



SalienTime

Select Dataset:

Cloud and Moisture Imagery  
CONUS

Band 13 of the Advanced Very High Resolution Radiometer (AVHRR) L2  
Cloud and Moisture imagery is a clean longwave infrared band. It measures the brightness temperature at the top of the atmosphere.

Saliency Definition:

Selecting 8 frames

Structural:

Statistical:

Aggregation: MAX MIN AVG

Time Steps:

Latent Space:



ECNUVIS ECNU Visualization Lab

# SalienTime: User-driven Selection of Salient Time Steps for Large-Scale Geospatial Data Visualization

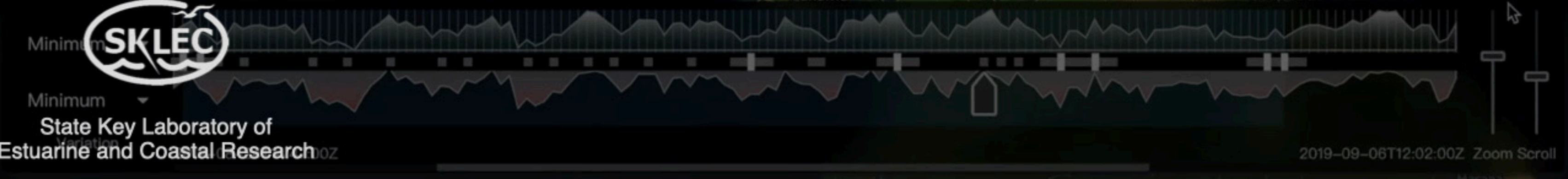
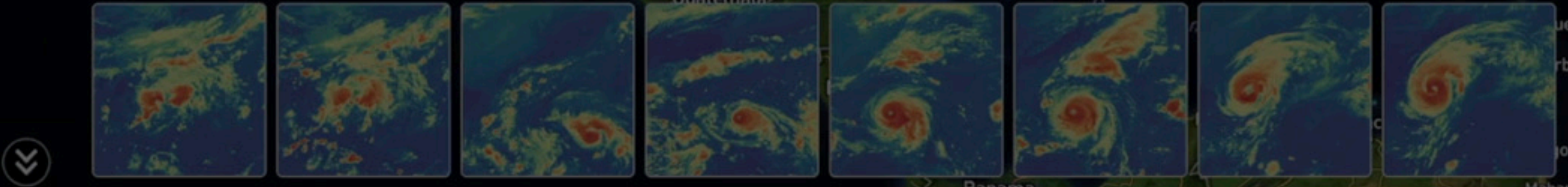
Juntong Chen, Haiwen Huang, Huayuan Ye, Zhong Peng, Chenhui Li, Changbo Wang



Unit: Kelvin (K)  
Coordinate: 56.8041W, 16.7624N  
Geo Bound: 90.7519W, 41.4814N  
63.1531W, 18.2565N

Value: 294.1708 (K)  
Global Max: 357.1 (K)  
Global Min: 241.1 (K)  
Global Avg: 273.3 (K)

Regional Max: 309.45 (K)  
Regional Min: 261.51 (K)  
Regional Avg: 279.67 (K)  
CHI 2024  
Surfing the World  
11-16 May 2024

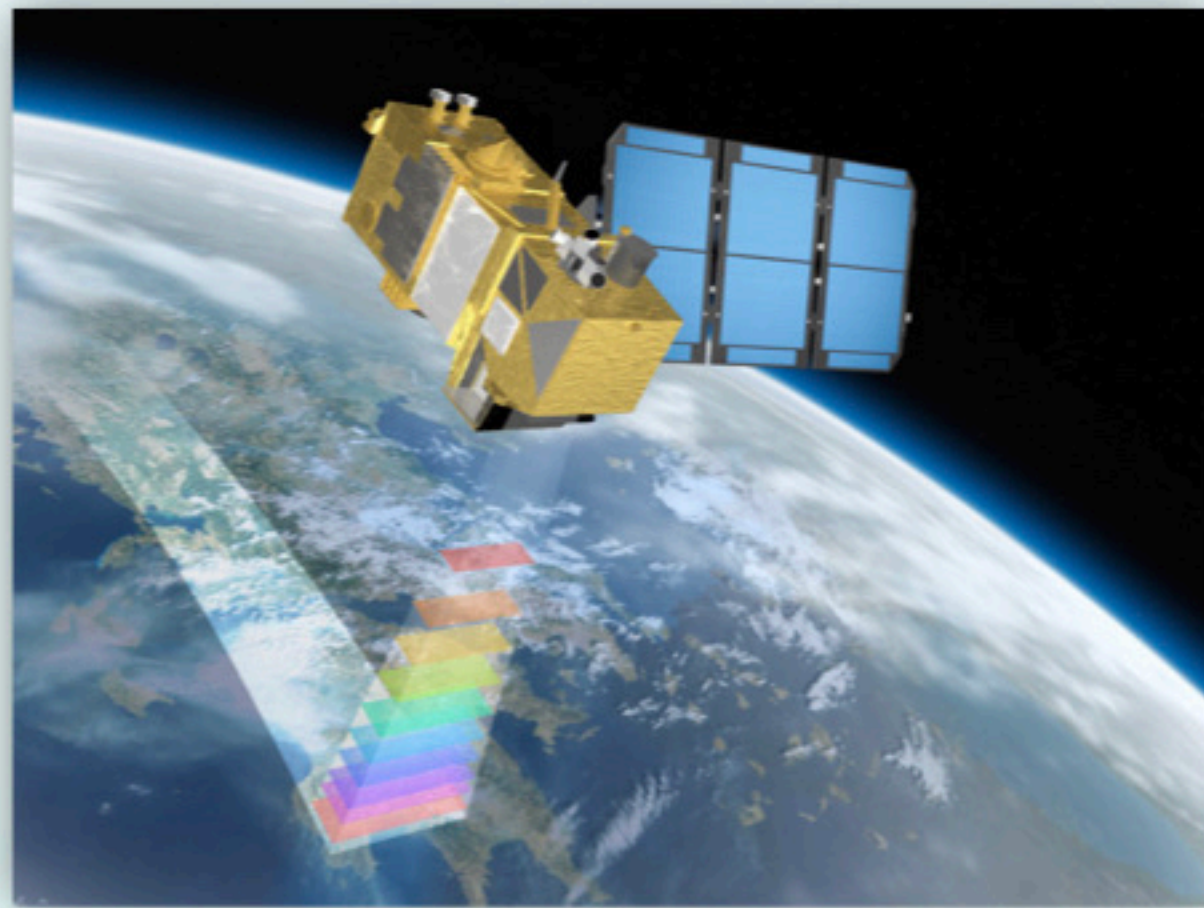


2019-09-01 23:22:00  
2019-09-06T12:02:00Z  
Zoom Scroll  
Map navigation controls: Home, Download, Refresh, Zoom In, Play, Stop, Previous, Next, Full Screen, Close.



# Background

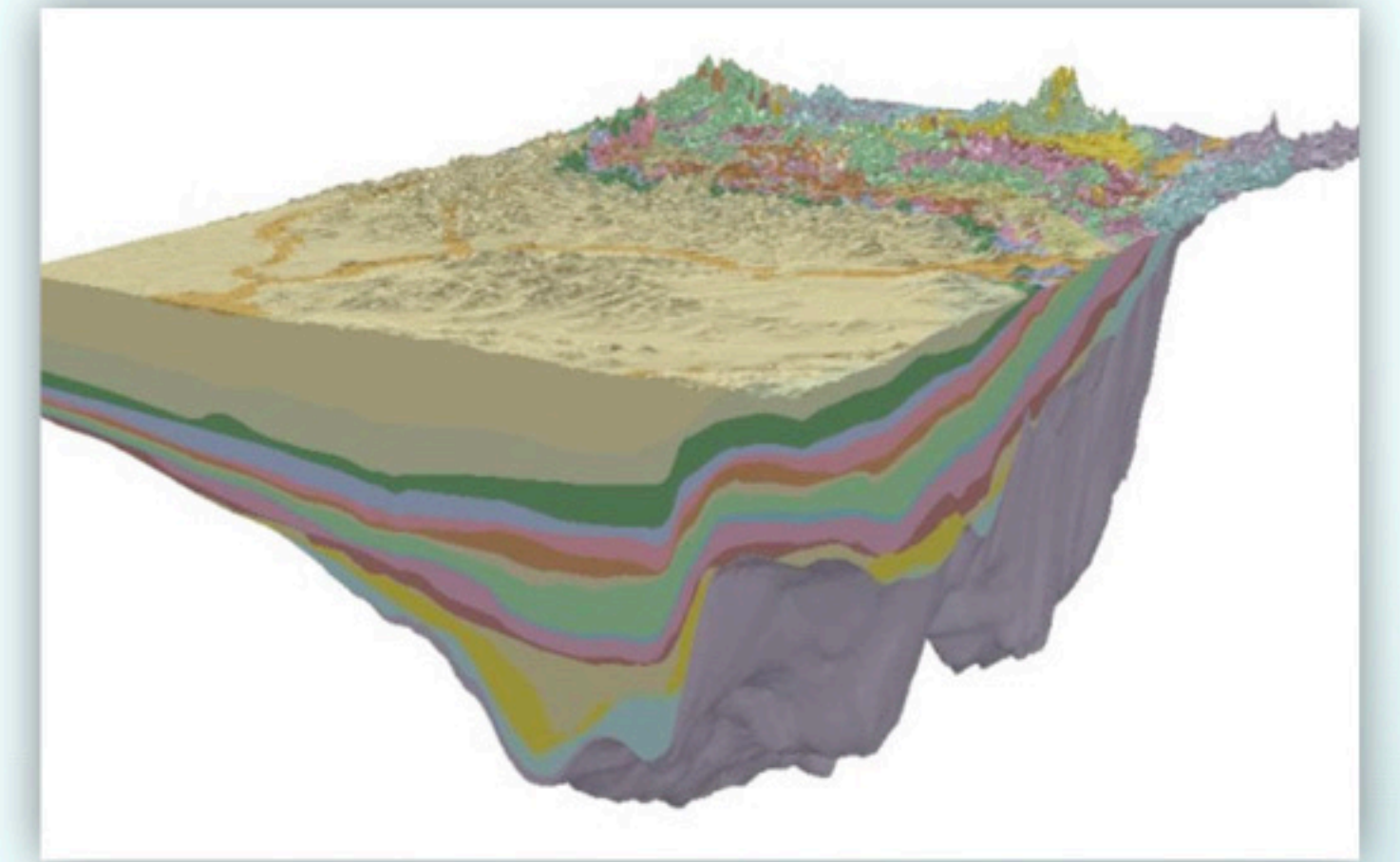
- Geospatial big data has grown exponentially in both ubiquity and volume



**Observation Satellites**



**Meteorological Instruments**



**Numerical Simulations**



# Background

- Geospatial big data has grown exponentially in both ubiquity and volume [1]



**68,360,184**

**Available Datasets**



**405 PiB**

**Volume Downloaded**

- The full potential of these large-scale datasets can only be realized through efficient approaches to user access.



# Background

## Web-based Data Portals

- Allowing users to explore the datasets without full download

**a. NASA Worldview**

**b. Sentinel Hub EO Browser**

**c. MetOceanView**

**Temporal Selection**

**Time-lapse Video**

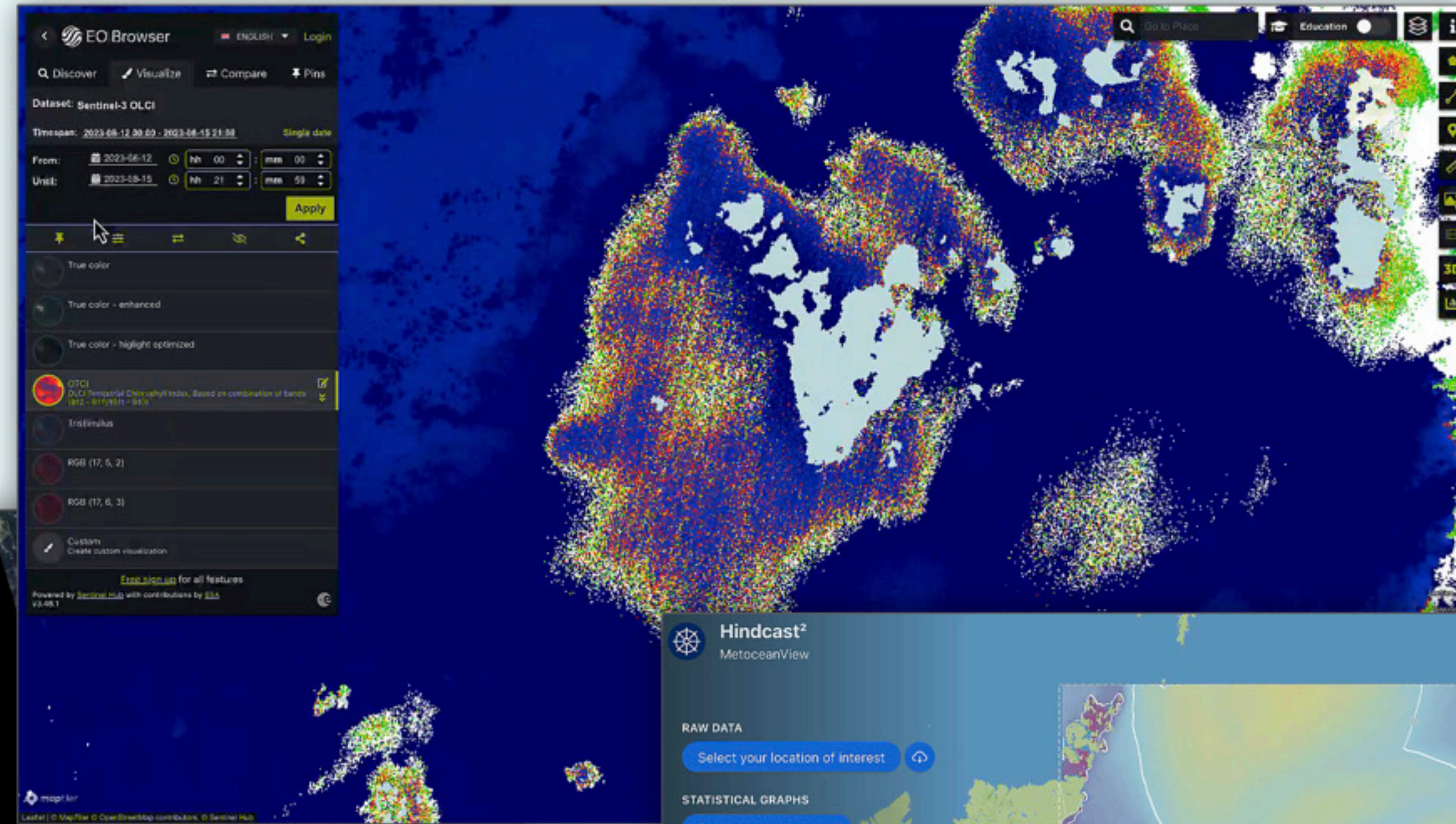
**Spatial Boundaries**

**Temporal Selection**

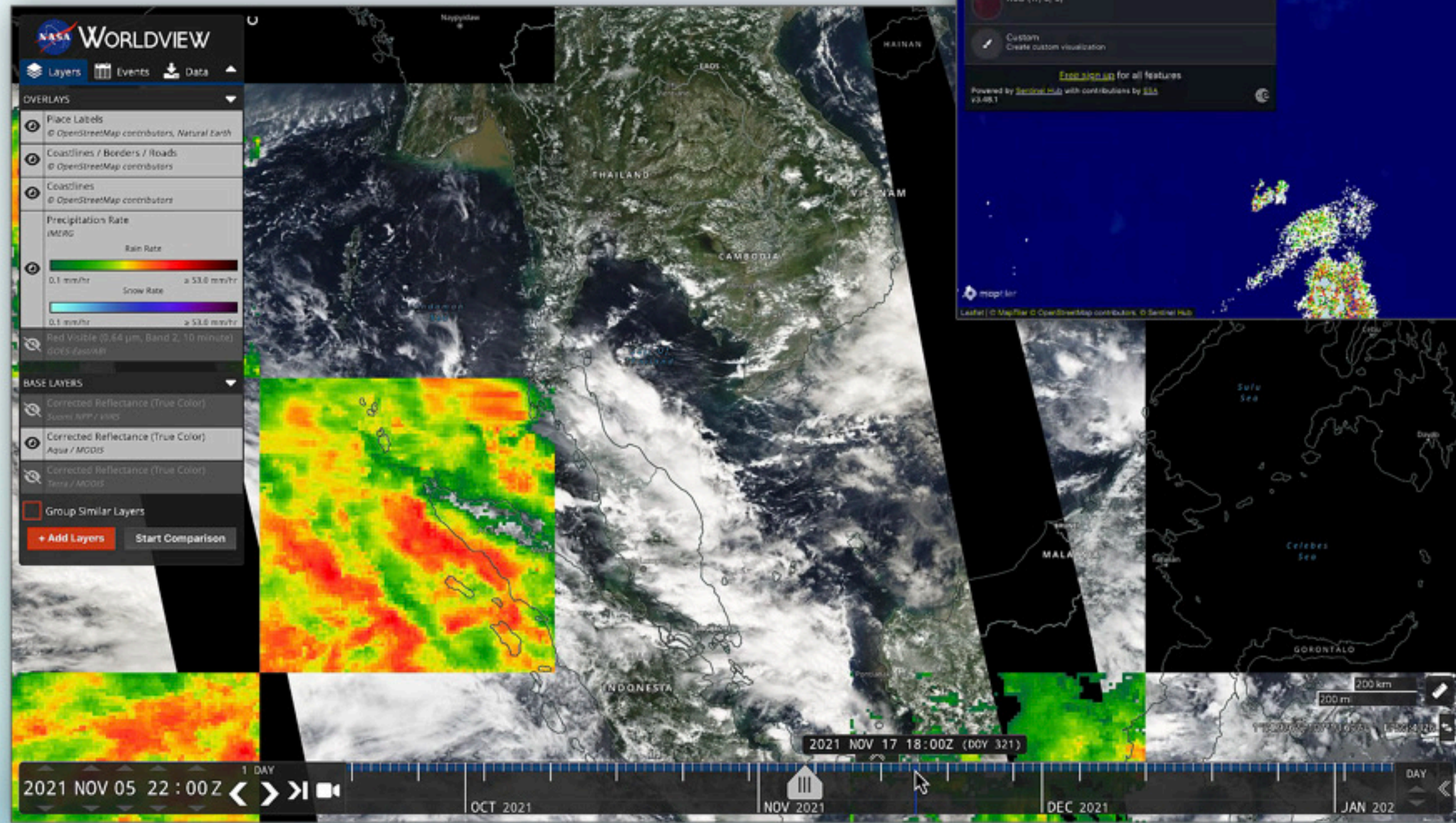
The image displays three web-based data portals. Portal (a) NASA Worldview shows a global map with a 'Time-lapse Video' control at the bottom. Portal (b) Sentinel Hub EO Browser shows a satellite image of a coastal area with a 'Temporal Selection' control. Portal (c) MetOceanView shows a map of the North Sea region with 'Spatial Boundaries' and 'Temporal Selection' callouts.



