

# OceanEddies

A visualization tool for oceanic eddies detected by satellite altimetry



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# The Team

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❖ Jeffrey J. Early (NWRA)



❖ **Brian J. Curtis**

❖ Jonathan Lilly (PSI)



❖ Peter Gaube (UW-APL)





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# Motivation

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- ❖ Lots of cool science eddies and satellite altimetry.
- ❖ Along-track eddy detection, vertical structure, fluid trapping from drifters and ocean color, etc.
- ❖ Super fun aspect of this work is describing what eddies look like and how we measurement them.

*A visualization tool for oceanic eddies detected by satellite altimetry*



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# OceanEddies.org

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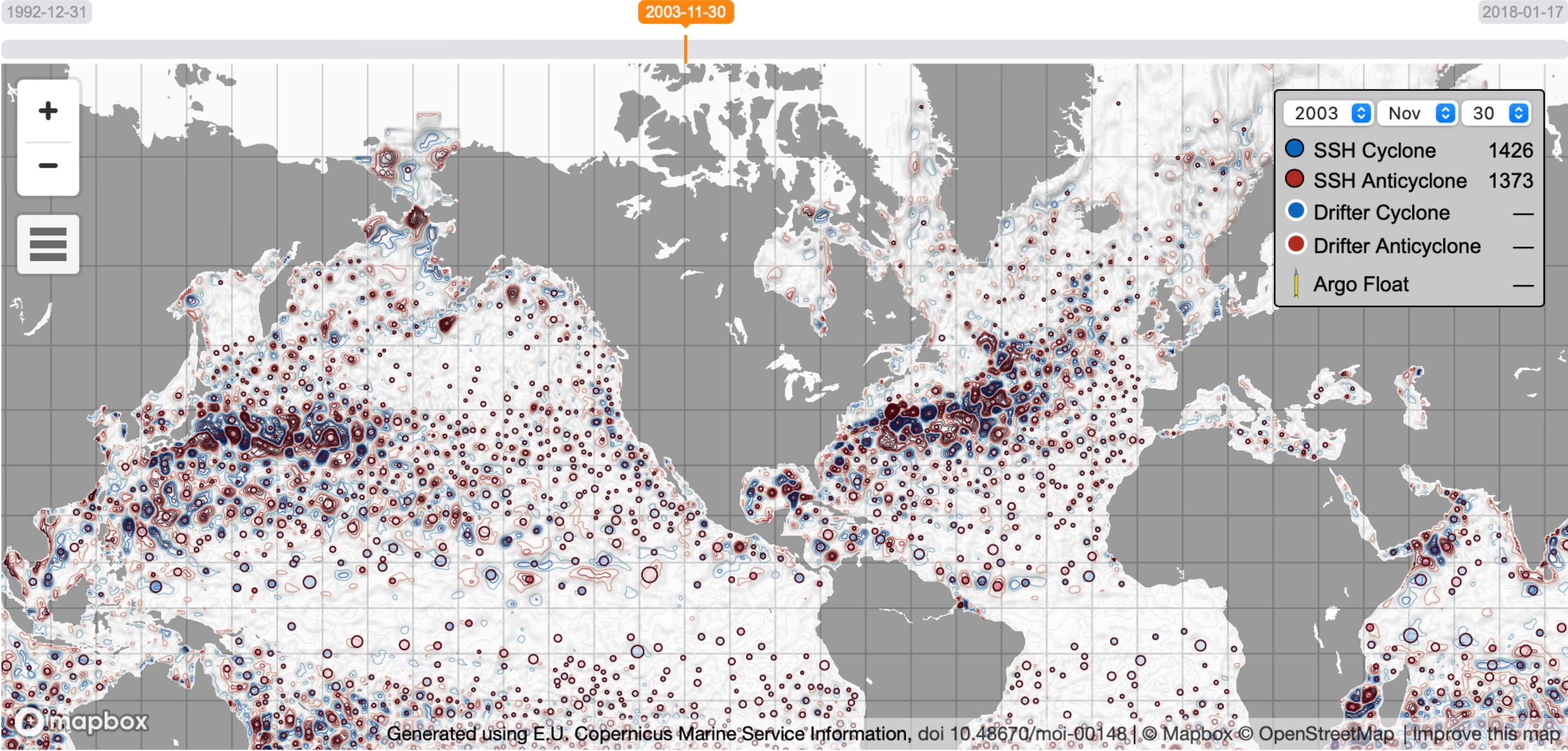
- ❖ Global daily SLA 1993-2016 as hillshade & contours
- ❖ SSH eddies, drifter eddies, Argo floats
- ❖ Sortable & filter by size, lifetime, etc.
- ❖ Data matchups downloadable, with example scripts.



