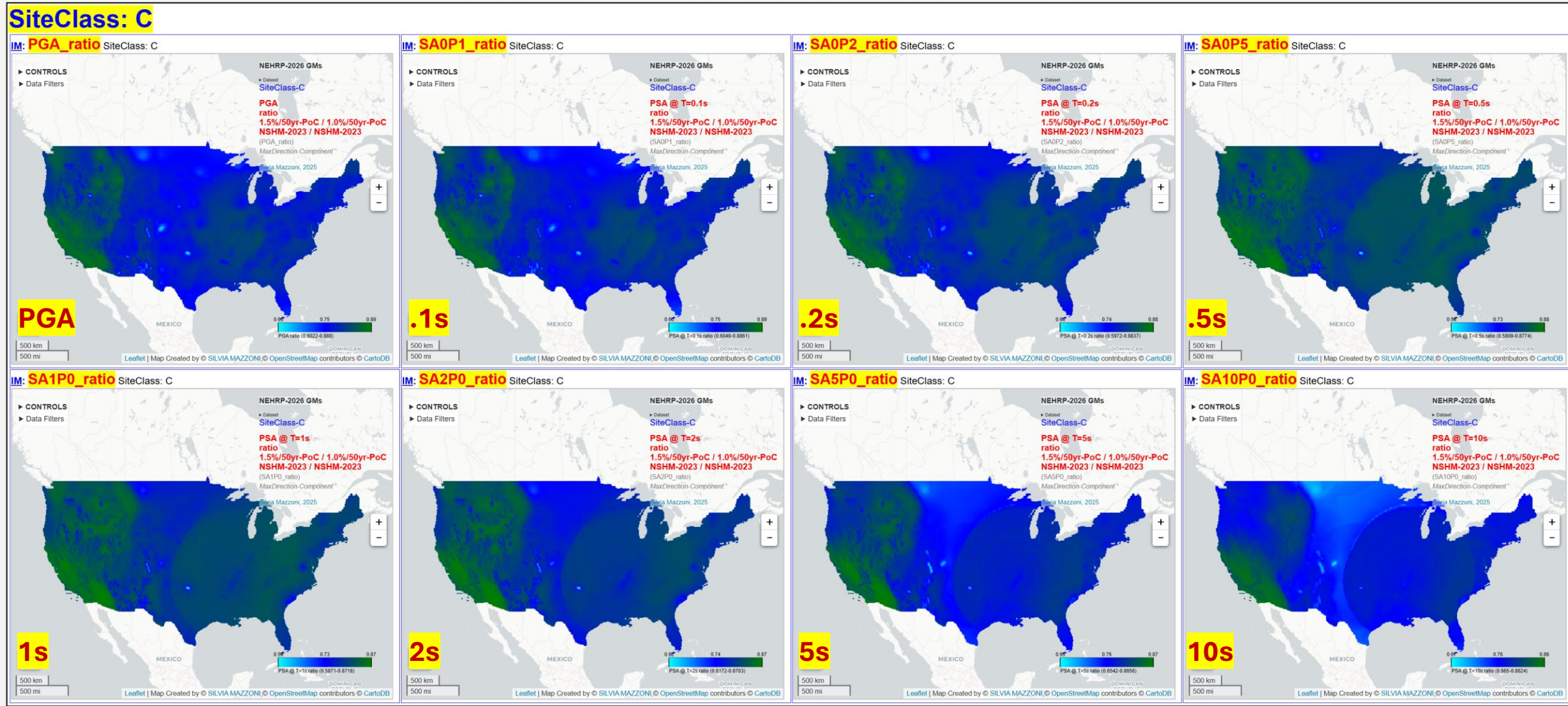
Periods: PGA, 0.1,0.2,0.5 1,2,5,10

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

SiteClass: BC

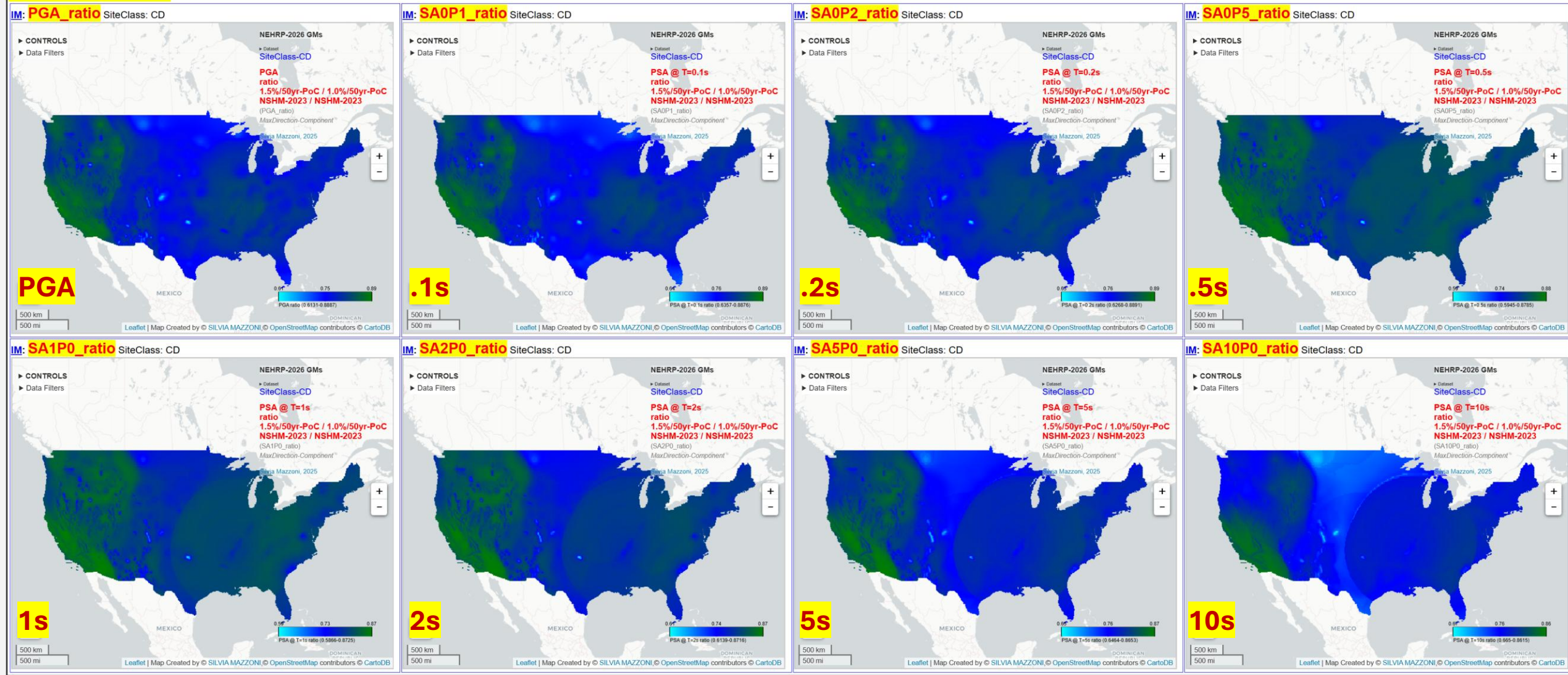


QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