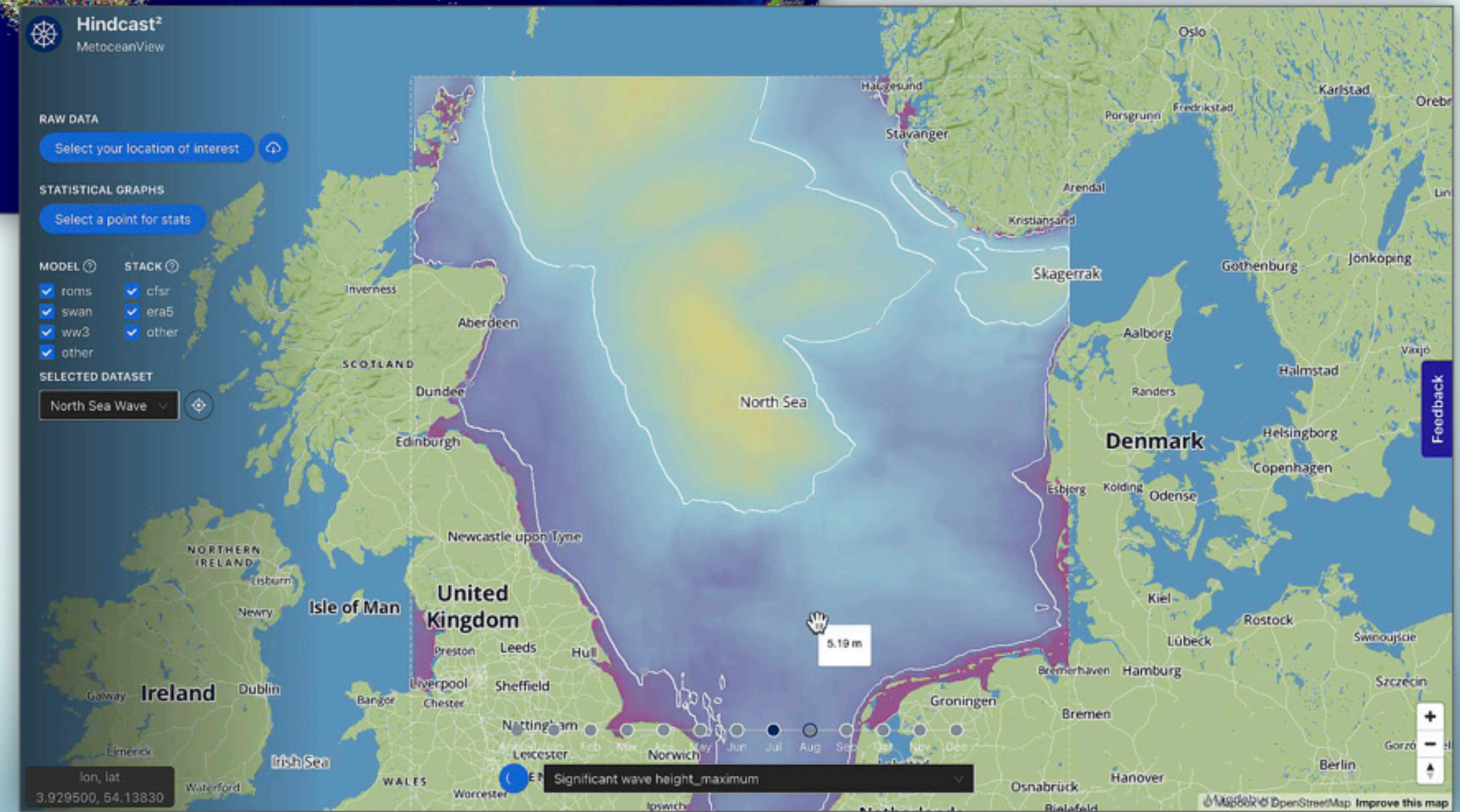
### Sentinel hub EO Browser



### NASA WorldView

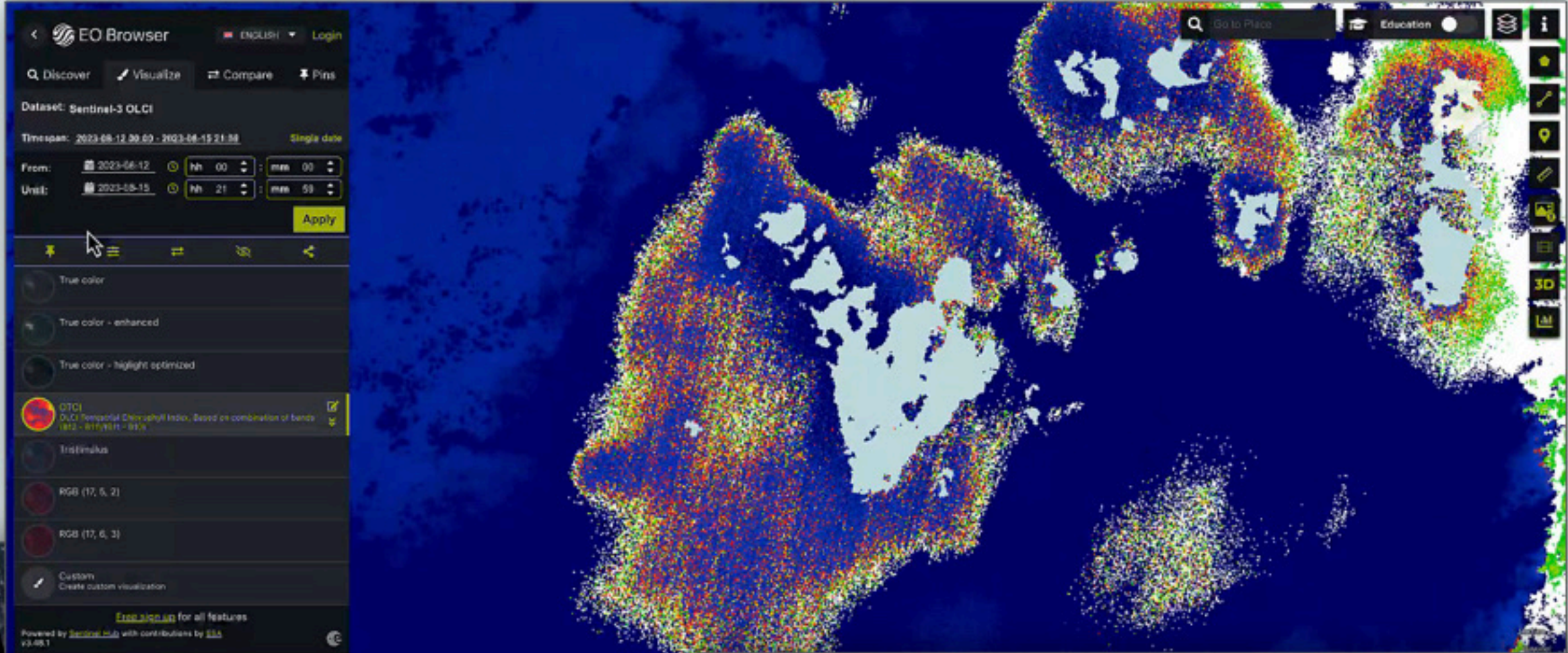


### MetOceanView

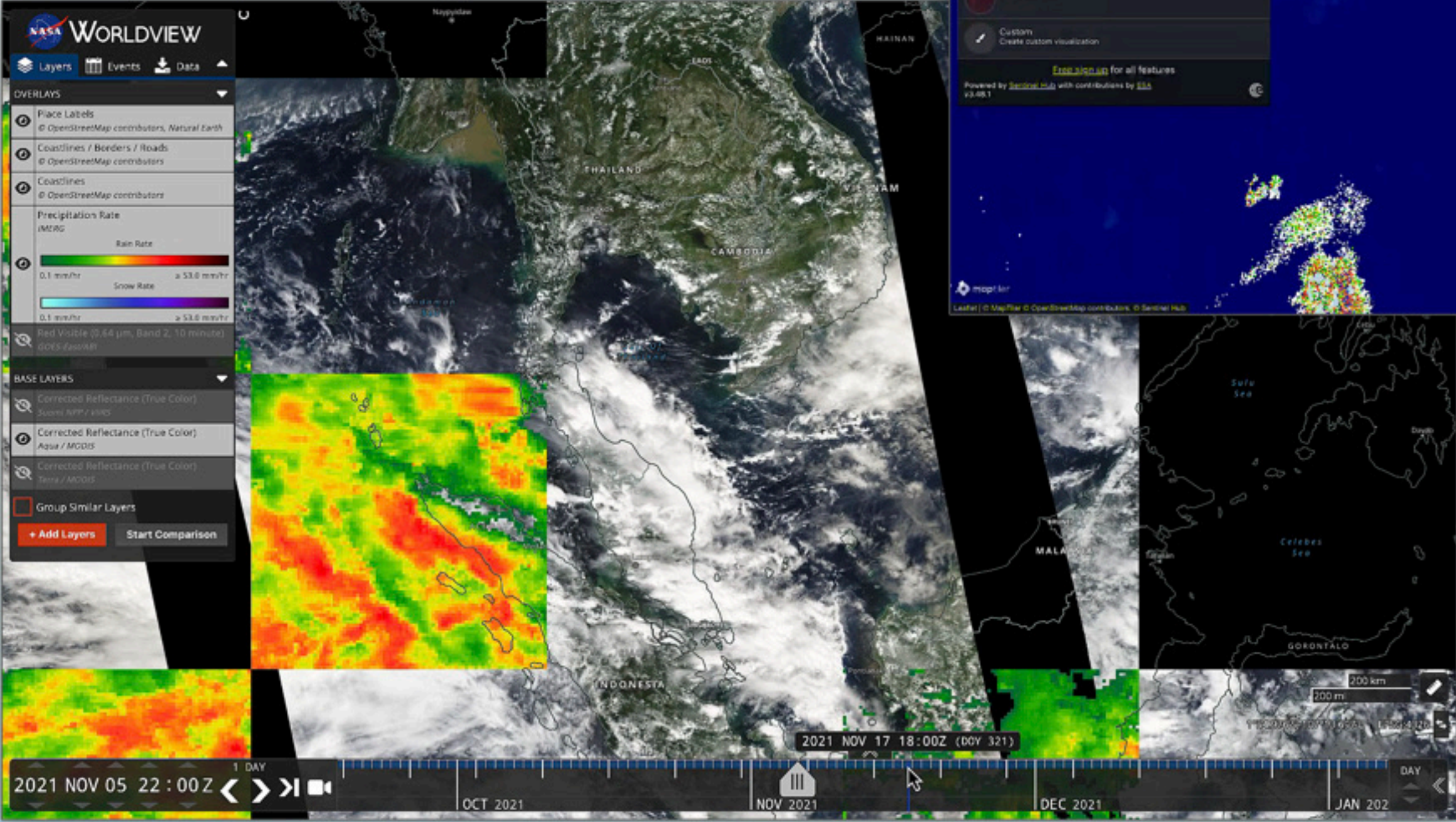




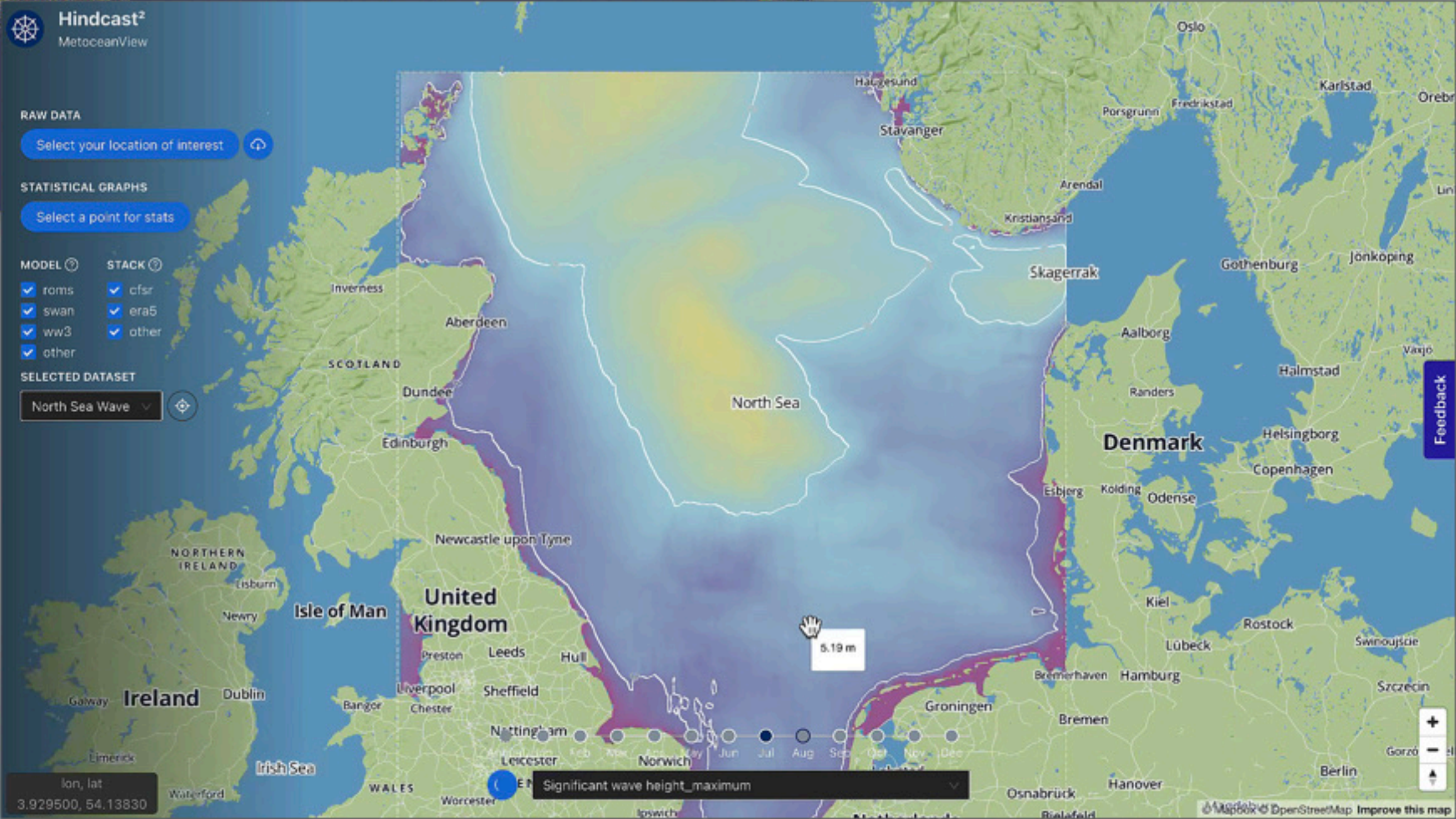
### Sentinel hub EO Browser



### NASA WorldView



### MetOceanView

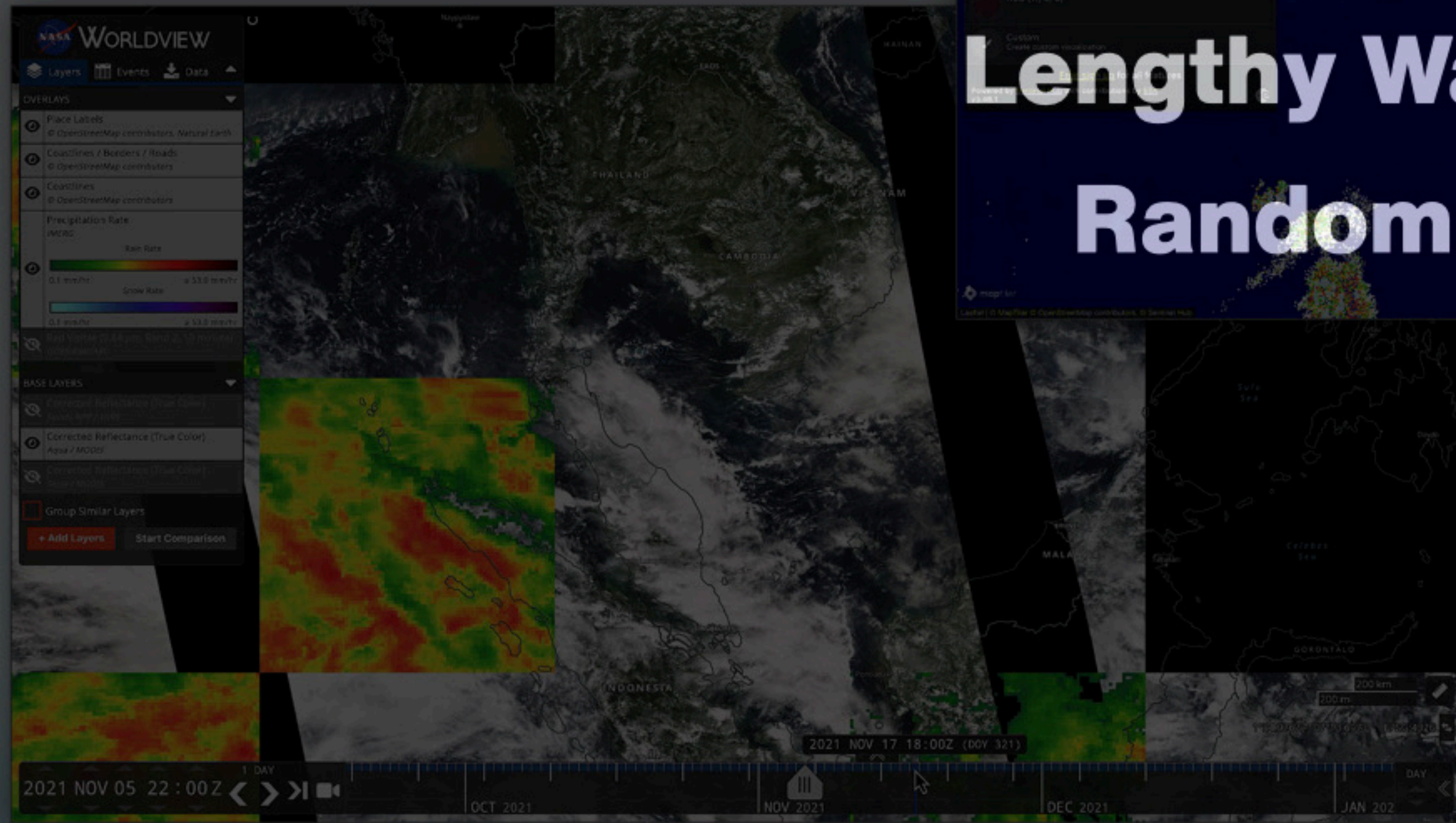




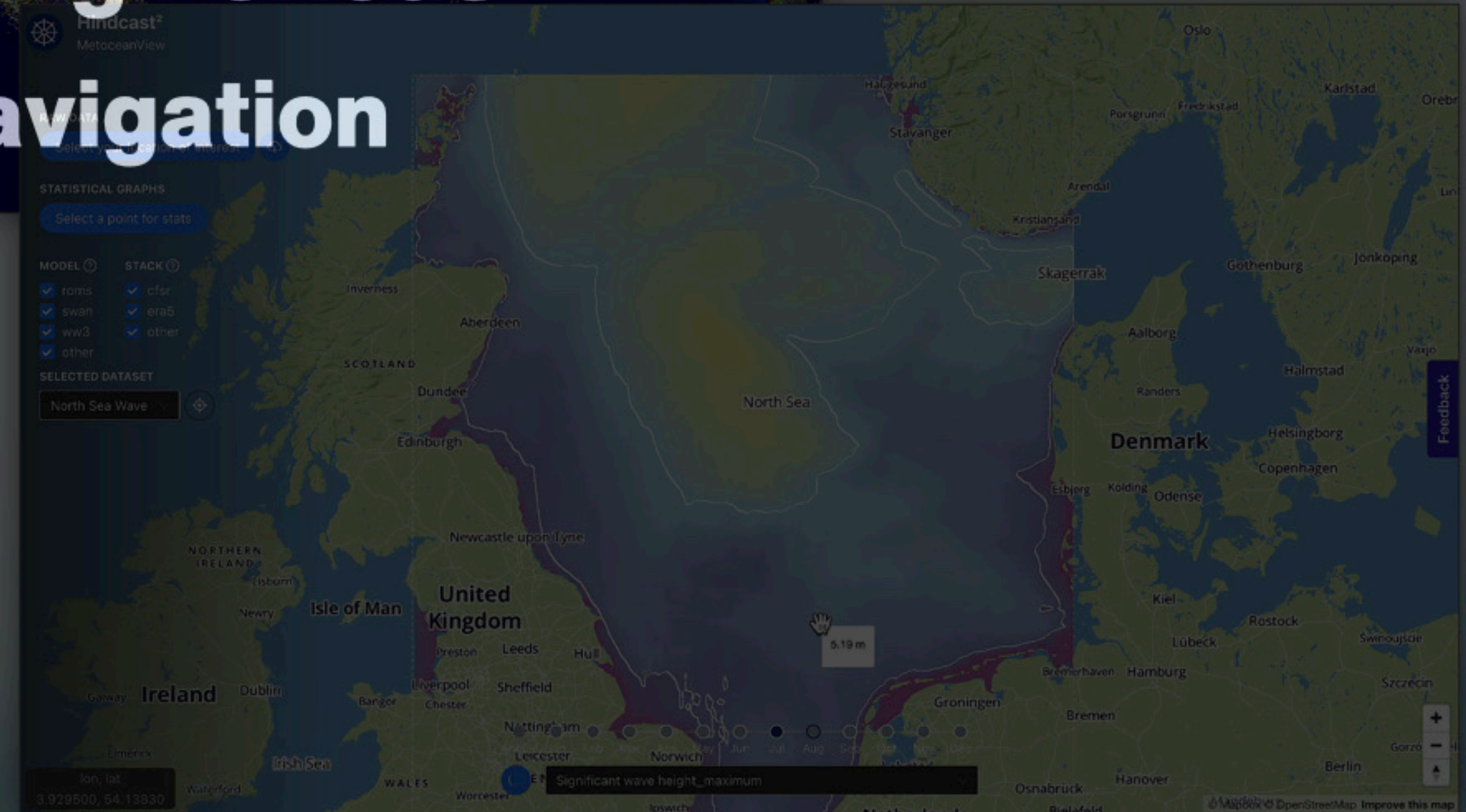
### Sentinel hub EO Browser



### NASA WorldView



### MetOceanView



**Lengthy Waiting Periods**  
**Random Navigation**



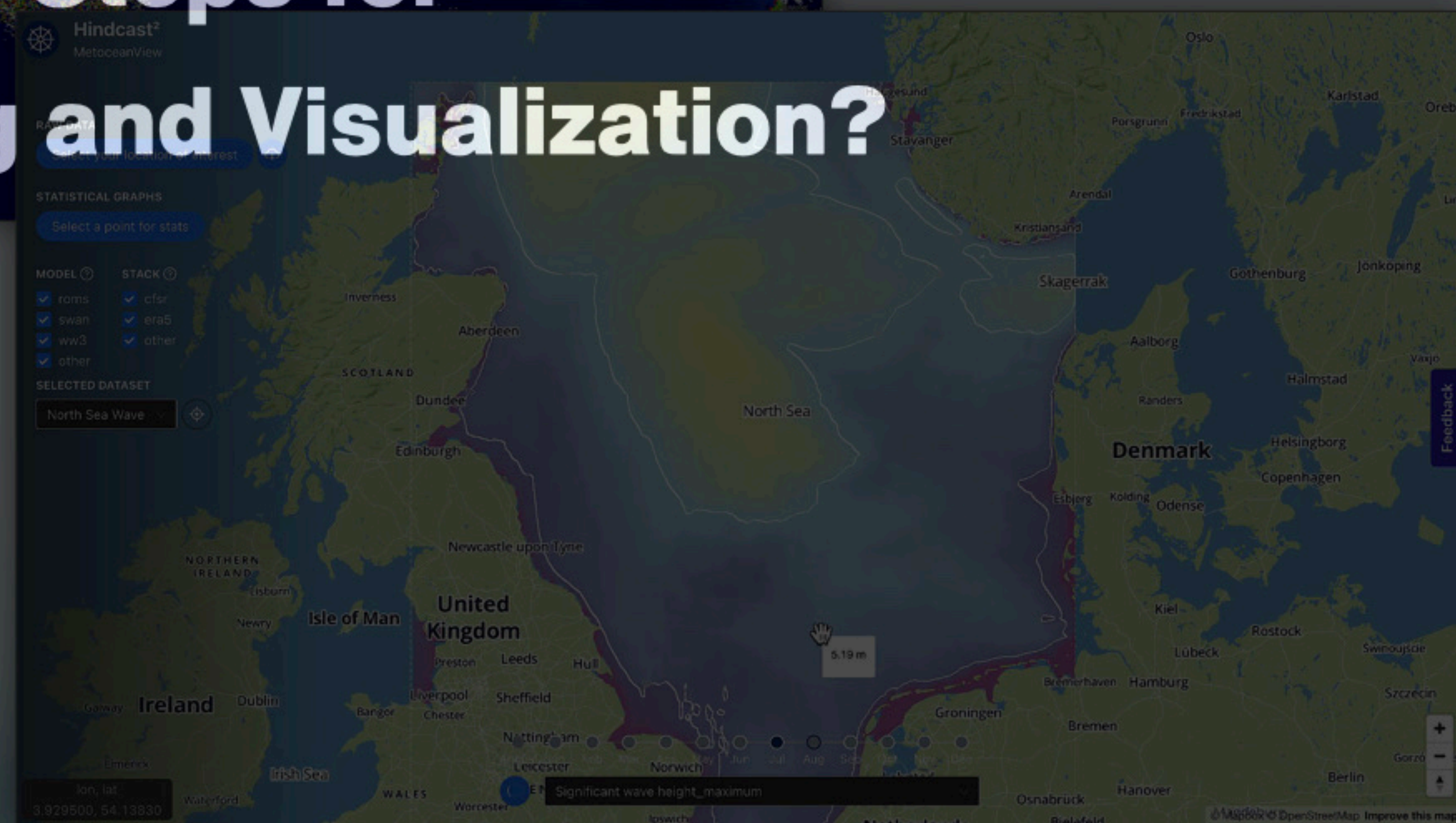
### Sentinel hub EO Browser



### NASA WorldView



### MetOceanView



**Salient Time Steps for  
Prioritized Pre-loading and Visualization?**

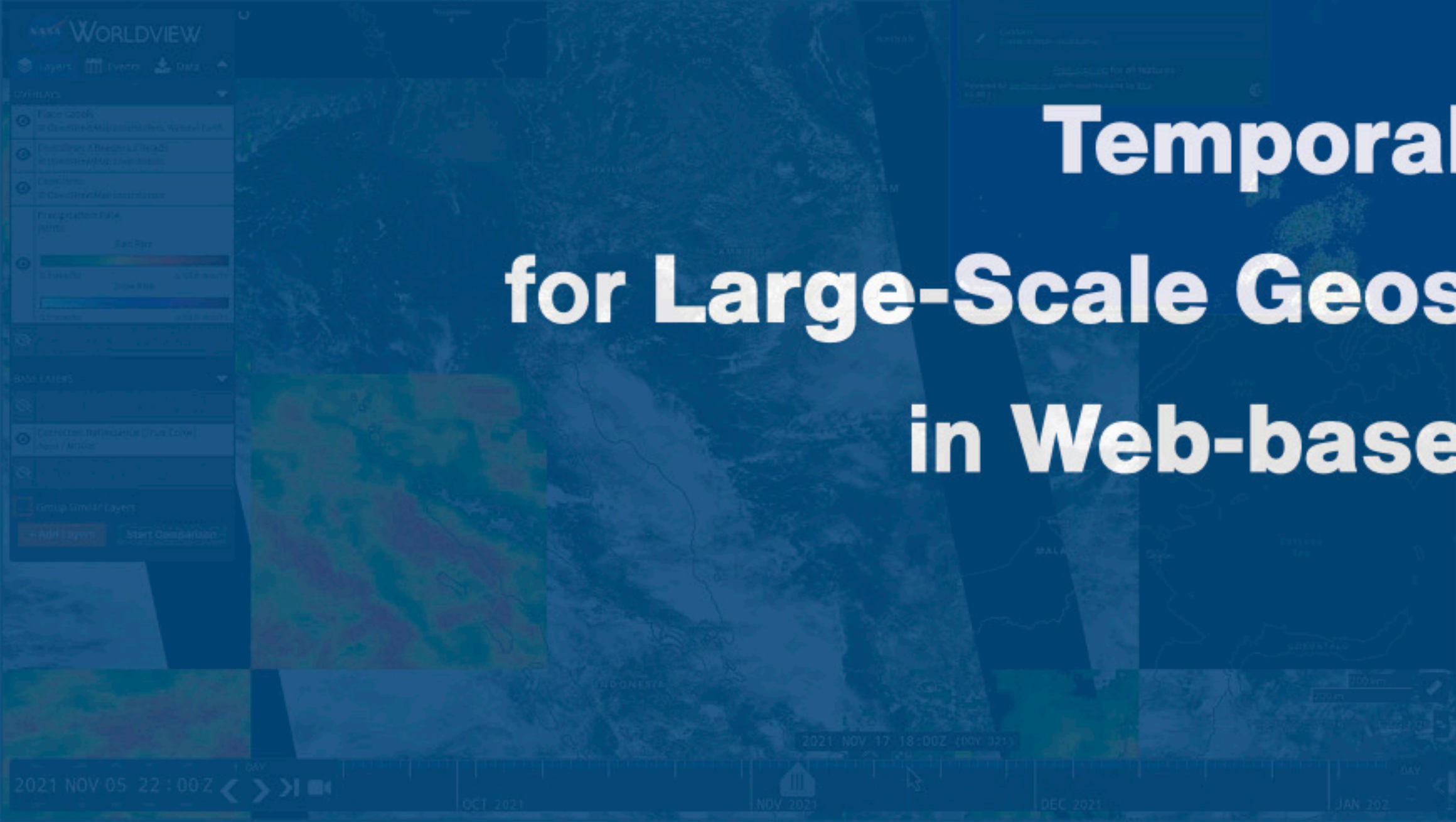


Sentinel hub EO Browser



# Research Scope

NASA WorldView



MetOceanView



# Temporal Navigation for Large-Scale Geospatial Data Exploration in Web-based Data Portals



# Need-finding Study

## Structure

- How do experts perform temporal selection in Geospatial Systems?



**10min**  
**Introduction**



**25min**  
**Free Exploration**



**25min**  
**Semi-structured Interview**



# Need-finding Study

## Structure

- How do experts perform temporal selection in Geospatial Systems?



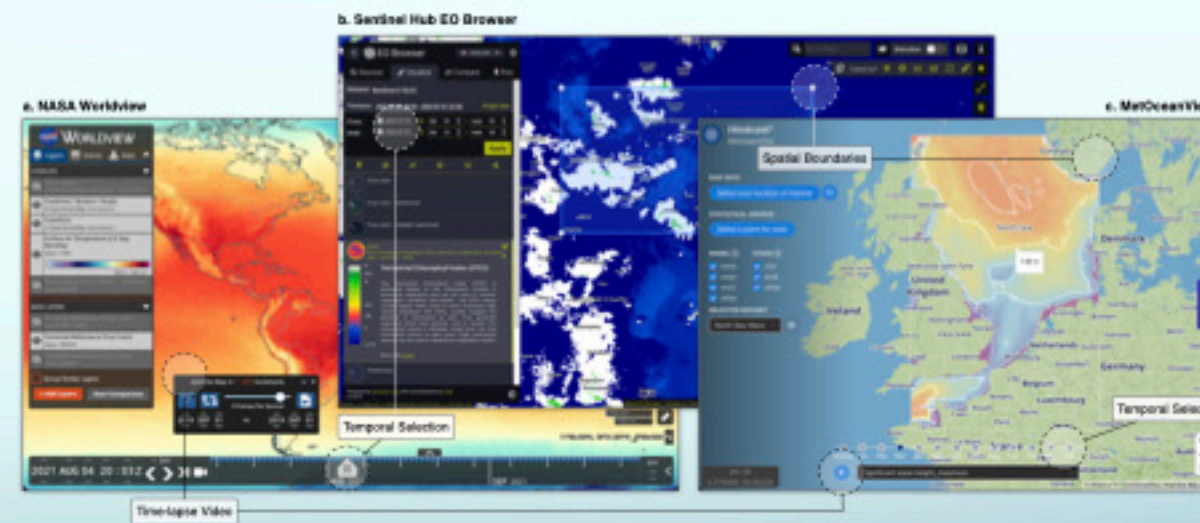
**10min**  
**Introduction**



**25min**  
**Free Exploration**



**25min**  
**Semi-structured Interview**



At least one data download



# Need-finding Study

## Interview

- How do experts perform temporal selection in Geospatial Systems?

### **Motivation & Outcome**

What dataset and time range were selected, and what motivated this selection?

### **Temporal Navigation**

How do the participants navigate between time steps for visualization?

### **Decision-making Factors**

What contextual information influenced their decision in terms of spatial and temporal selection?

### **Remarks about Interaction**

What were the participants' assessments of the interactions involved in the data exploration workflow?