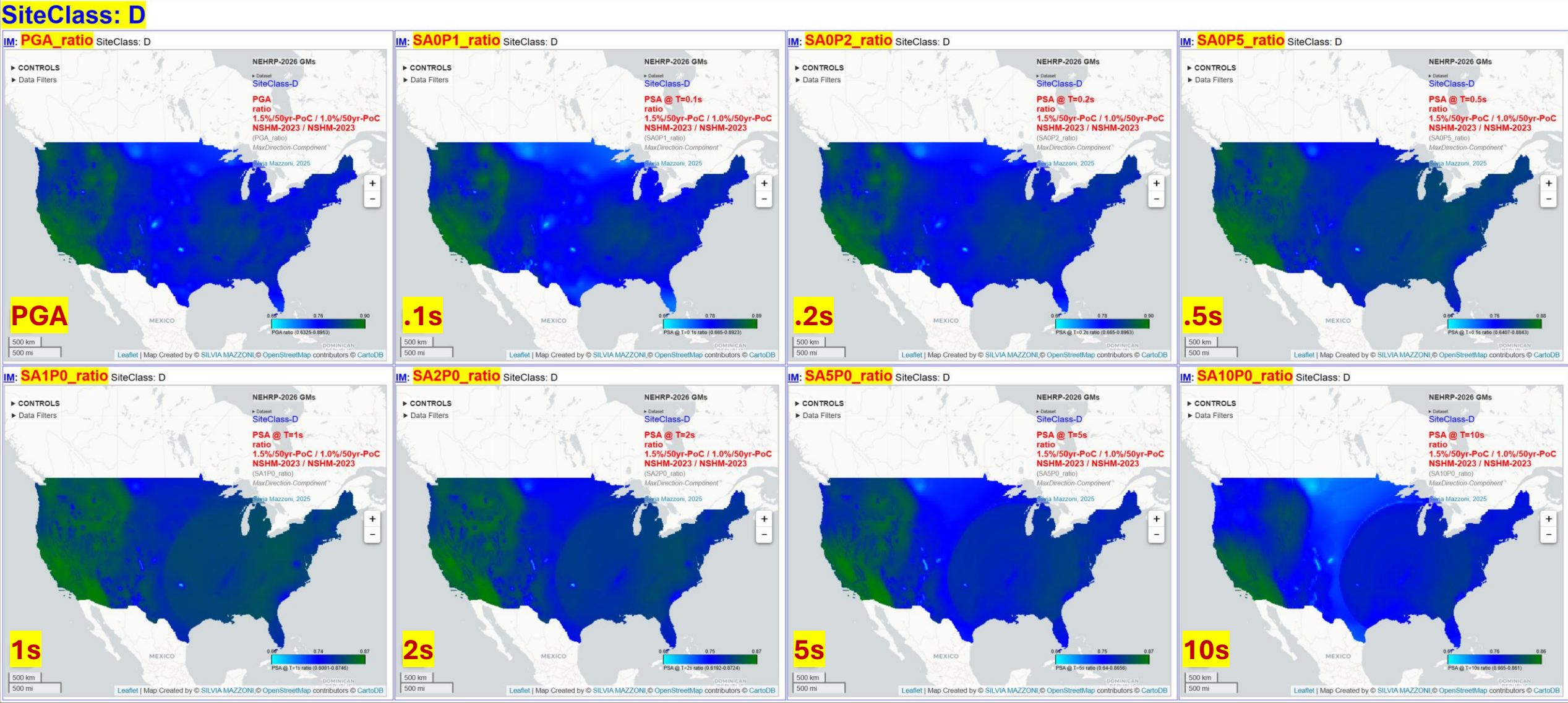


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SiteClass: CD

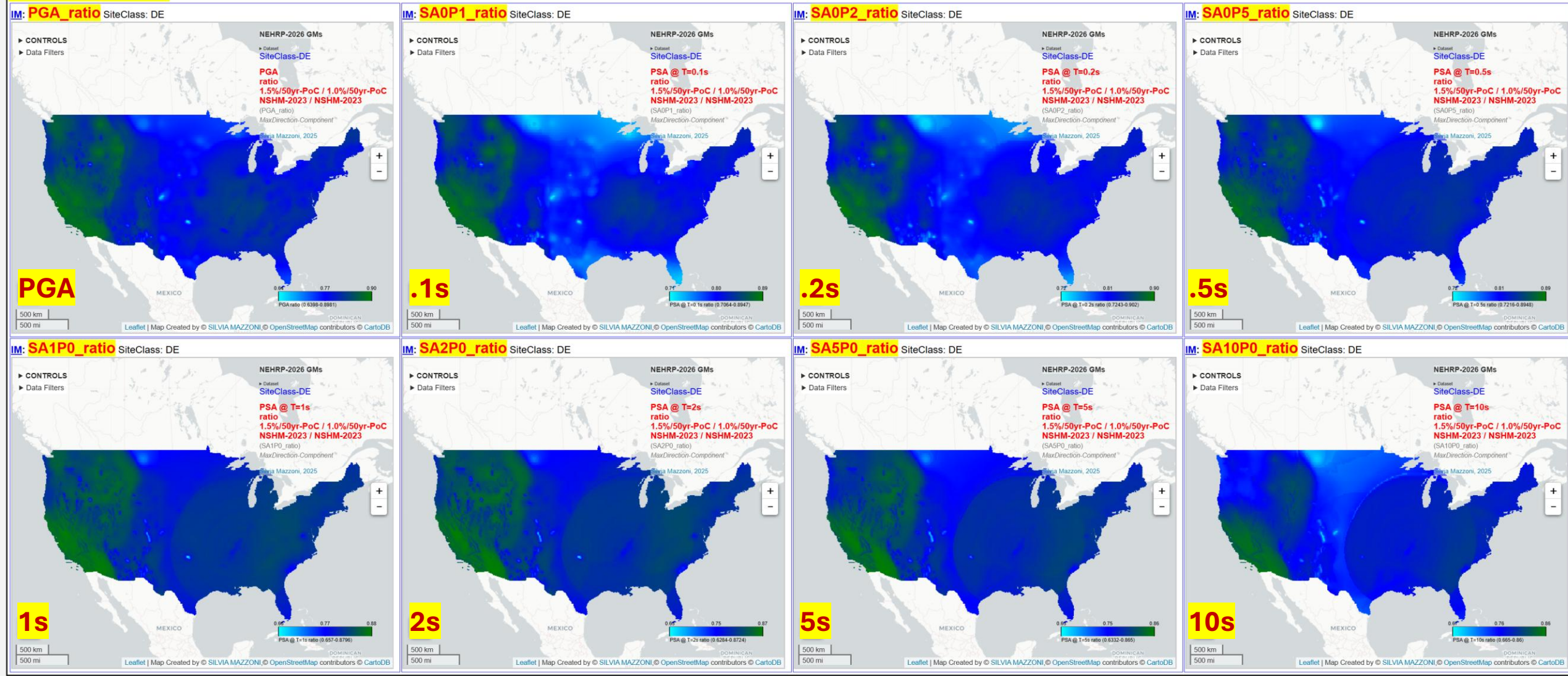


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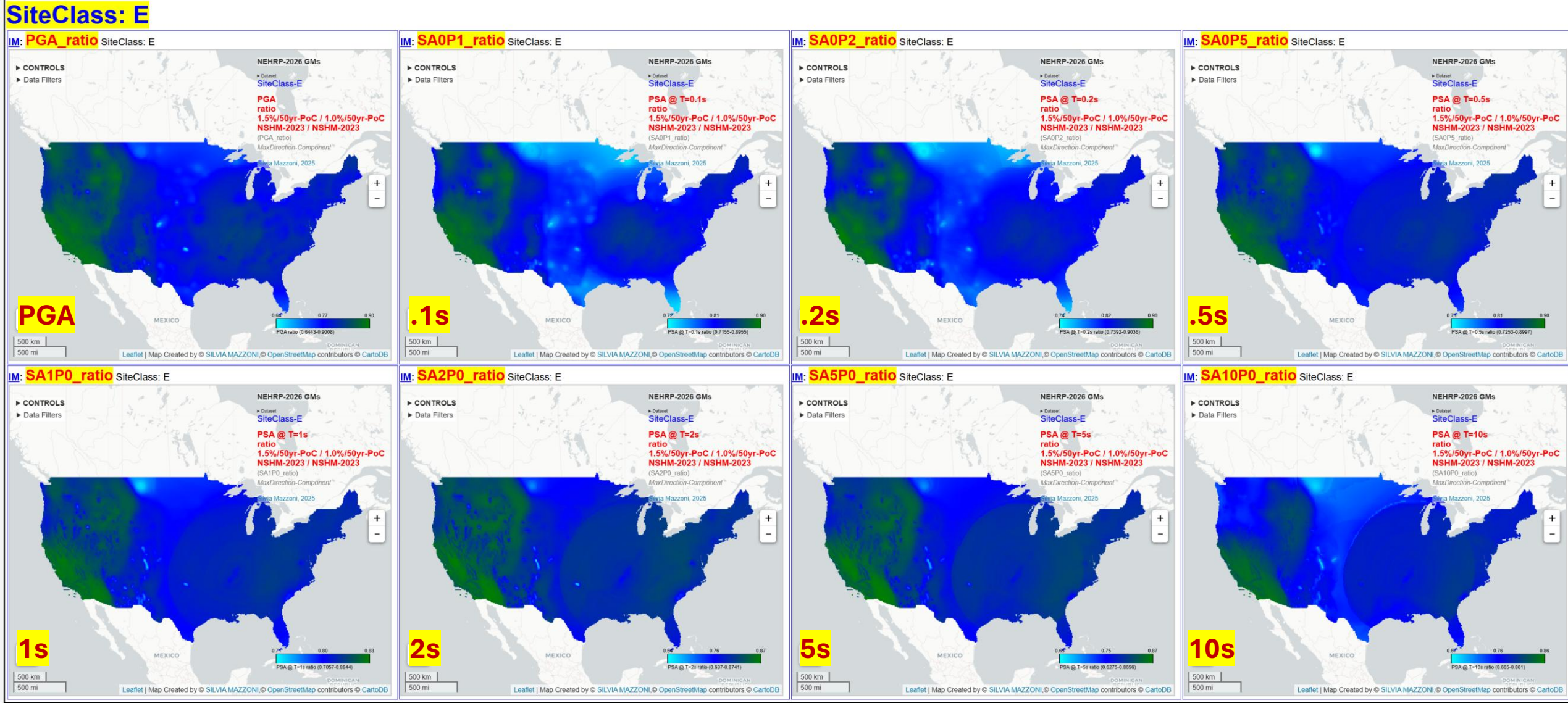


QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

SiteClass: DE



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**



Effect of risk target within 2023 NSHM

PSA Ratio

1.5%poc/50yr / 1.0%poc/50yr

NSHM-2023

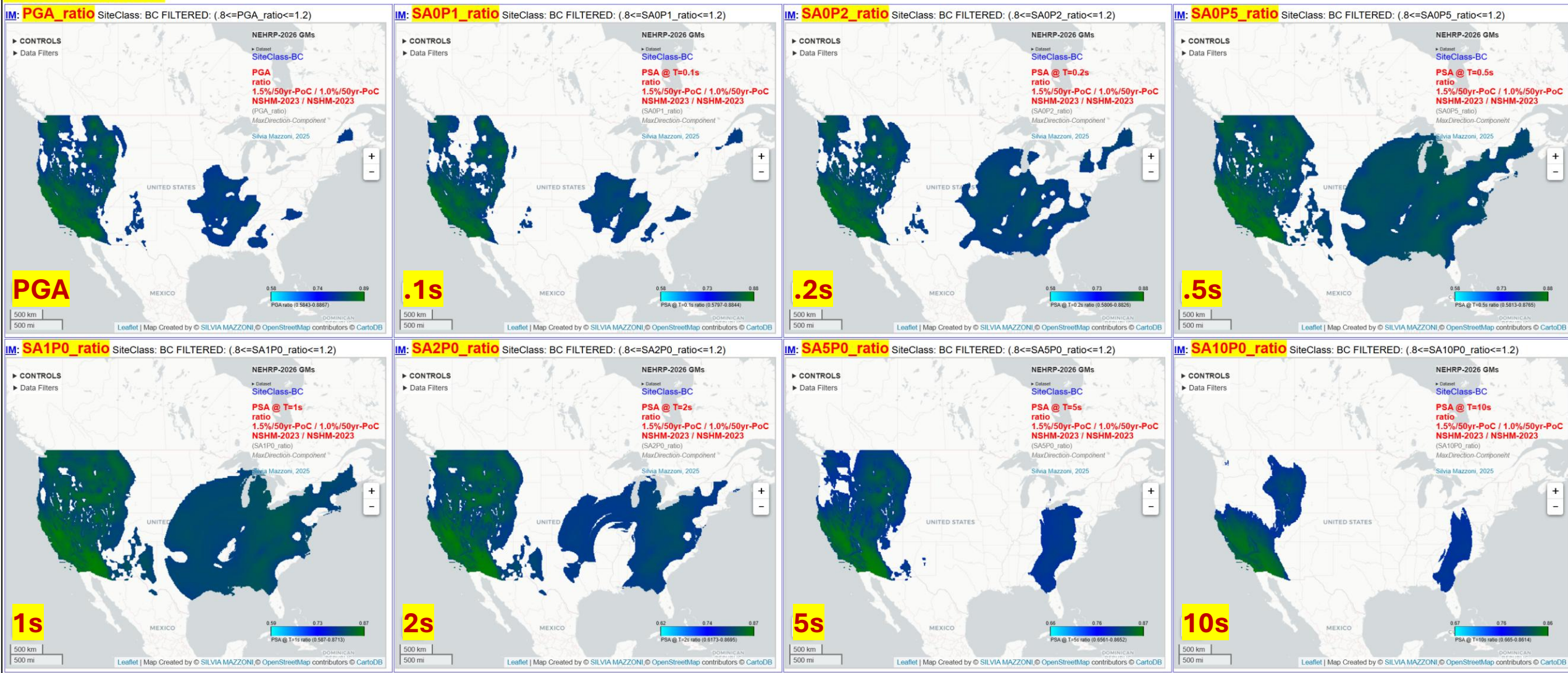
Site Classes: BC,C,CD,D,DE,E

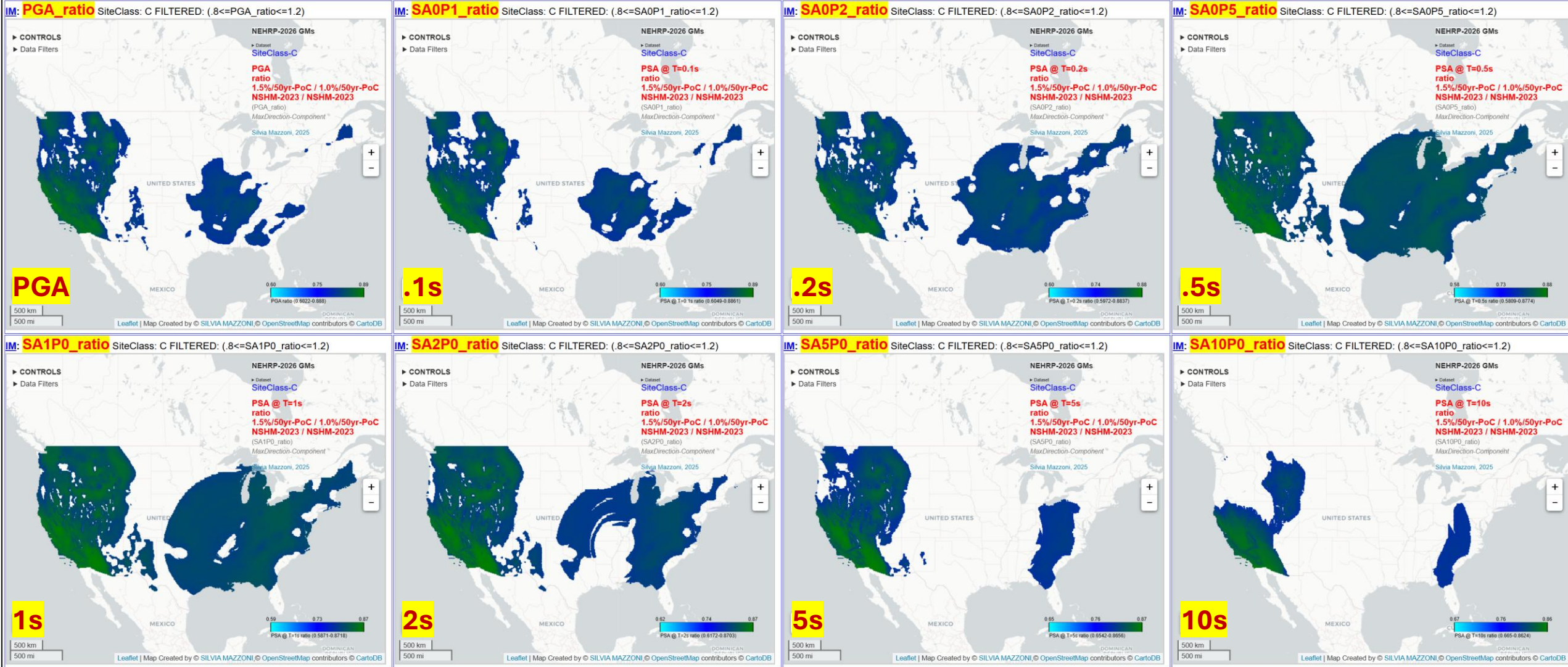
Periods: PGA, 0.1,0.2,0.5 1,2,5,10

+/- 20%

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

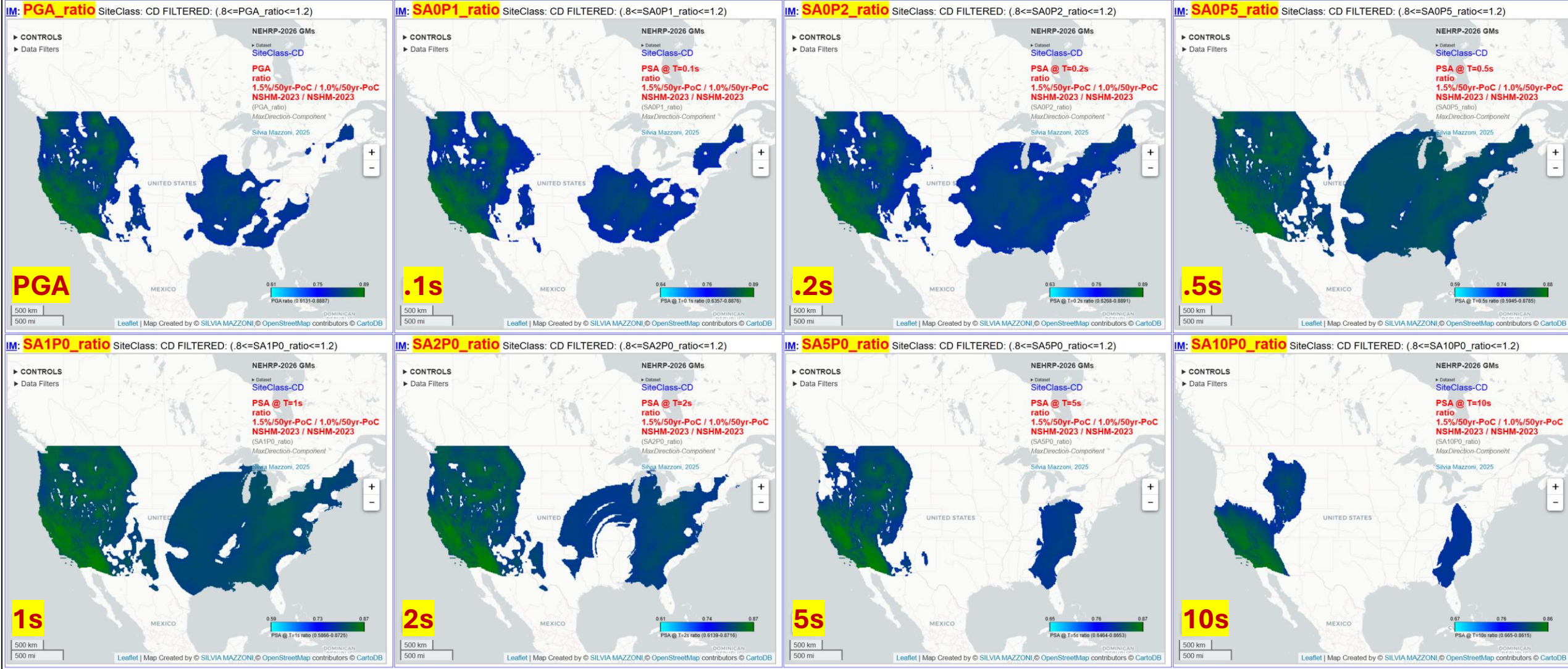