	E1	E2	E3	E4	E5
<b>Motivation &amp; Outcome</b>	To analyze storm tides by examining significant wave height data for the North Sea area. <i>MetoceanView</i> <i>North Sea Wave, Jan 2017</i>	To investigate algal bloom conditions in the Yangtze River Estuary using Sentinel-3A OLCI data. <i>EO Browser</i> <i>Sentinel - 3 OLCI, 2016</i>	To produce high-quality tiled maps for web applications using high-resolution satellite imagery. <i>EO Browser</i> <i>Landsat 8-9 L2, June 2023</i>	To explore the distribution of global precipitation rates on an annual basis. <i>NASA Worldview</i> <i>GCOM W1/AMSR2, 2021</i>	To inspect urban air pollution levels and generate heatmap datasets for subsequent research. <i>NASA Worldview</i> <i>MODIS/Aerosol Optical Depth</i> <i>May 2020</i>
<b>Decision-making Factors</b>					
	Spatial Boundary Visualizations	✓	✓	✓	✓
	Earth Event Occurrence	✓	✓	✓	✓
	Time-lapse Video	✓	✓	✓	✓
	Dataset Visualization	✓	✓	✓	✓
<b>Temporal Selection</b>					
	Sequential Navigation	✓		✓	✓
	Random Navigation		✓	✓	✓
	Stepped Navigation	✓	✓	✓	✓
	Targeted Navigation	✓	✓	✓	✓
<b>Interaction Remarks</b>					
	Slow Response Time		✓	✓	✓
	Lack Contextual Guidance	✓	✓	✓	✓
	Lack Temporal Granularity	✓		✓	✓
	Hard to Navigate Between Time		✓		✓
<b>Additional Remarks</b>	<ul style="list-style-type: none"> <li>Since the change rate differs across datasets, solely providing monthly previews are insufficient.</li> <li>The maximum value within a region is particularly important for extreme weather conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Though no temporal comparison provided, the spatial comparison helped the selection process.</li> <li>For multiple data sources, they need to be combined to perform analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Visualizing a tile of data for one time step is taking too much time.</li> <li>Not certain about which time is better for the task, leading to multiple random navigations.</li> </ul>	<ul style="list-style-type: none"> <li>It will be good if additional information about data variation is provided.</li> <li>Prefer sequential preview at smaller zoom levels and stepped preview on larger zoom levels.</li> </ul>	<ul style="list-style-type: none"> <li>Aggregated data summaries will be helpful to determine anomaly and patterns.</li> <li>Frequently go back and forth between time steps due to the absence of contextual information.</li> </ul>



Motivation & Outcome	Examining significant wave height data for the North Sea area. <i>MetoceanView</i> <i>North Sea Wave, Jan 2017</i>	conditions in the Yangtze River Estuary using Sentinel-3A OLCI data. <i>EO Browser</i> <i>Sentinel - 3 OLCI, 2016</i>	maps for web applications using high-resolution satellite imagery. <i>EO Browser</i> <i>Landsat 8-9 L2, June 2023</i>	global precipitation rates on an annual basis. <i>NASA Worldview</i> <i>GCOM W1/AMSR2, 2021</i>	levels and generate heatmap datasets for subsequent research. <i>NASA Worldview</i> <i>MODIS/Aerosol Optical Depth</i> <i>May 2020</i>
Decision-making Factors	Spatial Boundary Visualizations	✓	✓	✓	[Progress bar]
Decision-making Factors	Earth Event Occurrence	✓	✓		[Progress bar]
Decision-making Factors	Time-lapse Video	✓	✓	✓	✓
Decision-making Factors	Dataset Visualization	✓	✓	✓	✓
Temporal Selection	Sequential Navigation	✓		✓	[Progress bar]
Temporal Selection	Random Navigation		✓	✓	✓
Temporal Selection	Stepped Navigation	✓	✓	✓	[Progress bar]
Temporal Selection	Targeted Navigation	✓	✓		✓
Interaction Remarks	Slow Response Time		✓	✓	✓
Interaction Remarks	Lack Contextual Guidance	✓	✓	✓	✓
Interaction Remarks	Lack Temporal Granularity	✓		✓	✓
Interaction Remarks	Hard to Navigate Between Time		✓		✓
Additional Remarks	<ul style="list-style-type: none"> <li>Since the change rate differs across datasets, solely providing monthly previews are insufficient.</li> <li>The maximum value within a</li> </ul>	<ul style="list-style-type: none"> <li>Though no temporal comparison provided, the spatial comparison helped the selection process.</li> <li>For multiple data sources,</li> </ul>	<ul style="list-style-type: none"> <li>Visualizing a tile of data for one time step is taking too much time.</li> <li>Not certain about which time is better for the task, leading</li> </ul>	<ul style="list-style-type: none"> <li>It will be good if additional information about data variation is provided.</li> <li>Prefer sequential preview at smaller zoom levels and</li> </ul>	<ul style="list-style-type: none"> <li>Aggregated data summaries will be helpful to determine anomaly and patterns.</li> <li>Frequently go back and forth between time steps</li> </ul>



	1	2	3	4	5	6	7	8
<b>Decision-making Factors</b>	Spatial Boundary Visualizations	✓			✓			✓
	Earth Event Occurrence	✓	✓					
	Time-lapse Video	✓	✓			✓		✓
	Dataset Visualization	✓	✓		✓	✓		✓
<b>Temporal Selection</b>	Sequential Navigation	✓				✓		
	Random Navigation		✓		✓	✓		✓
	Stepped Navigation	✓	✓			✓		
	Targeted Navigation	✓	✓					✓
<b>Interaction Remarks</b>	Slow Response Time		✓		✓	✓		
	Lack Contextual Guidance	✓	✓		✓	✓		✓
	Lack Temporal Granularity	✓			✓			✓
	Hard to Navigate Between Time		✓					✓

<b>Additional Remarks</b>	<ul style="list-style-type: none"> <li>Since the change rate differs across datasets, solely providing monthly previews are insufficient.</li> <li>The maximum value within a region is particularly important for extreme weather conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Though no temporal comparison provided, the spatial comparison helped the selection process.</li> <li>For multiple data sources, they need to be combined to perform analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Visualizing a tile of data for one time step is taking too much time.</li> <li>Not certain about which time is better for the task, leading to multiple random navigations.</li> </ul>	<ul style="list-style-type: none"> <li>It will be good if additional information about data variation is provided.</li> <li>Prefer sequential preview at smaller zoom levels and stepped preview on larger zoom levels.</li> </ul>	<ul style="list-style-type: none"> <li>Aggregated data summaries will be helpful to determine anomaly and patterns.</li> <li>Frequently go back and forth between time steps due to the absence of contextual information.</li> </ul>
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<b>Temporal Selection</b>	Sequential Navigation	✓				✓			
	Random Navigation		✓		✓	✓		✓	
	Stepped Navigation	✓	✓			✓			
	Targeted Navigation	✓	✓					✓	
<b>Interaction Remarks</b>	Slow Response Time		✓		✓		✓		
	Lack Contextual Guidance	✓	✓		✓	✓		✓	
	Lack Temporal Granularity	✓			✓			✓	
	Hard to Navigate Between Time		✓					✓	

- | <b>Additional Remarks</b>   | 1  | 2   | 3  | 4   | 5 | 6 | 7 | 8 |
|---|--|---|--|---|---|---|---|---|
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# **Salient Time Steps**