SiteClass: BC



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50****SiteClass: C**

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

SiteClass: CD



1.5% PoC / 1.0% PoC 2023NSHM-RTSA

SiteClass: **D**

+/-20%

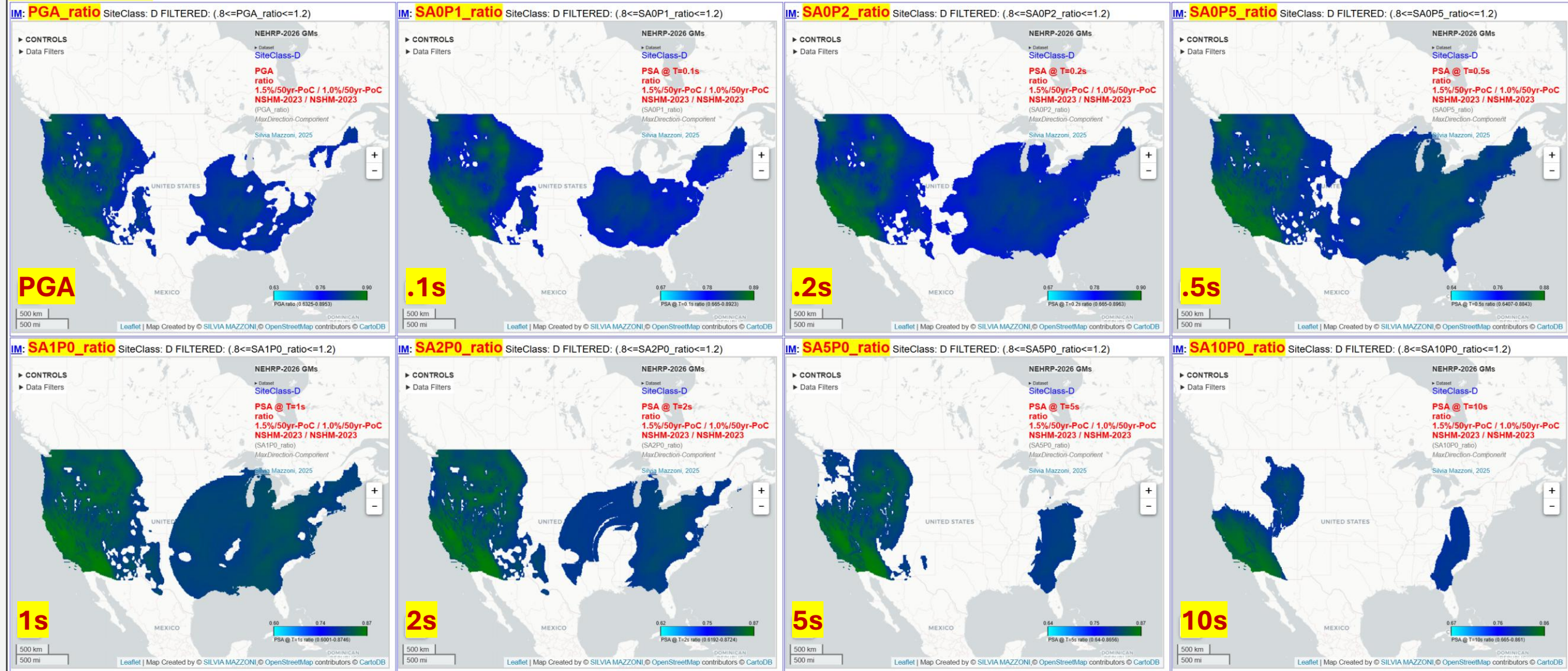
NEHRP-2026 Interactive Maps -- Sets

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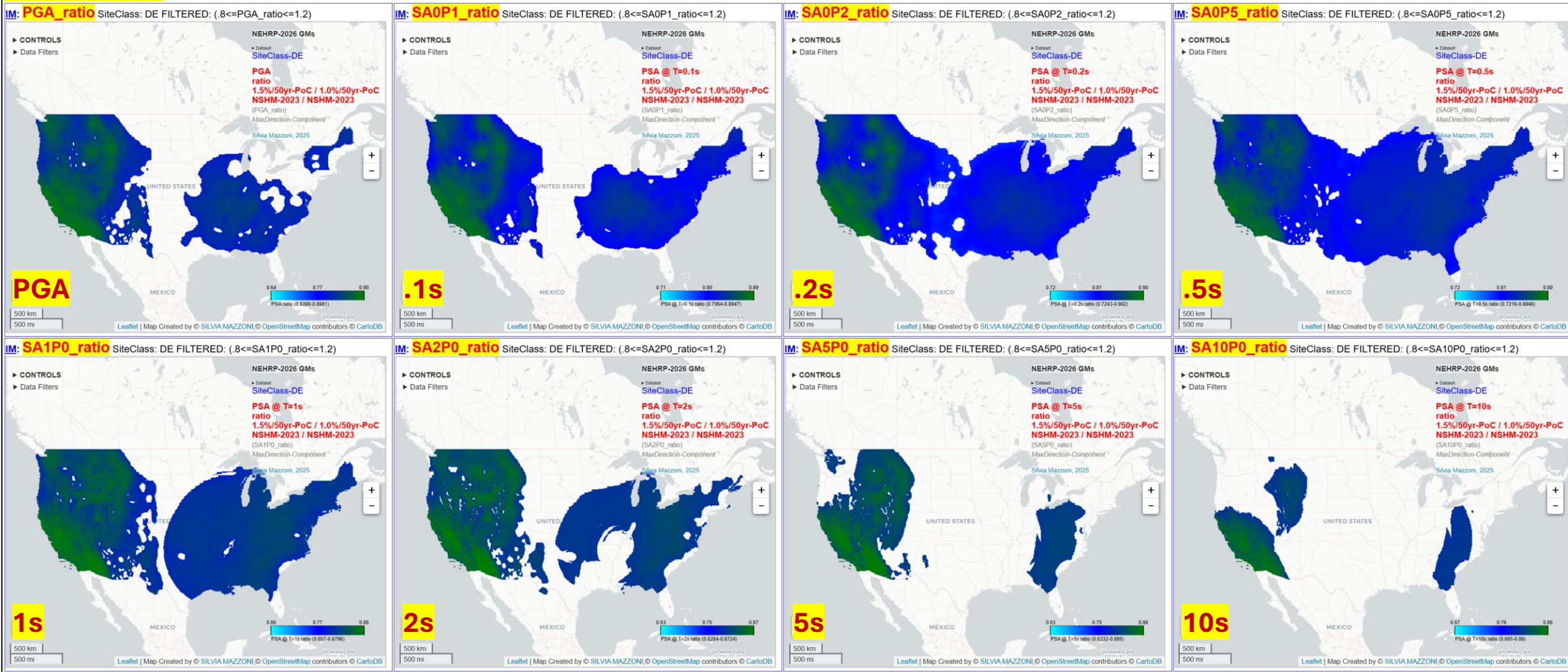
QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