for prioritized visualization and download



## **DF1. Summarizability**

Frames that can summarize the critical information and trends within the dataset

## **Salient Time Steps**

for prioritized visualization and download



## **DF1. Summarizability**

Frames that can summarize the critical information and trends within the dataset

# **Salient Time Steps**

for prioritized visualization and download

## **DF2. Anomaly**

Frames that deviate from the norm  
and represent outliers



## **DF1. Summarizability**

Frames that can summarize the critical information and trends within the dataset

# **Salient Time Steps**

for prioritized visualization and download

## **DF2. Anomaly**

Frames that deviate from the norm and represent outliers

## **DF3. Extremum**

Frames that are extreme values within a certain spatial and temporal region



# Selecting Salient Time Steps

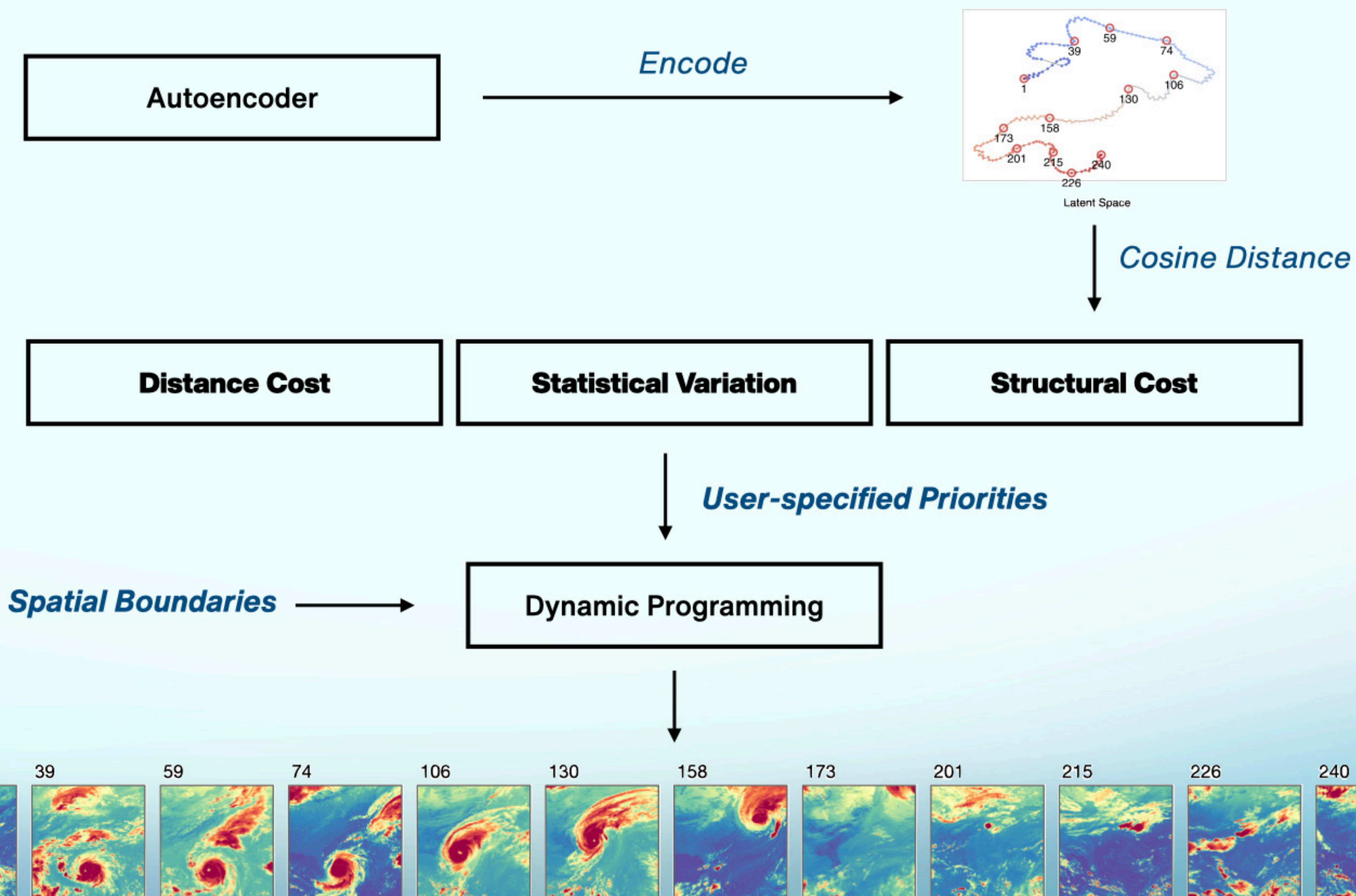
**Distance Cost**

**Statistical Variation**

**Structural Cost**



# Selecting Salient Time Steps

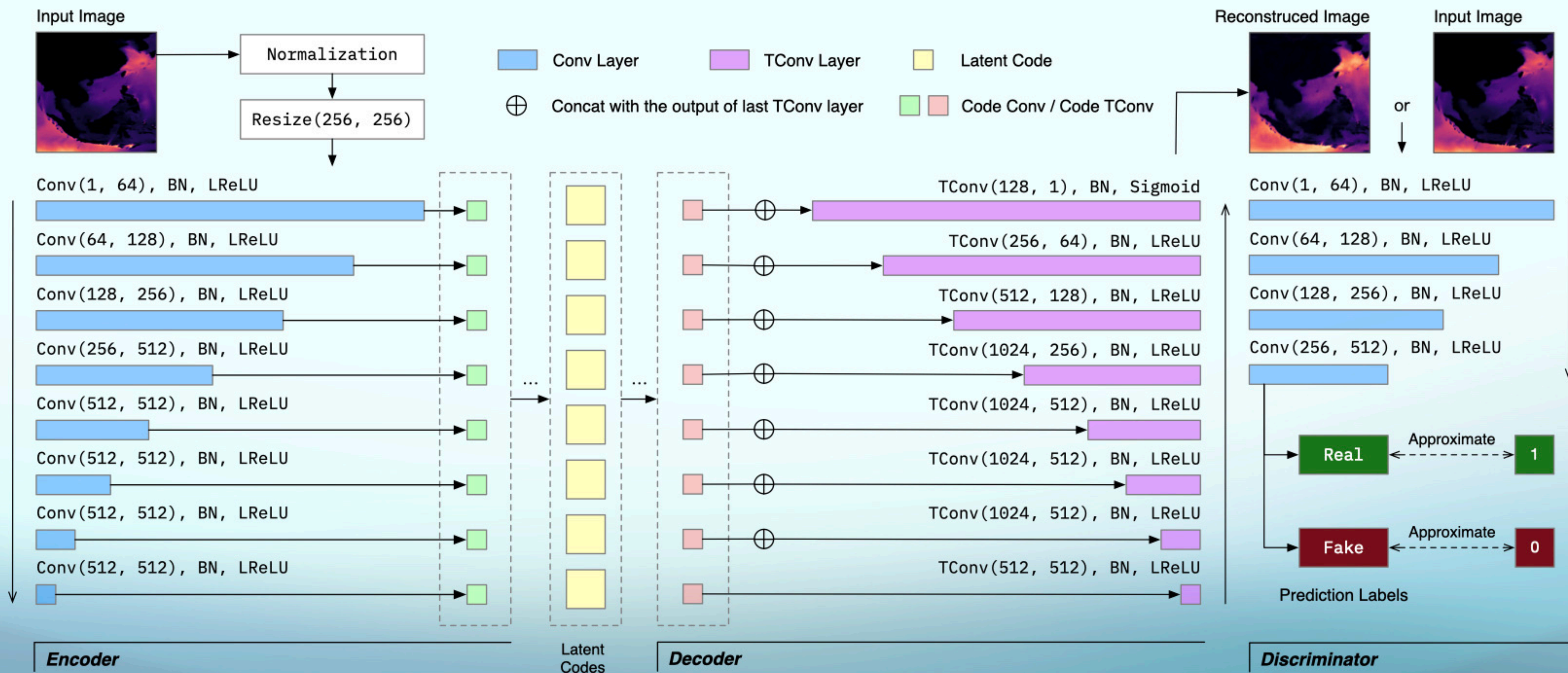




# Selecting Salient Frames

## Summarizability

- Convolution Neural Network (CNN) based Autoencoder

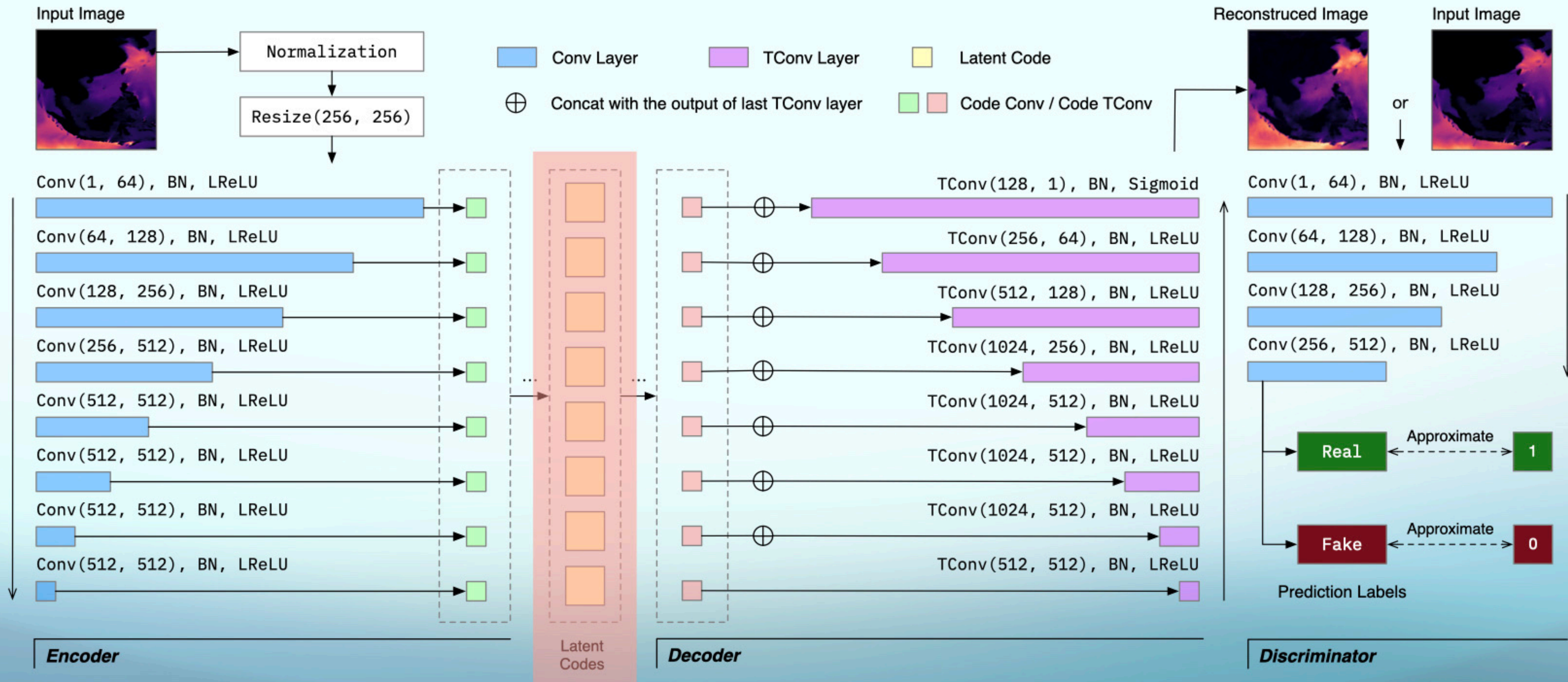




# Selecting Salient Frames

## Summarizability

- Structural Cost: Cosine distance between the latent code of two frames





# Selecting Salient Frames

## Extremum & Anomaly

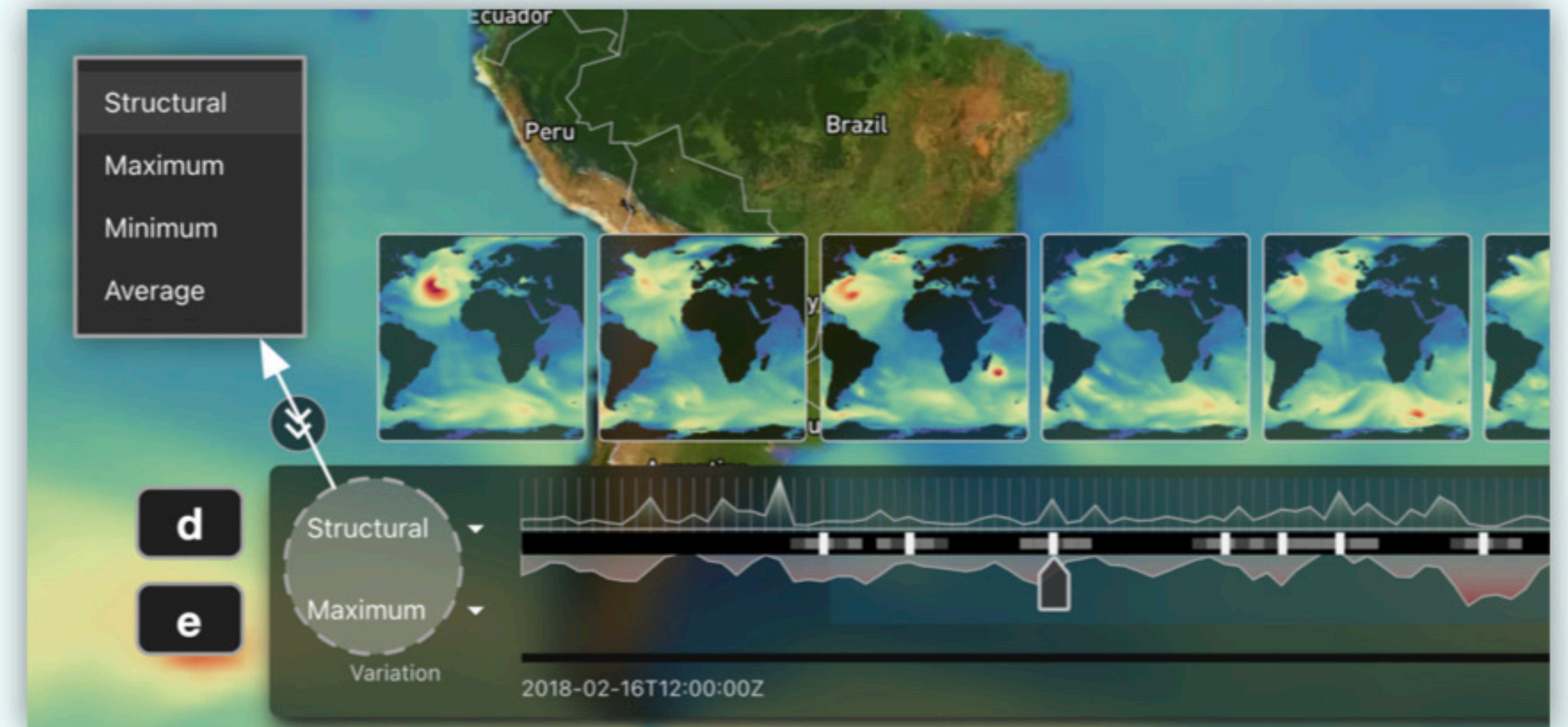
- Statistical Cost:

- $\mathcal{C}_{\text{stat}}(i, j) = -\tanh(|\hat{v}_i - \hat{v}_j|) + 1$

Aggregated Values

- Aggregation Method

- Maximum / Minimum / Average





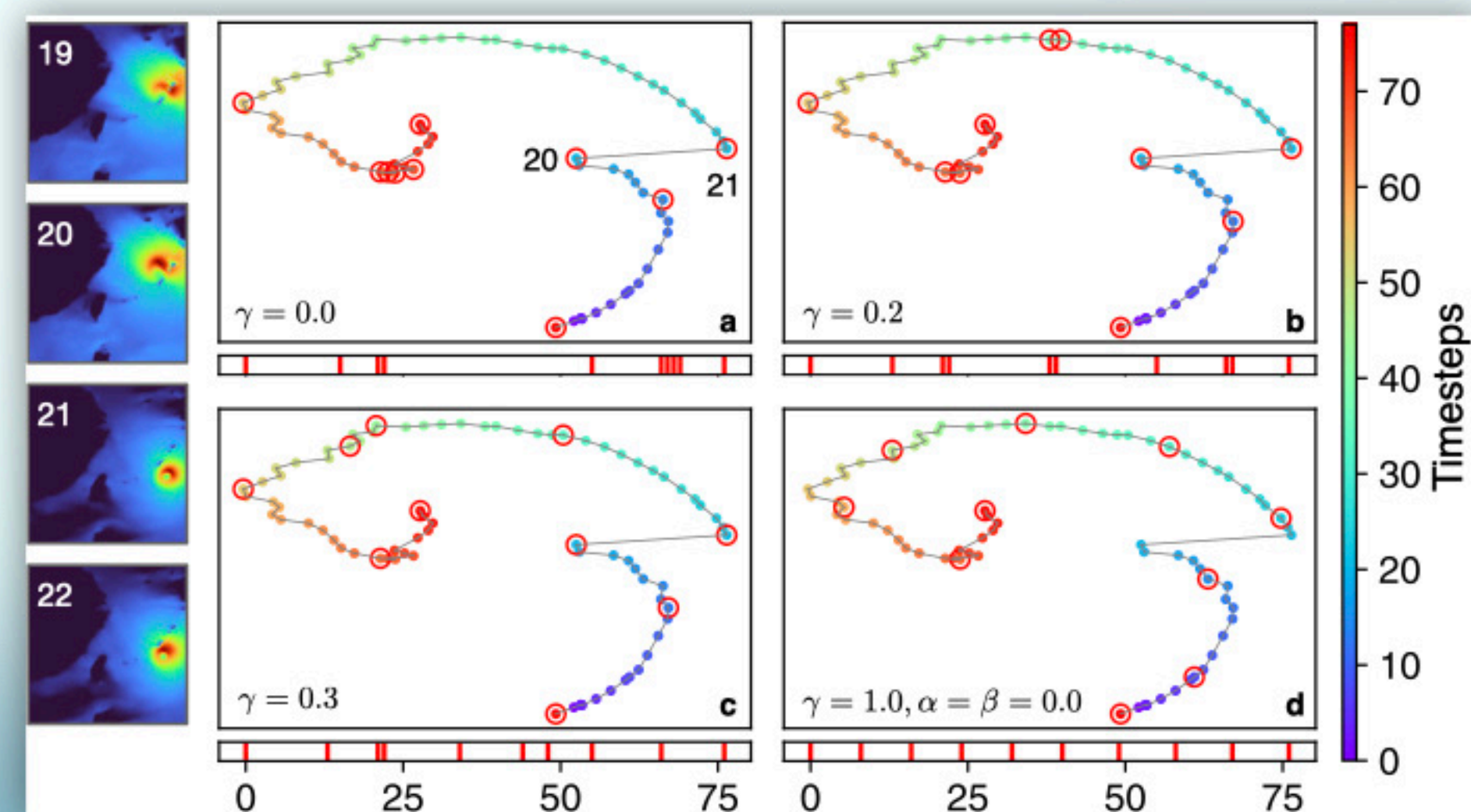
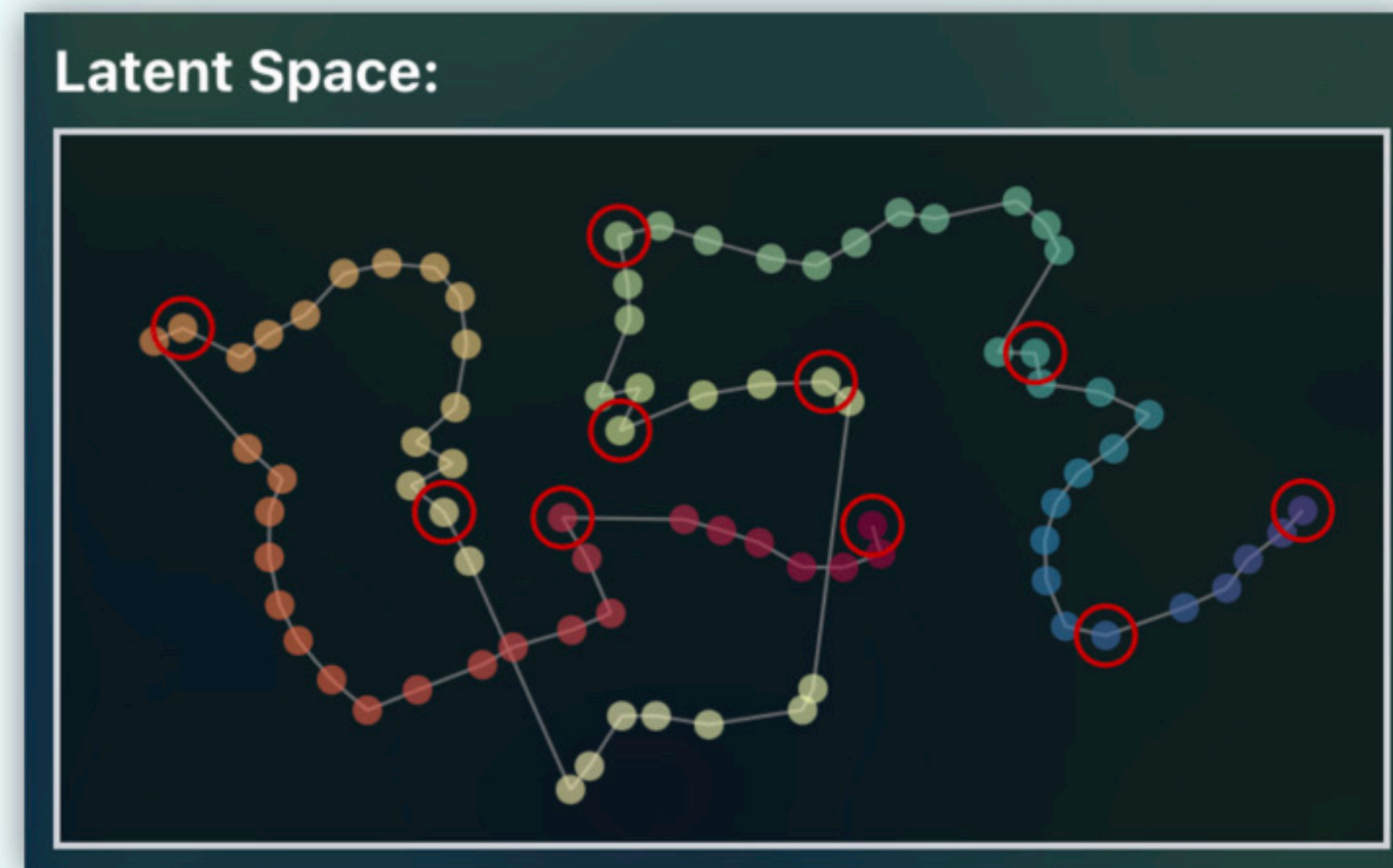
# Selecting Salient Frames

## Extremum & Anomaly

- Distance Cost

$$\mathcal{C}_{\text{dis}}(i, j) = -\gamma \tanh\left(\frac{|i - j|}{\sigma n/k}\right) + 1$$

- Prevent selected frames from being concentrated in a short time window.





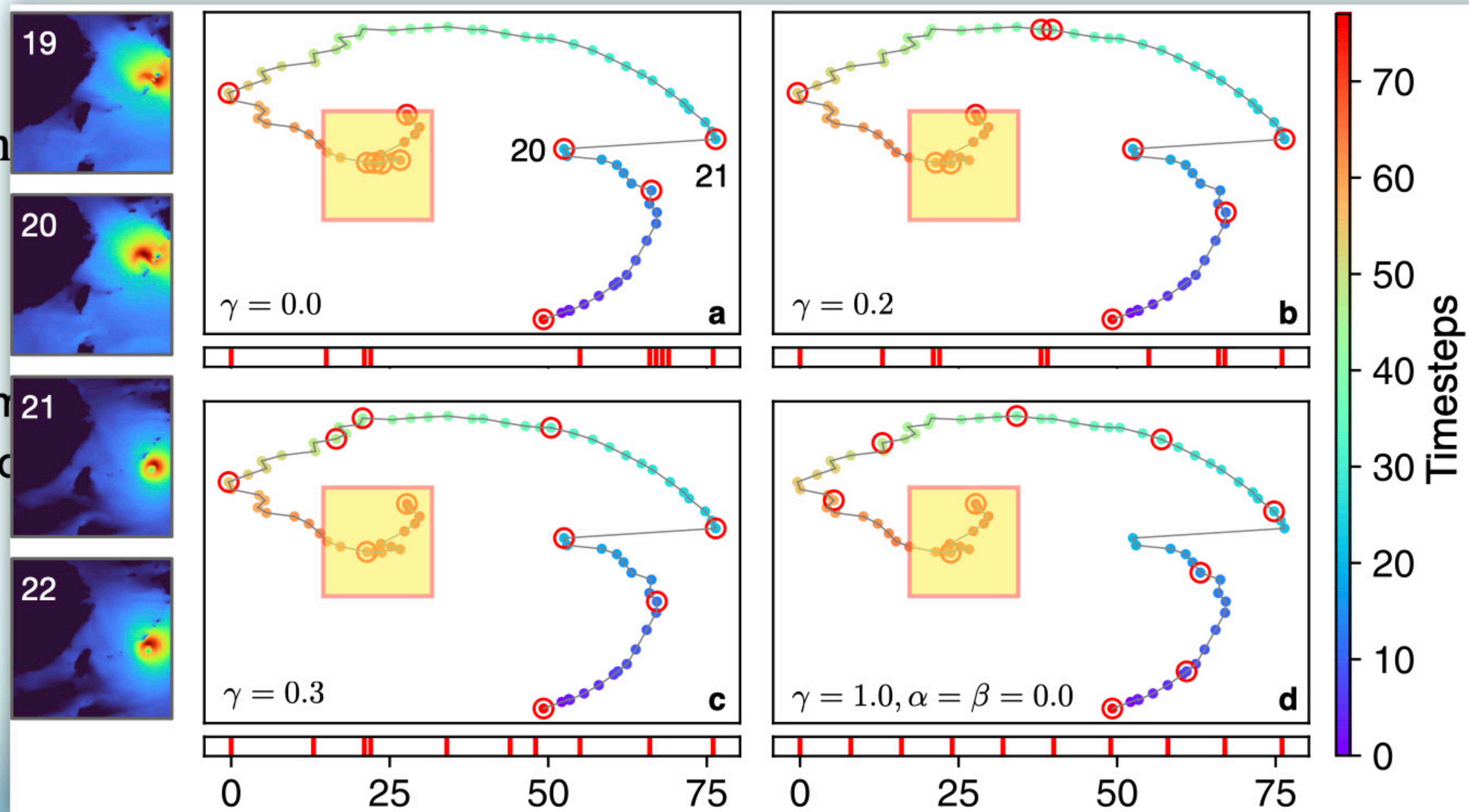
# Selecting Salient Frames

## Extremum & Anomaly

- Distance Cost

- $\mathcal{C}_{\text{dis}}(i, j) = -\gamma \tan$

- Prevent selected frames concentrated in a shot





# Selecting Salient Frames

## User-Specified Priorities

- Total Cost:

*Statistical Variation*

$$\mathcal{C}(i, j) = \alpha \mathcal{C}_{\text{struc}}(i, j) + \beta \mathcal{C}_{\text{stat}} + \mathcal{C}_{\text{dis}}$$

*Structural Similarity*

*Distance Penalty*

- Dynamic Programming Table:

$$D(i, j) = \min_{k \in [i-1, j]} \{D(i-1, k) + \mathcal{C}(k, j)\}$$

**Saliency Definition:**

Selecting 10 frames with focus on:

Structural:

Statistical:

Aggregation:  MAX  MIN  AVG

Time Steps:  10





# Selecting Salient Frames

## User-Specified Priorities

- Total Cost:

*Statistical Variation*

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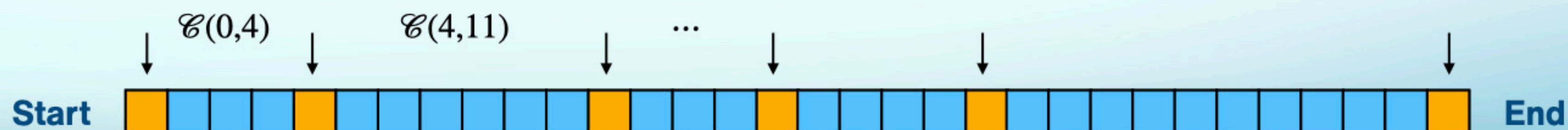
Selecting 10 frames with focus on:

Structural:

Statistical:

Aggregation:  MAX  MIN  AVG

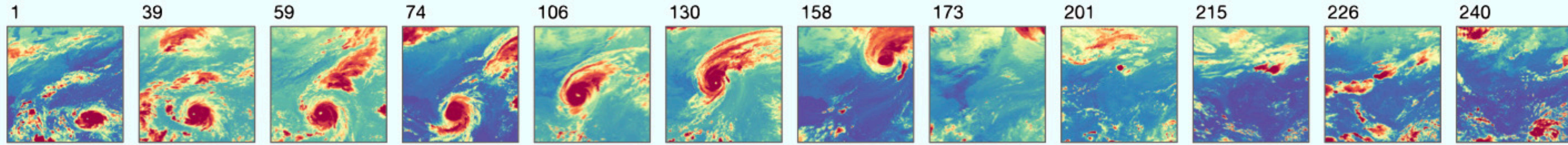
Time Steps:  10





## Minimizing

$$\mathcal{C}(i, j) = \alpha \mathcal{C}_{\text{struc}}(i, j) + \beta \mathcal{C}_{\text{stat}} + \mathcal{C}_{\text{dis}}$$



*Structural Similarity*

*Statistical Variation*

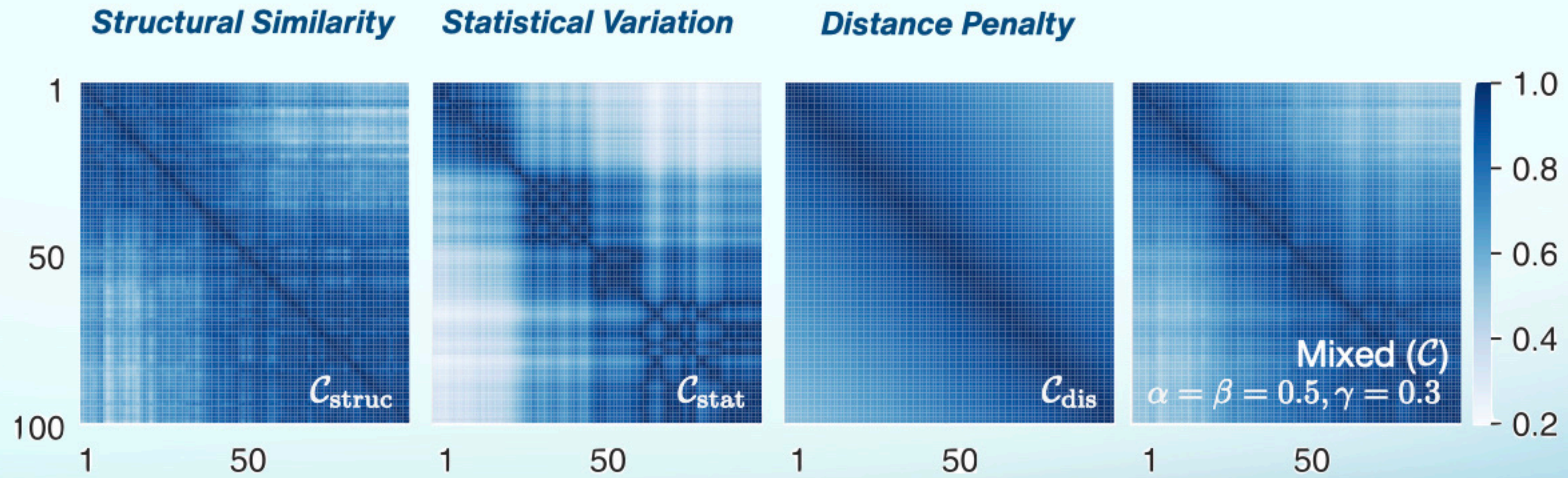
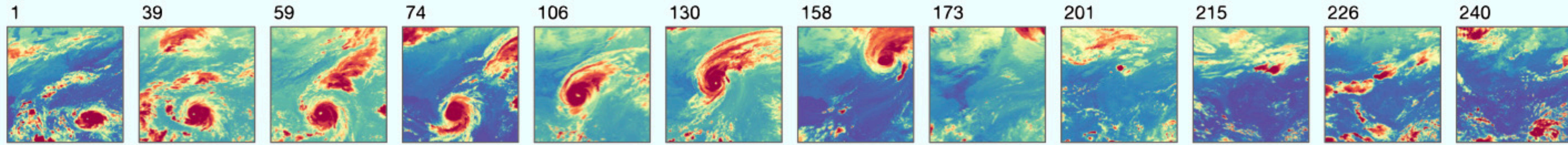
*Distance Penalty*

*Cost Matrices for the DP*



## Minimizing

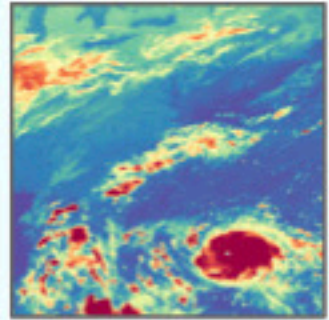
$$\mathcal{C}(i, j) = \alpha \mathcal{C}_{\text{struc}}(i, j) + \beta \mathcal{C}_{\text{stat}} + \mathcal{C}_{\text{dis}}$$



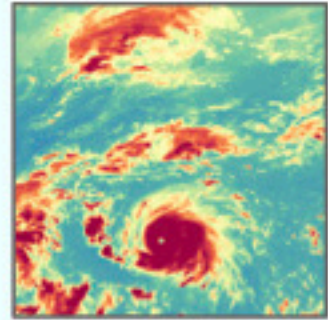
**Cost Matrices for the DP**



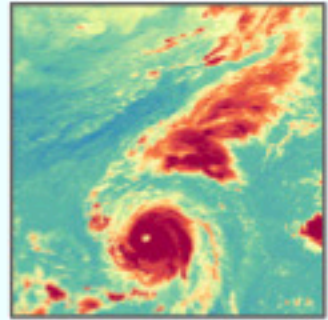
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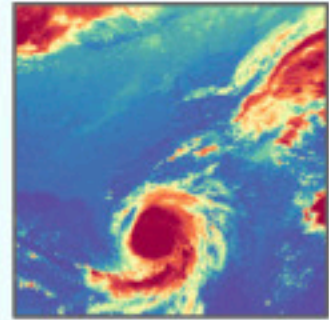
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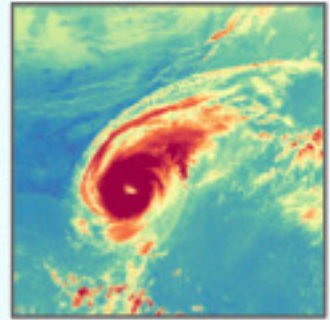
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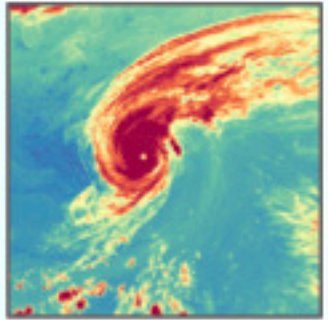
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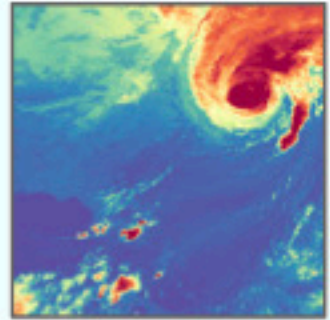
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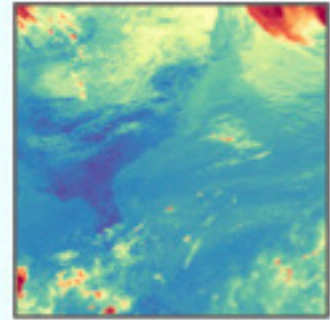
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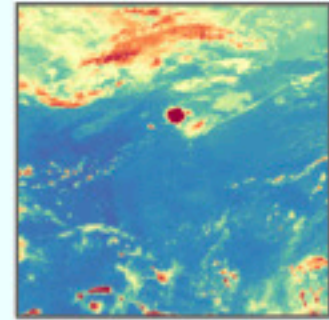
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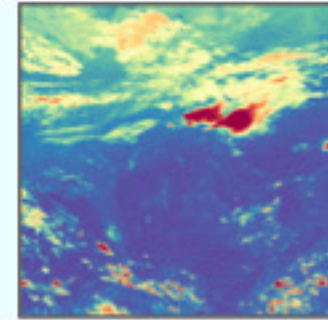
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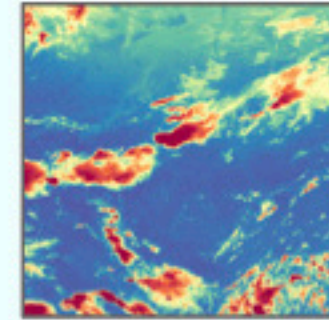
201



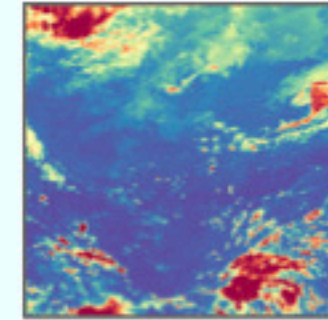
215



226



240





# SalienTime

Select Dataset:

 Significant Height of Wind and Swell Waves  
WAVEWATCH III

WAVEWATCH III® is a numerical wave model developed by NOAA/NCEP. Significant wave height (hs) is a measure of the average height of the largest 33% of waves. This dataset covers the global area.

## Saliency Definition:

Selecting 10 frames with focus on:

Structural:

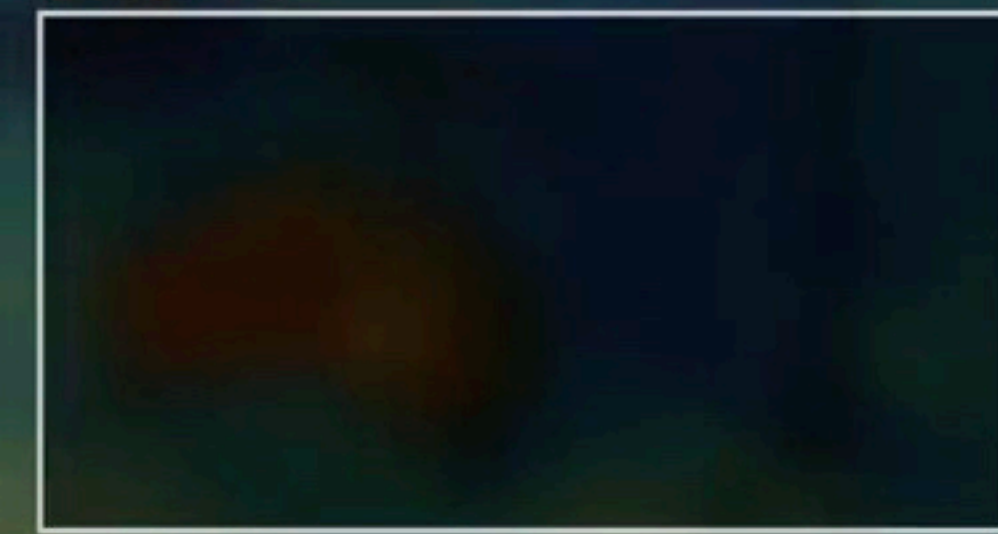
Statistical:

Aggregation:

Time Steps:  10

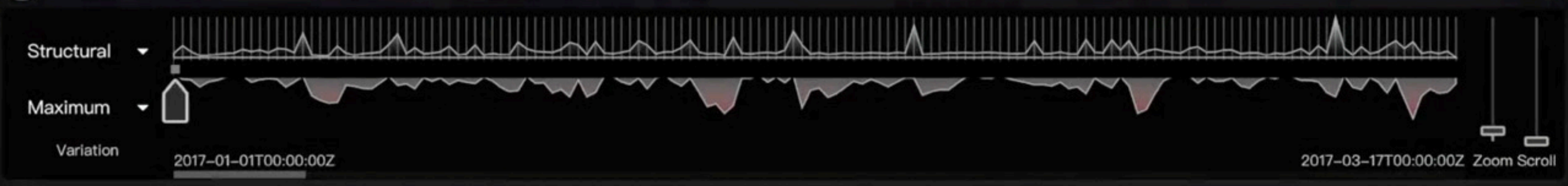
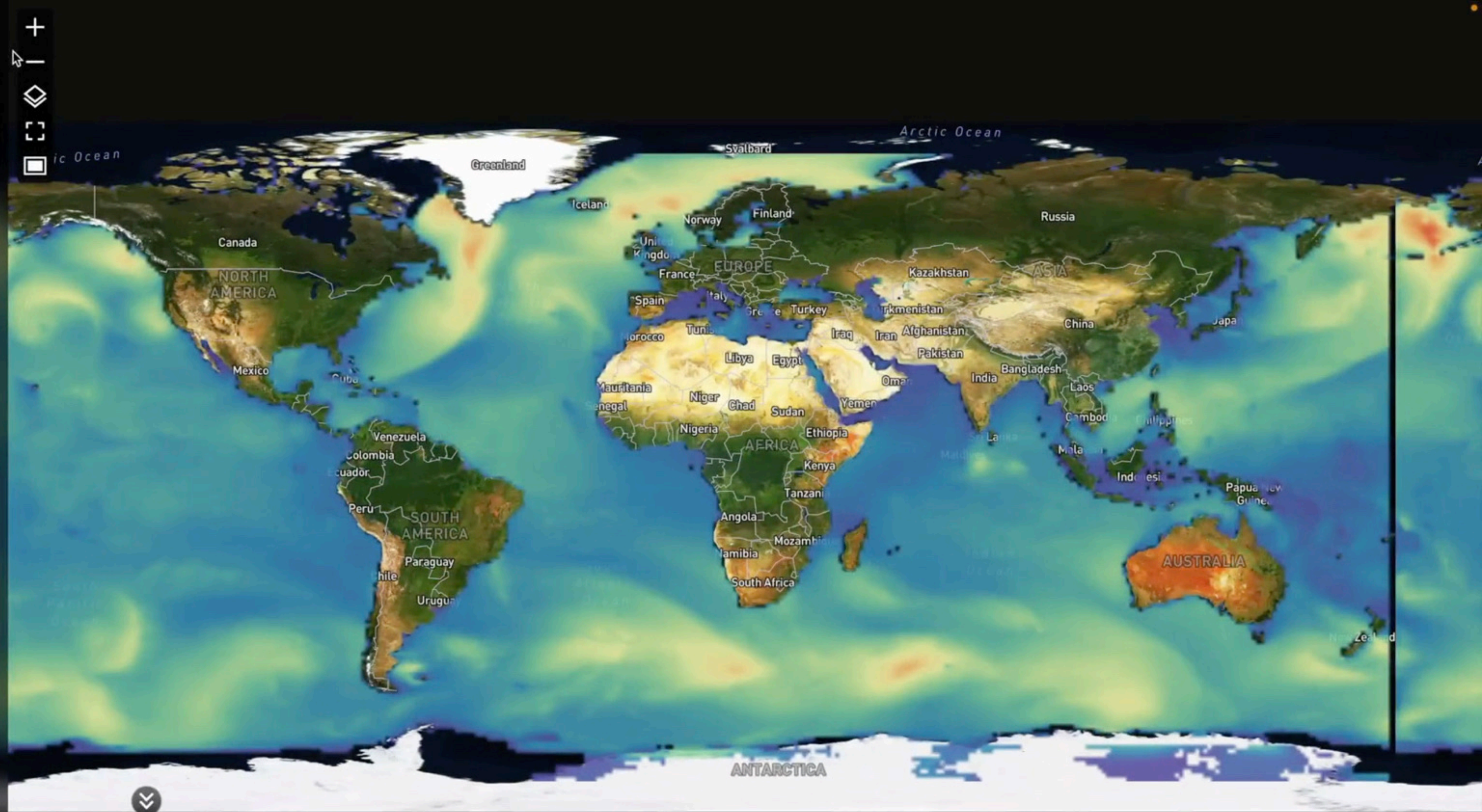


## Latent Space:



Unit: Meter (M)  
Coordinate: 161.1746W, 85.0511N  
Geo Bound: 180.0000W, 77.5000N  
179.5000E, 77.5000S  
Value: NaN (M)  
Global Max: 10.73 (M)  
Global Min: 0.00 (M)  
Global Avg: 2.49 (M)  
Regional Max: 10.73 (M)  
Regional Min: 0.00 (M)  
Regional Avg: 2.49 (M)

Colormap: Spectral Mapping: Linear

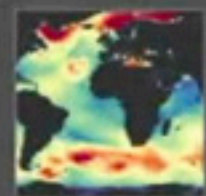


Navigation icons: Home, Download, Refresh, Zoom In, Play/Pause, Previous, Next, Full Screen, Close.



# SalienTime

## Select Dataset:



Significant Height of Wind and Swell Waves  
WAVEWATCH III

WAVEWATCH III® is a numerical wave model developed by NOAA/NCEP. Significant wave height (hs) is a measure of the average height of the largest 33% of waves. This dataset covers the global area.