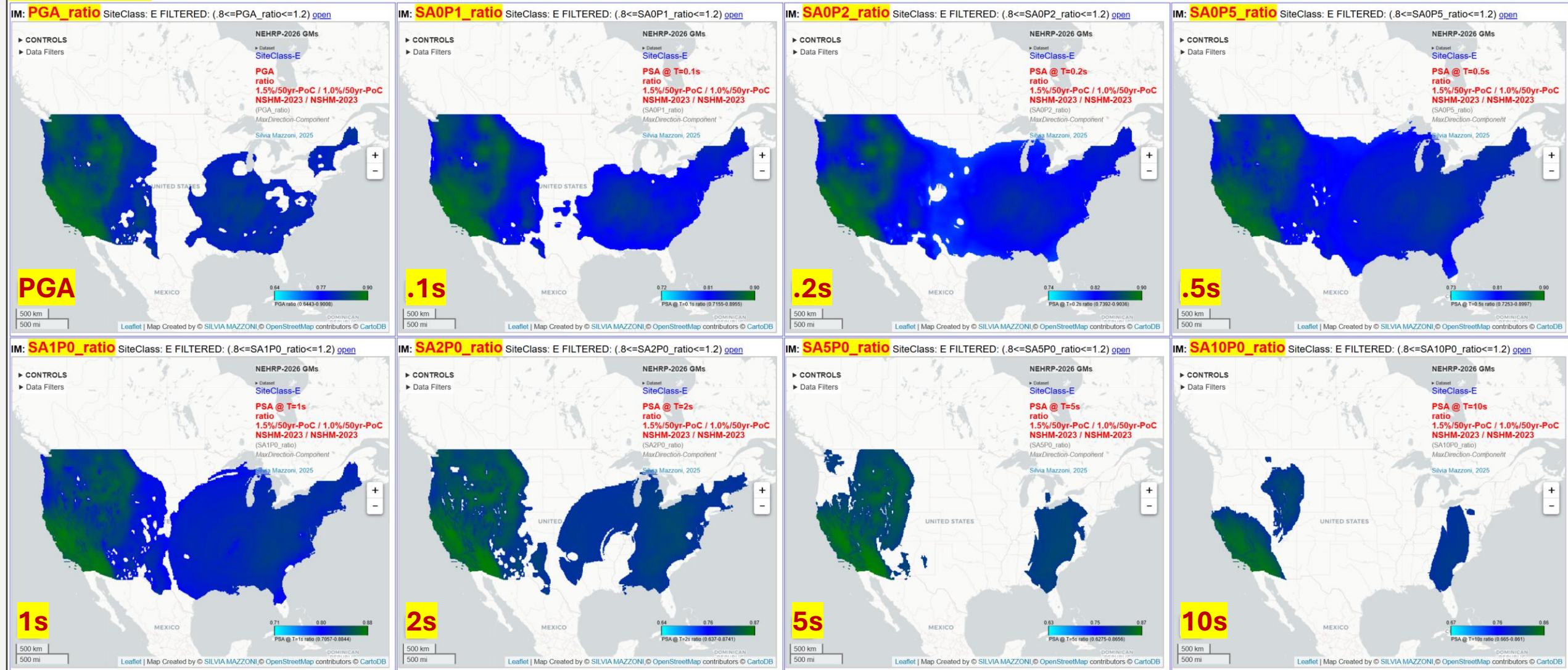
SiteClass: D



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

SiteClass: DE



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50****SiteClass: E**

Effect of risk target within 2023 NSHM

PSA Ratio

1.5%poc/50yr / 1.0%poc/50yr

NSHM-2023

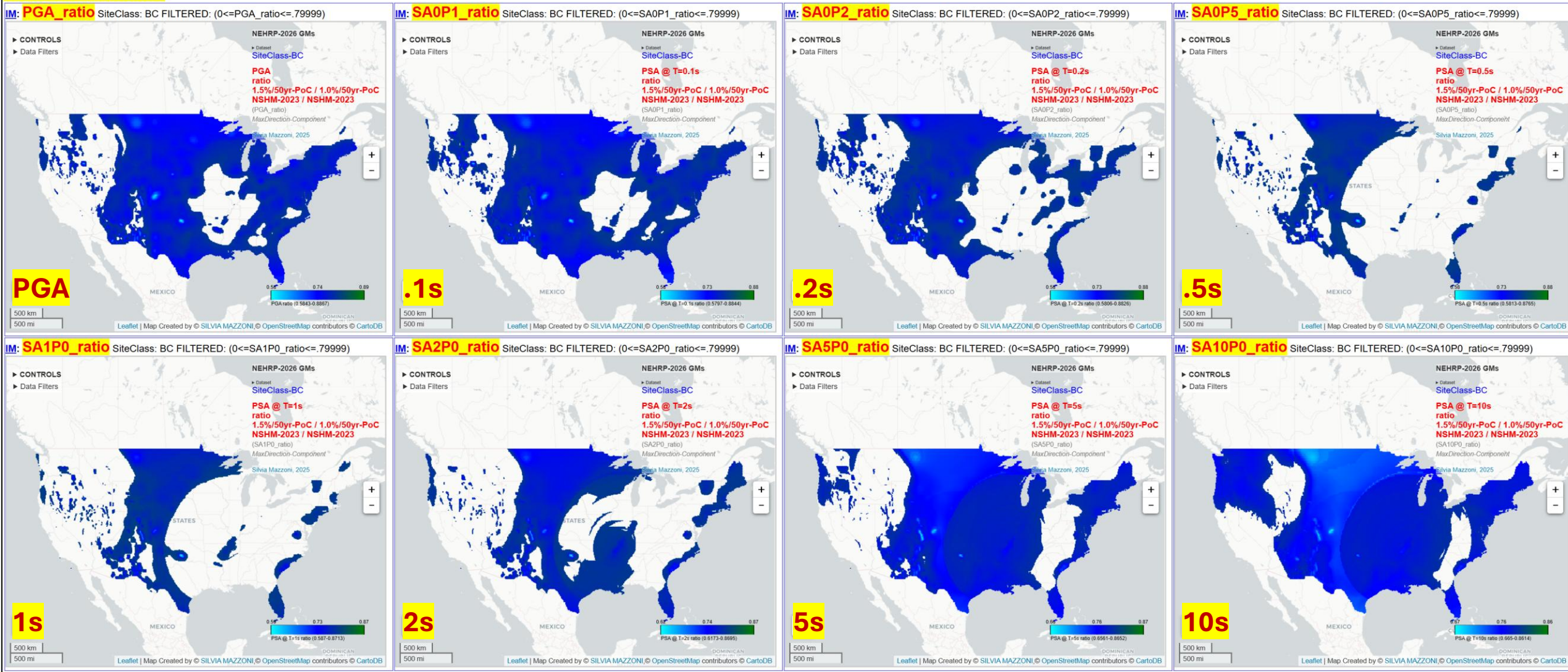
Site Classes: BC,C,CD,D,DE,E

Periods: PGA, 0.1,0.2,0.5 1,2,5,10

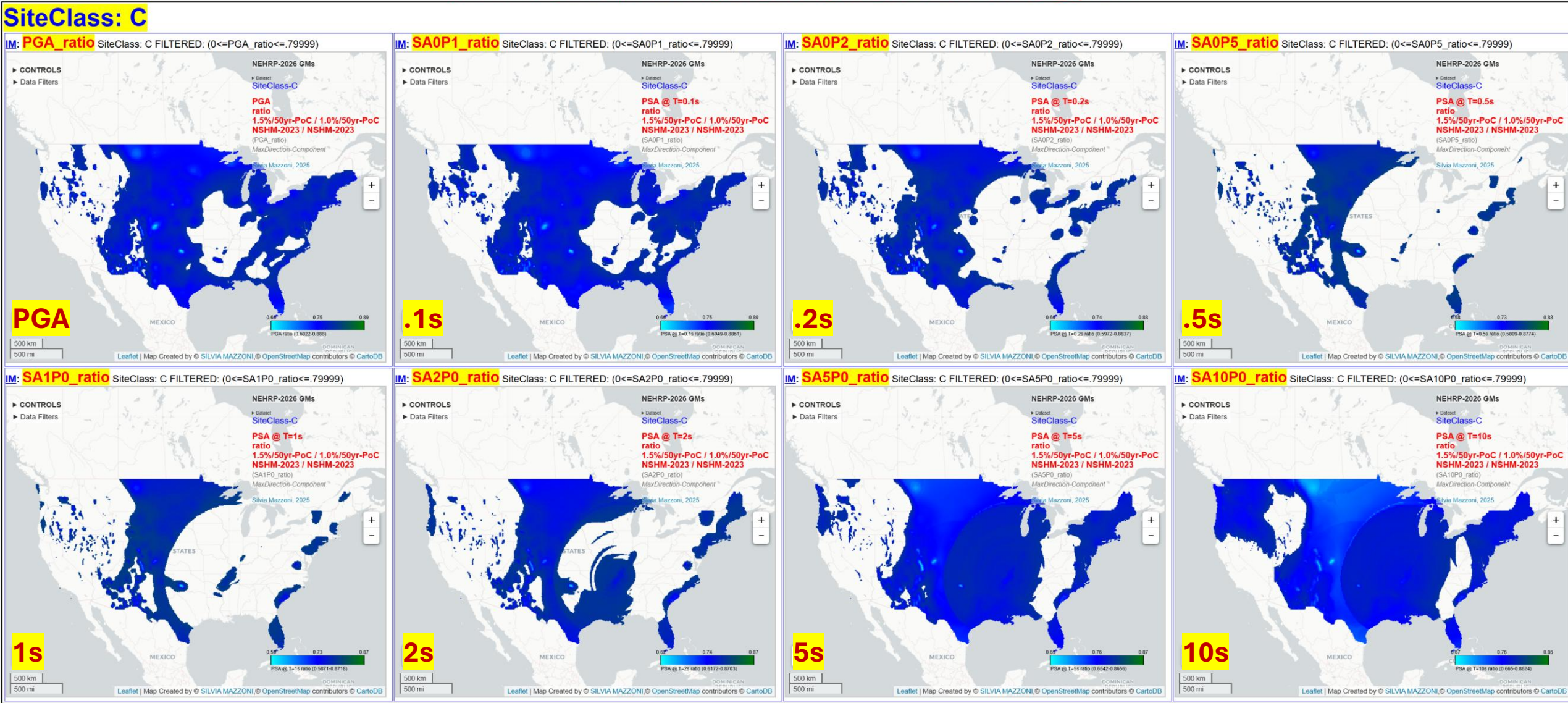
<80%

QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

SiteClass: BC

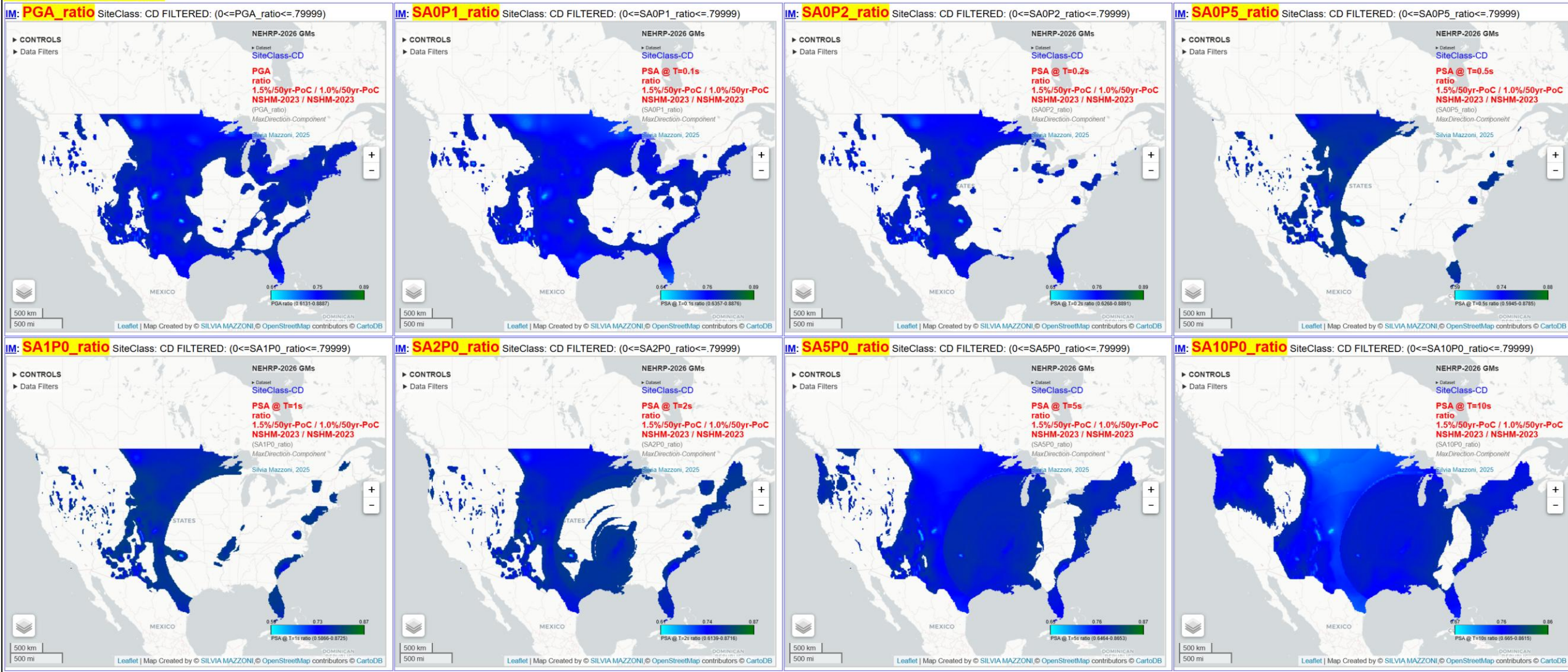


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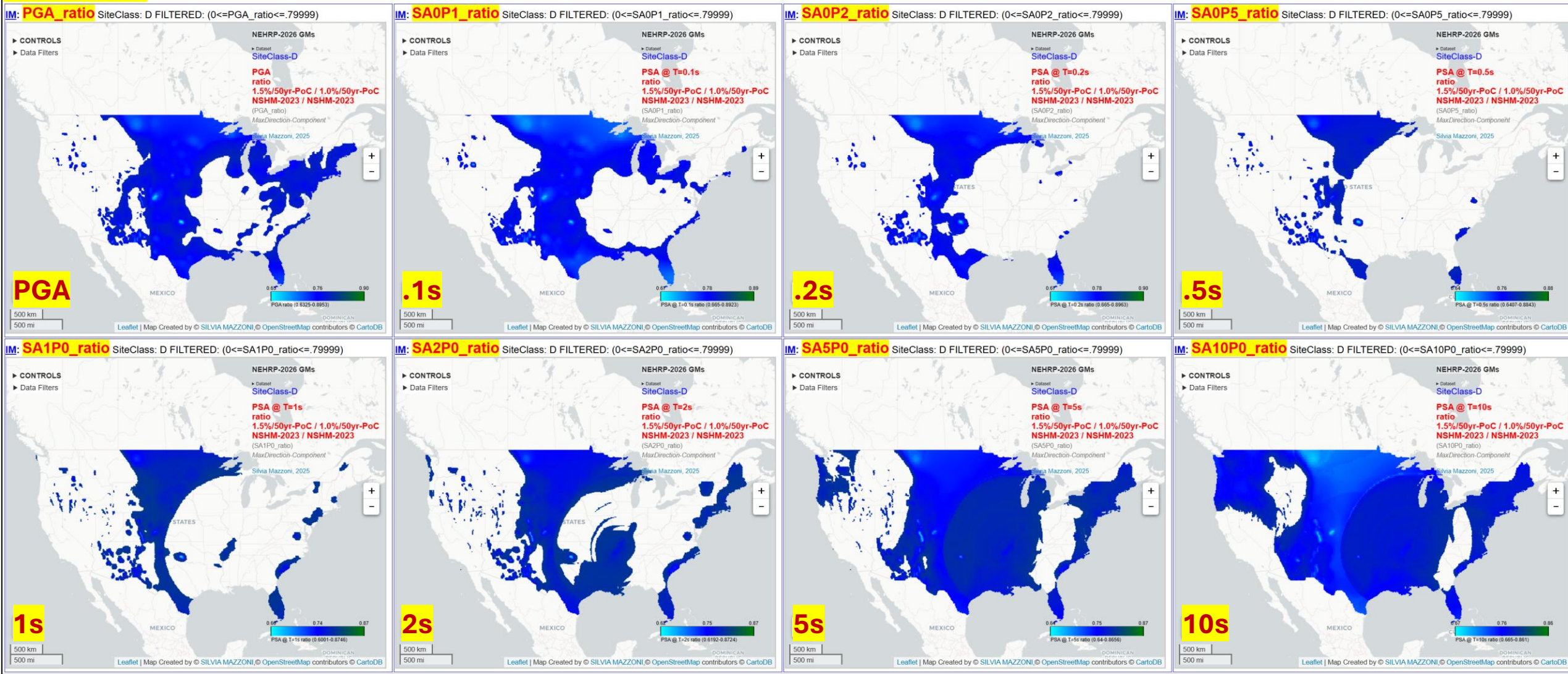
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SiteClass: CD