## Saliency Definition:

Selecting 10 frames with focus on:

Structural:

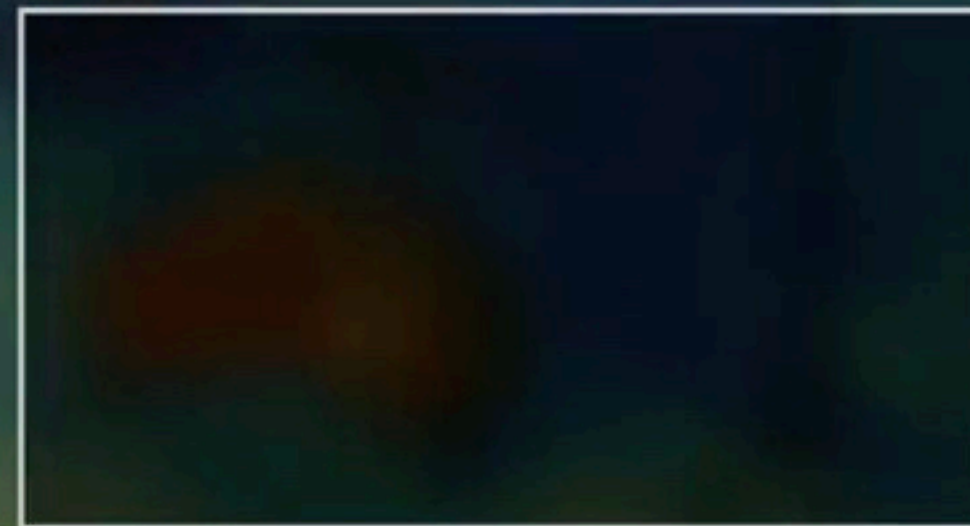
Statistical:

Aggregation:

Time Steps:  10



## Latent Space:



Unit: Meter (M)

Coordinate: 161.1746W, 85.0511N

Geo Bound: 180.0000W, 77.5000N  
179.5000E, 77.5000S

Value: NaN (M)

Global Max: 10.73 (M)

Global Min: 0.00 (M)

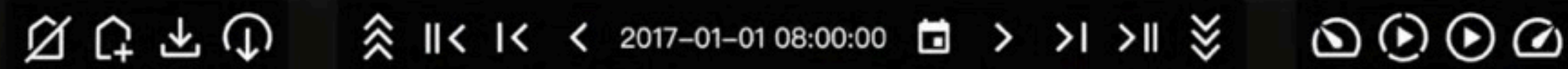
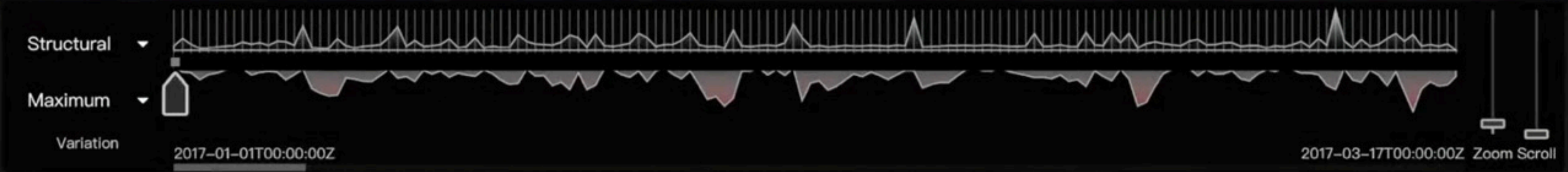
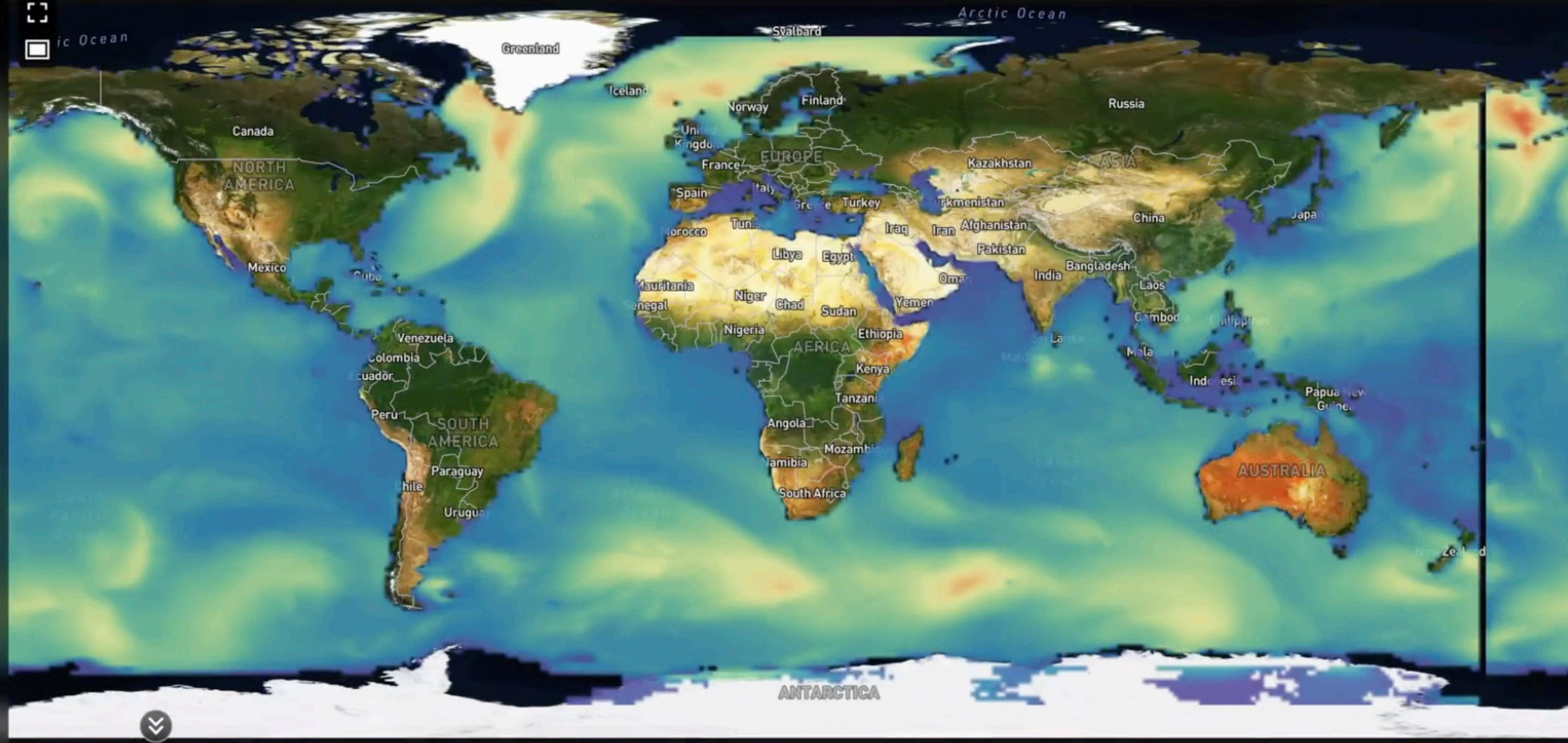
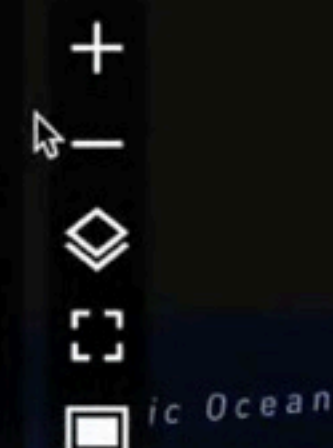
Global Avg: 2.49 (M)

Regional Max: 10.73 (M)

Regional Min: 0.00 (M)

Regional Avg: 2.49 (M)

Colormap: Spectral Mapping: Linear

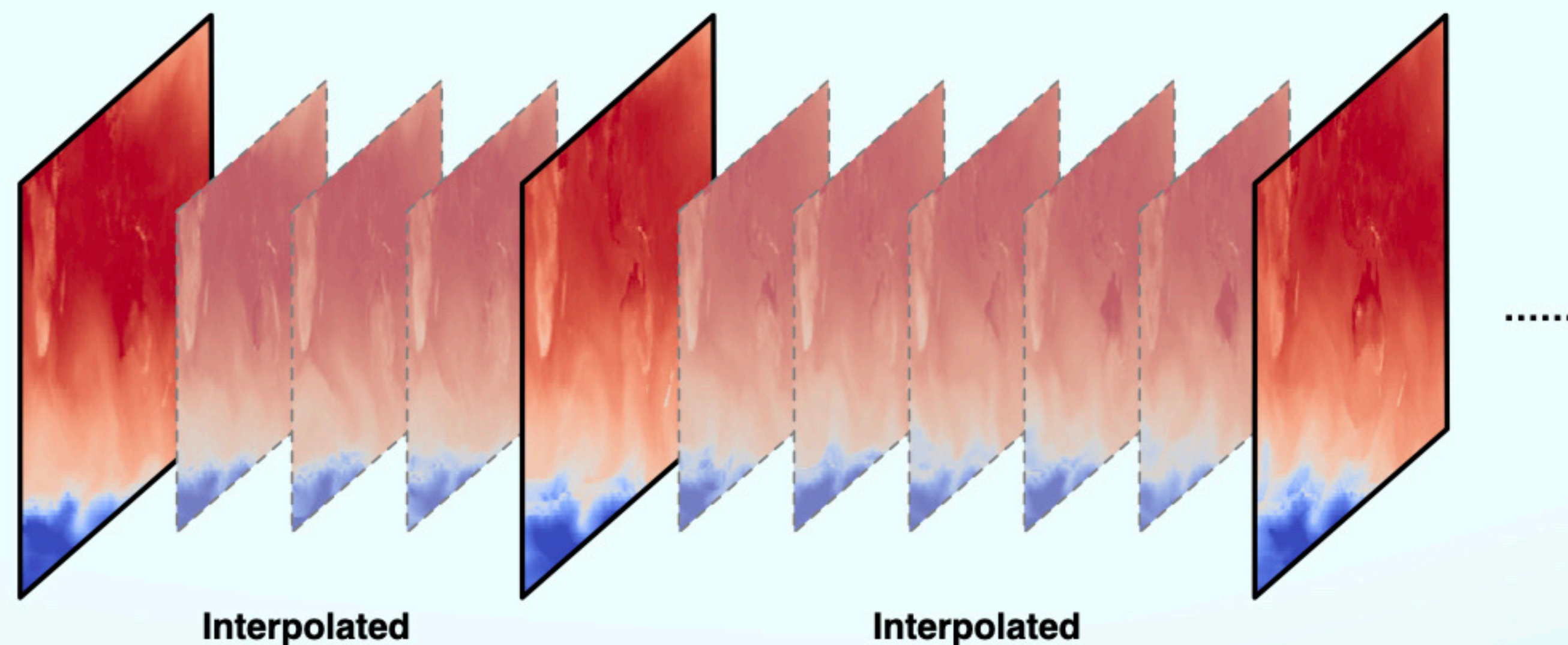




# Evaluation

## Summarizability

- Metric: reconstruction error of piece-wise linear interpolation from selected frames



Code	Description	Source	Spatial Region	Dimension ( $t \times n \times m$ )	Temporal Res. / Cov.
tmp2m	Air Temperature at 2 Meters	CDAS-1 [71]	Global	$1588 \times 880 \times 1760$	1 d / 4 years
hs	Significant Height of Wind and Swell Waves	WAVEWATCH III [62]	Global	$4632 \times 311 \times 720$	3 h / 2 Years
prmsl	Air Pressure at Mean Sea Level	CDAS-1 [71]	Global	$1463 \times 361 \times 720$	6 h / 1 Year
cmipc	Cloud Moisture Imagery, Band 13 ( $10.3 \mu m$ )	GOES-16 [40]	Continental US	$1653 \times 994 \times 1532$	20 min / 20 Day
lm	Mean Wave Length	WAVEWATCH III [62]	East China Sea	$234 \times 551 \times 401$	3 h / 1 Month



# Evaluation

## Summarizability

- Metric: reconstruction error of piece-wise linear interpolation from selected frames

Dataset	k	Ours		Arc-based [49]		Even	
		RMSE ↓	SSIM ↑	RMSE ↓	SSIM ↑	RMSE ↓	SSIM ↑
tmp2m	10	<b>0.0286</b>	<b>0.9127</b>	0.0326	0.9055	0.0299	0.9111
	20	<b>0.0258</b>	0.9220	0.0260	<b>0.9234</b>	0.0261	0.9241
	40	0.0214	0.9403	<b>0.0207</b>	<b>0.9439</b>	0.0221	0.9430
hs	10	<b>0.0404</b>	<b>0.9064</b>	0.0448	0.8998	0.0476	0.8946
	20	<b>0.0282</b>	<b>0.9430</b>	0.0298	0.9388	0.0301	0.9413
	40	0.0186	<b>0.9727</b>	<b>0.0171</b>	0.9720	0.0229	0.9577
prmsl	10	<b>0.0654</b>	<b>0.9014</b>	0.0716	0.9006	0.1023	0.8892
	20	<b>0.0571</b>	0.9143	0.0578	<b>0.9153</b>	0.0620	0.9135
	40	<b>0.0454</b>	<b>0.9389</b>	0.0459	0.9365	0.0466	0.9373
cmipc	10	<b>0.1205</b>	0.4473	0.1726	0.4459	0.1809	<b>0.4525</b>
	20	<b>0.0916</b>	<b>0.5745</b>	0.0946	0.5696	0.0967	0.5737
	40	0.0800	0.6436	<b>0.0799</b>	<b>0.6546</b>	0.0815	0.6308
lm	10	<b>0.0638</b>	<b>0.9004</b>	0.0699	0.8842	0.0744	0.8799
	20	<b>0.0416</b>	<b>0.9384</b>	0.0517	0.9175	0.0577	0.9189
	40	<b>0.0310</b>	0.9574	0.0390	<b>0.9588</b>	0.0329	0.9624



# Evaluation

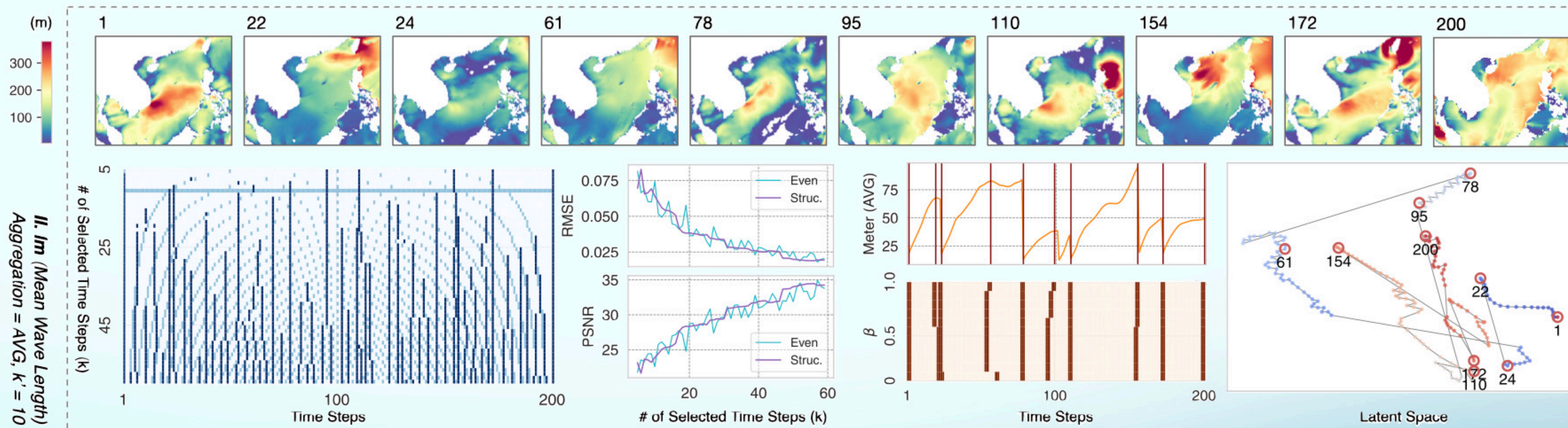
## Summarizability

- Metric: reconstruction error of piece-wise linear interpolation from selected frames

Dataset	k	Ours		Arc-based [49]		Even	
		RMSE ↓	SSIM ↑	RMSE ↓	SSIM ↑	RMSE ↓	SSIM ↑
tmp2m	10	<b>0.0286</b>	<b>0.9127</b>	0.0326	0.9055	0.0299	0.9111
	20	<b>0.0258</b>	0.9220	0.0260	<b>0.9234</b>	0.0261	0.9241
	40	0.0214	0.9403	<b>0.0207</b>	<b>0.9439</b>	0.0221	0.9430
hs	10	<b>0.0404</b>	<b>0.9064</b>	0.0448	0.8998	0.0476	0.8946
	20	<b>0.0282</b>	<b>0.9430</b>	0.0298	0.9388	0.0301	0.9413
	40	0.0186	<b>0.9727</b>	<b>0.0171</b>	0.9720	0.0229	0.9577
prmsl	10	<b>0.0654</b>	<b>0.9014</b>	0.0716	0.9006	0.1023	0.8892
	20	<b>0.0571</b>	0.9143	0.0578	<b>0.9153</b>	0.0620	0.9135
	40	<b>0.0454</b>	<b>0.9389</b>	0.0459	0.9365	0.0466	0.9373
cmipc	10	<b>0.1205</b>	0.4473	0.1726	0.4459	0.1809	<b>0.4525</b>
	20	<b>0.0916</b>	<b>0.5745</b>	0.0946	0.5696	0.0967	0.5737
	40	0.0800	0.6436	<b>0.0799</b>	<b>0.6546</b>	0.0815	0.6308
lm	10	<b>0.0638</b>	<b>0.9004</b>	0.0699	0.8842	0.0744	0.8799
	20	<b>0.0416</b>	<b>0.9384</b>	0.0517	0.9175	0.0577	0.9189
	40	<b>0.0310</b>	0.9574	0.0390	<b>0.9588</b>	0.0329	0.9624