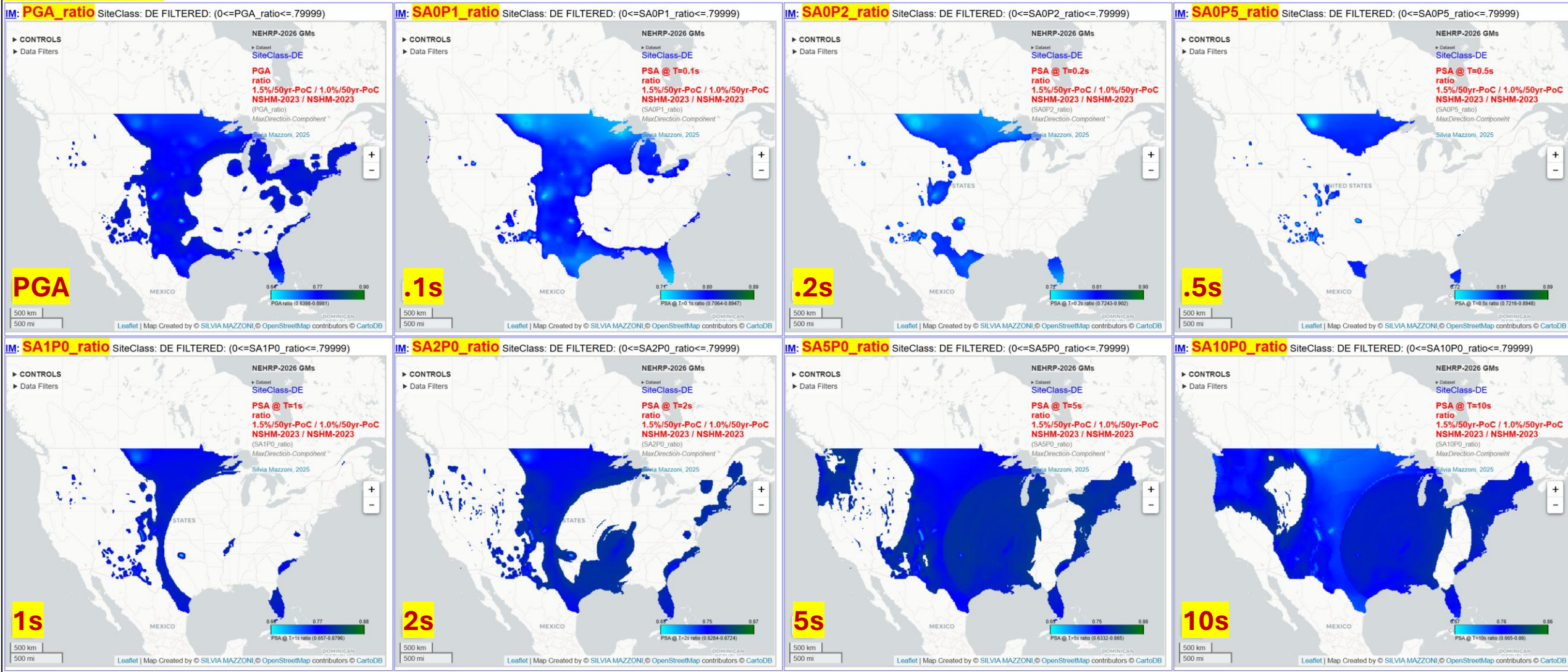
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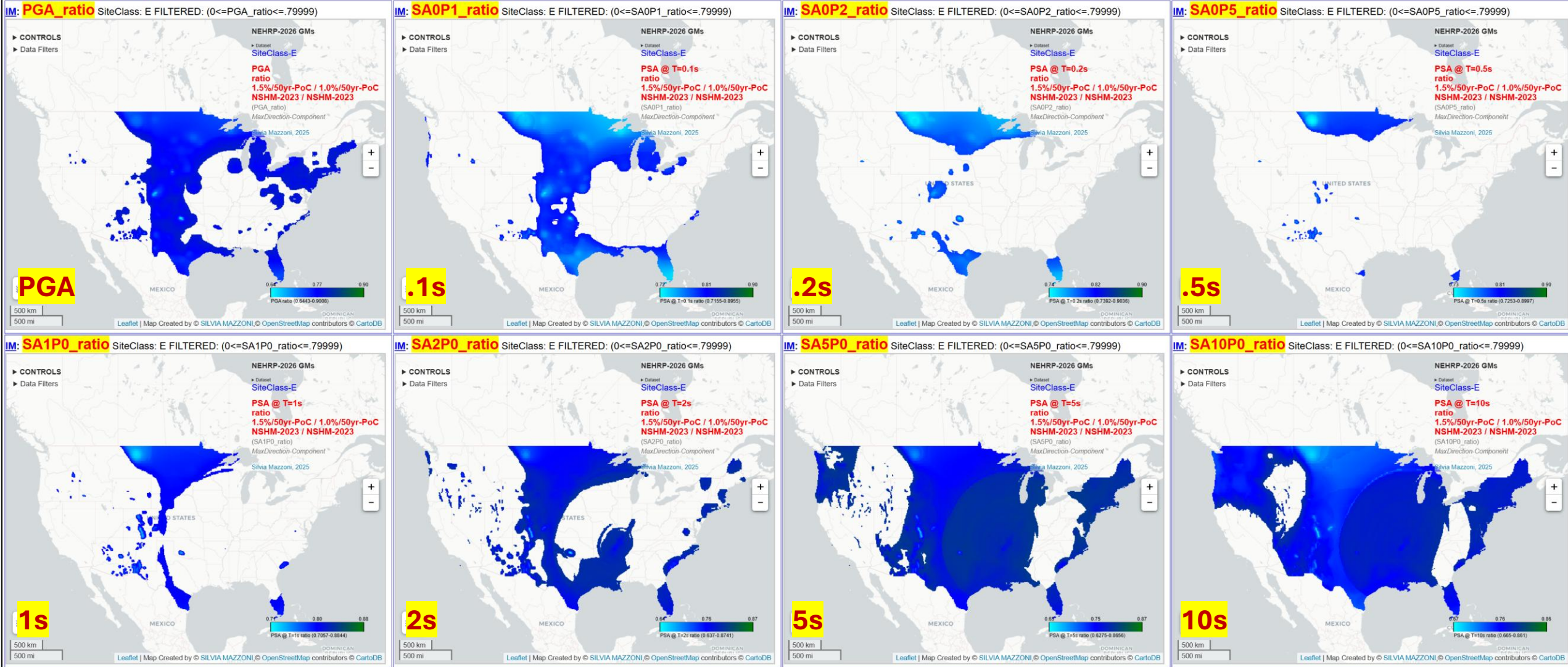
SiteClass: D



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50**

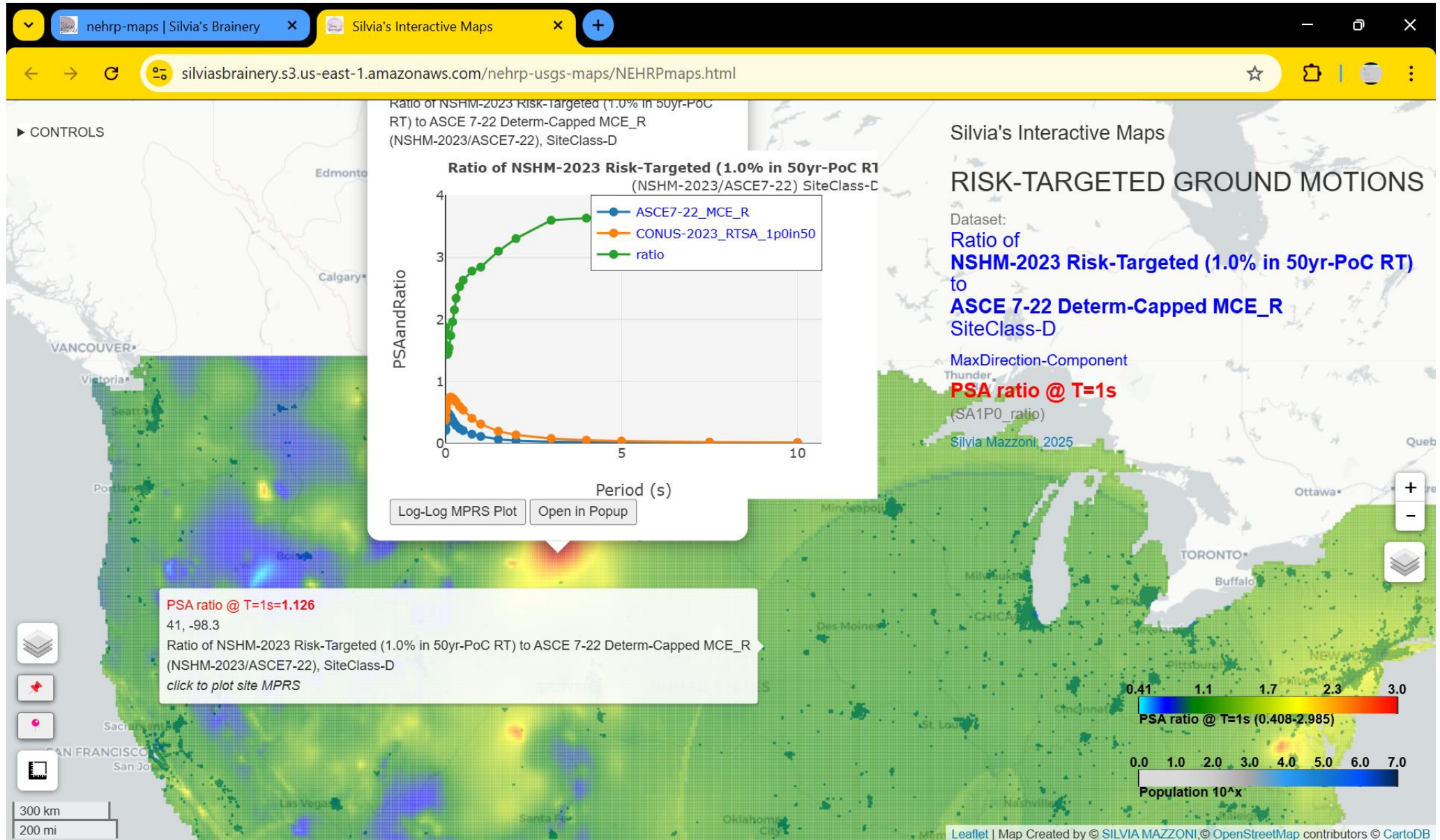
SiteClass: DE



QUANTITY: **PSAratio**, MODEL: **NSHM-2023/NSHM-2023**, METRIC: **RTSA_1p5in50****SiteClass: E**

More on what you can do with the maps

Query Grid Points



Filter data