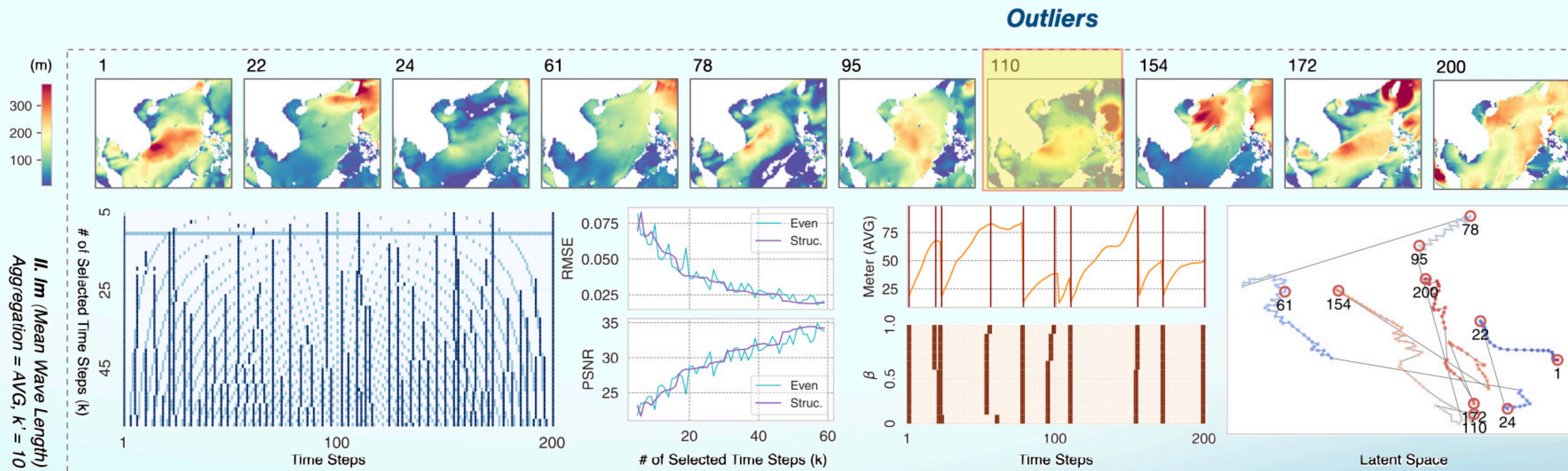


# Evaluation



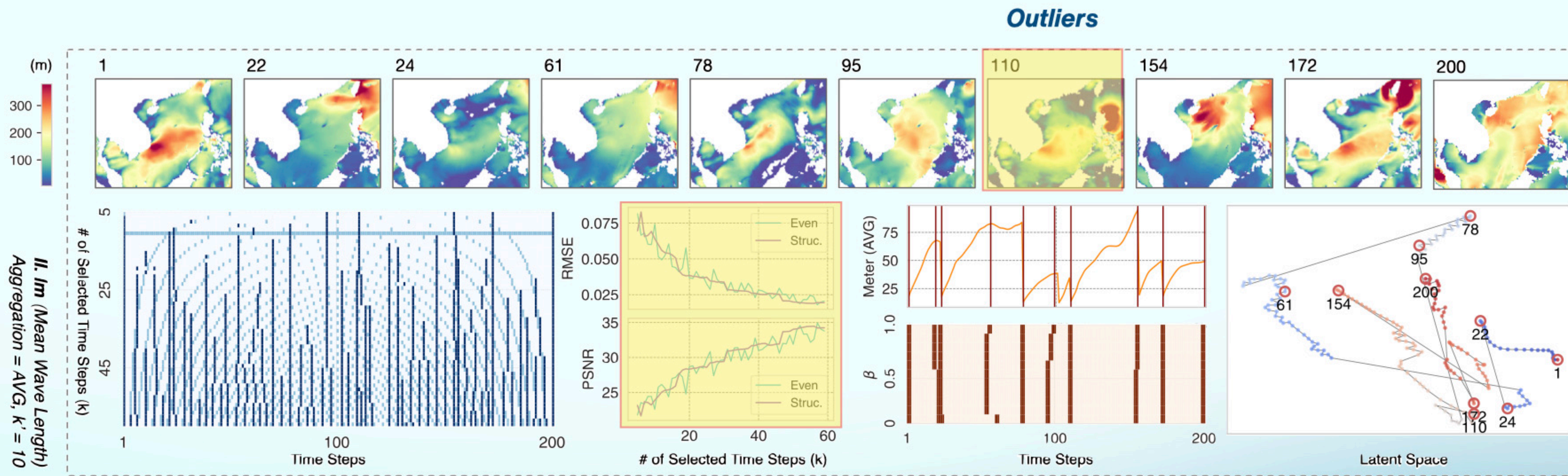


# Evaluation





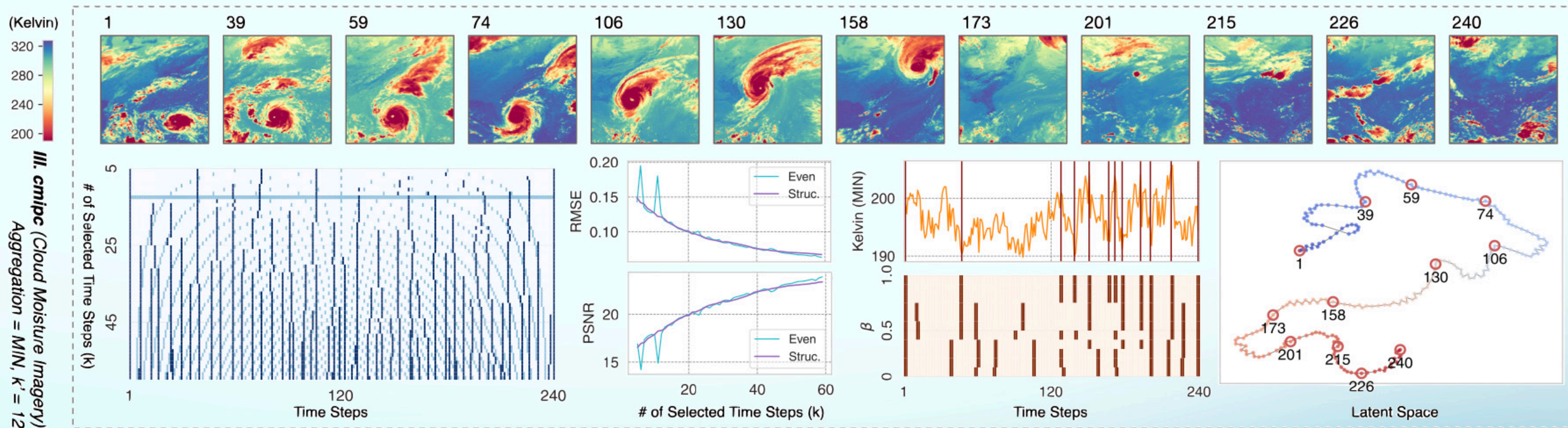
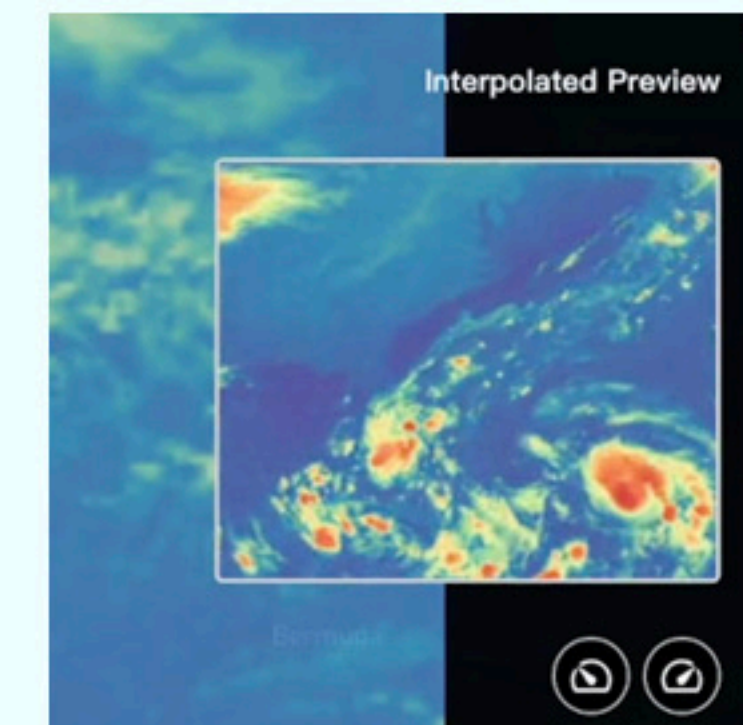
# Evaluation



**Stable Selections**

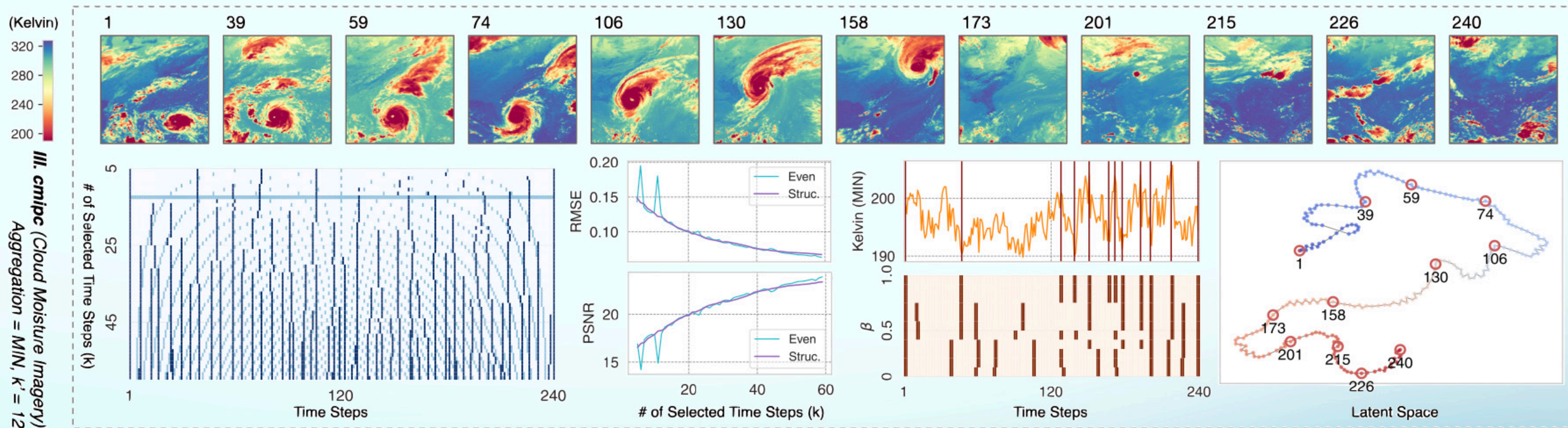
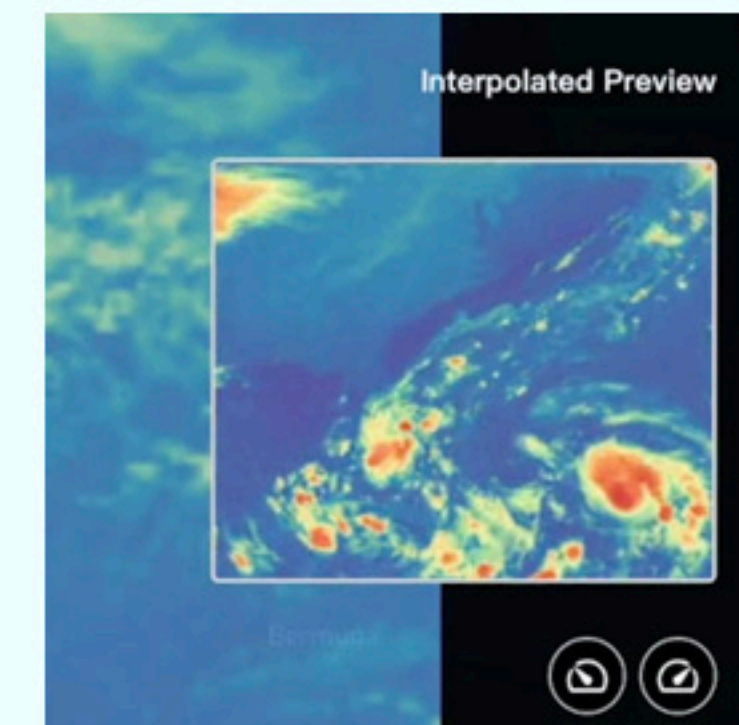


# Evaluation





# Evaluation

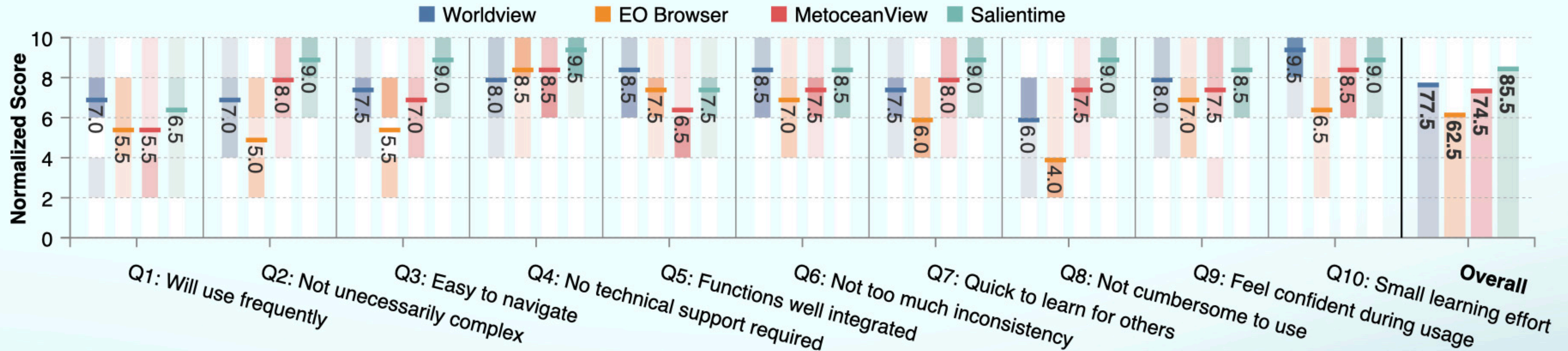




# Evaluation

## Expert Interview

- Employed an Adapted SUS (System Usability Scale) Questionnaire



- Higher usability with small learning effort.



# Summary

## **Need-finding Study with Domain Experts**

- Understanding the temporal selection workflow
- Multifaceted definitions for salient time steps

## **Novel Approach for Selecting Salient Frames**

- CNN-based Autoencoder to learn latent codes
- Structural cost, Statistical Cost, and Distance Cost

## **Interactive Systems with Contextual Visualizations**

- Contextual visualization: Temporal Trend + Relative Trend + Latent Space visualization
- Progressive Dynamics Generation



# Summary

## Need-finding Study with Domain Experts

- Understanding the temporal selection workflow
- Multifaceted definitions for salient time steps

## Context-aware Temporal Navigation

### Novel Approach for Selecting Salient Frames

## Informed Decision-Making Workflow

- CNN-based Autoencoder to learn latent codes
- Structural cost, Statistical Cost, and Distance Cost

## Interactive Systems with Contextual Visualizations

- Contextual visualization: Temporal Trend + Relative Trend + Latent Space visualization
- Progressive Dynamics Generation





SalienTime  
Select Dataset:  
ECNUVIS ECNU Visualization Lab

Band 13 of the GOES-R Advanced Baseline Imager (ABI) L2 Cloud and Moisture Imager (CMI) data. It measures the brightness temperature of the atmosphere.

Saliency Definition:  
Selecting 8 frames with focus on:

Structural:  
Statistical:

Aggregation:  
Time Steps: 8



# SalienTime: User-driven Selection of Salient Time Steps for Large-Scale Geospatial Data Visualization

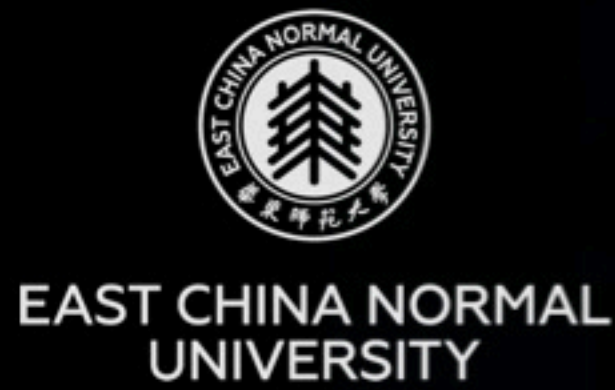
Juntong Chen, Haiwen Huang, Huayuan Ye, Zhong Peng, Chenhui Li, Changbo Wang

Source Code: <https://github.com/billchen2k/salientime>

Contact: [bill.chen@live.com](mailto:bill.chen@live.com)

<https://billc.io>

Unit: Kelvin (K)  
Coordinate: 63.1531W, 18.2565N  
Geo Bound: 90.7519W, 41.4814N  
63.1531W, 18.2565N  
Value: 295.5774 (K)  
Global Max: 300.45 (K)  
Global Min: 261.51 (K)  
Global Avg: 282.23 (K)  
Regional Max: 300.45 (K)  
Regional Min: 261.51 (K)  
Regional Avg: 282.23 (K)  
CHI 2024  
Surfing the World  
11-16 May 2024



Coordinate: 63.1531W 18.2565N  
Value: 295.5774

Code:



Image Credit:  
[https://www.mrclab.com/meteorology\\_equipment](https://www.mrclab.com/meteorology_equipment)  
[https://www.esa.int/ESA\\_Multimedia/Images/2012/02/Sentinel-2](https://www.esa.int/ESA_Multimedia/Images/2012/02/Sentinel-2)

2019-09-06T12:02:00Z Zoom Scroll

Navigation icons: Home, Download, Refresh, Zoom In, Play, Previous, Stop, Next, Zoom Out

2019-09-01 23:22:00