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SSH Eddies <input checked="" type="checkbox"/> Drifter Eddies <input type="checkbox"/> Argo Floats <input type="checkbox"/>							
Eddy ID ▲	Start Date ▲	End Date ▲	Age (days) ▲	Amplitude (RMS) ▲	Rotation ▲	Nearby Argo Floats ▲	Nearby Drifter Eddies ▲
Eddy ID	Date	Date	Min Age	Min Amplitude	Select	Min Argo	Min Drifter
61092	2001-08-08	2004-06-19	1046	6	Anticyclonic	0	18
62009	2001-09-24	2003-12-11	808	14	Anticyclonic	4	9
62705	2001-10-31	2004-05-13	925	9	Anticyclonic	3	16
63071	2001-11-18	2004-03-31	864	8	Anticyclonic	4	15



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# Hillshade & Contours

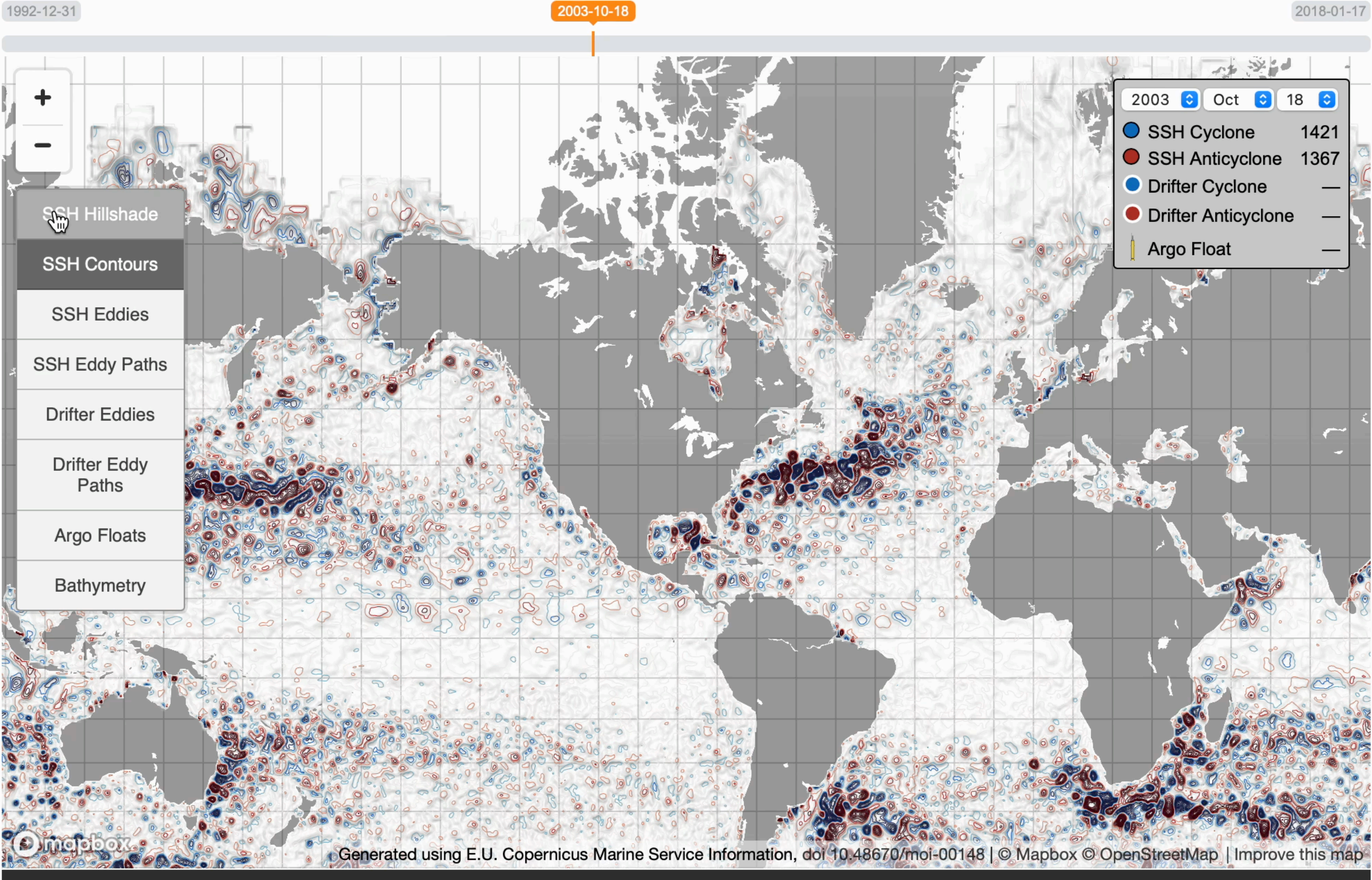
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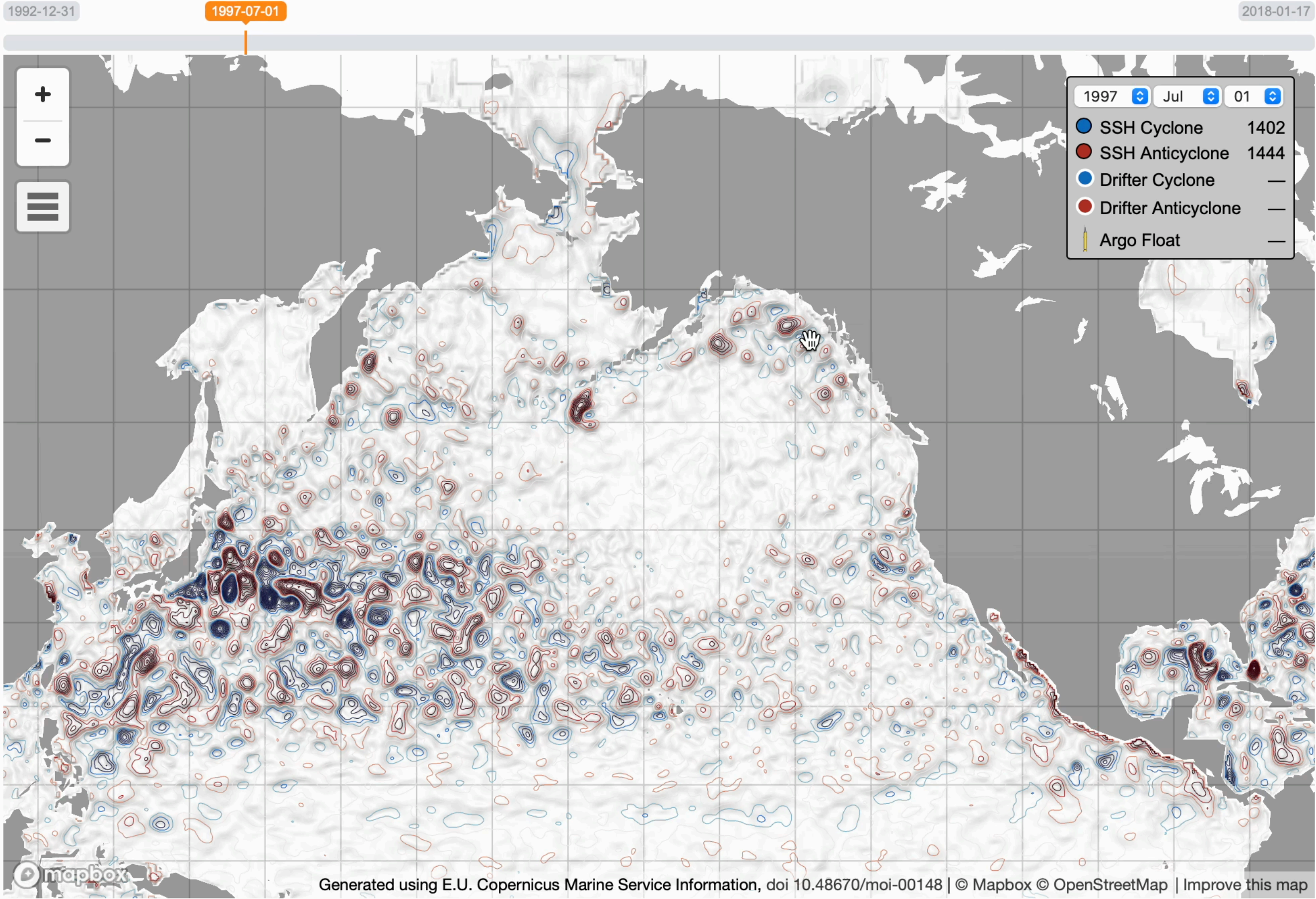




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# Hillshade & Contours

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- ❖ Hillshade tiles are rendered *on-the-fly* from the elevation data. Thus the actual data is accessible.
- ❖ Contours are pre-computed and download as vector data.
- ❖ Primary tools are Mapbox and Amazon S3.



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# Eddies & Argo floats

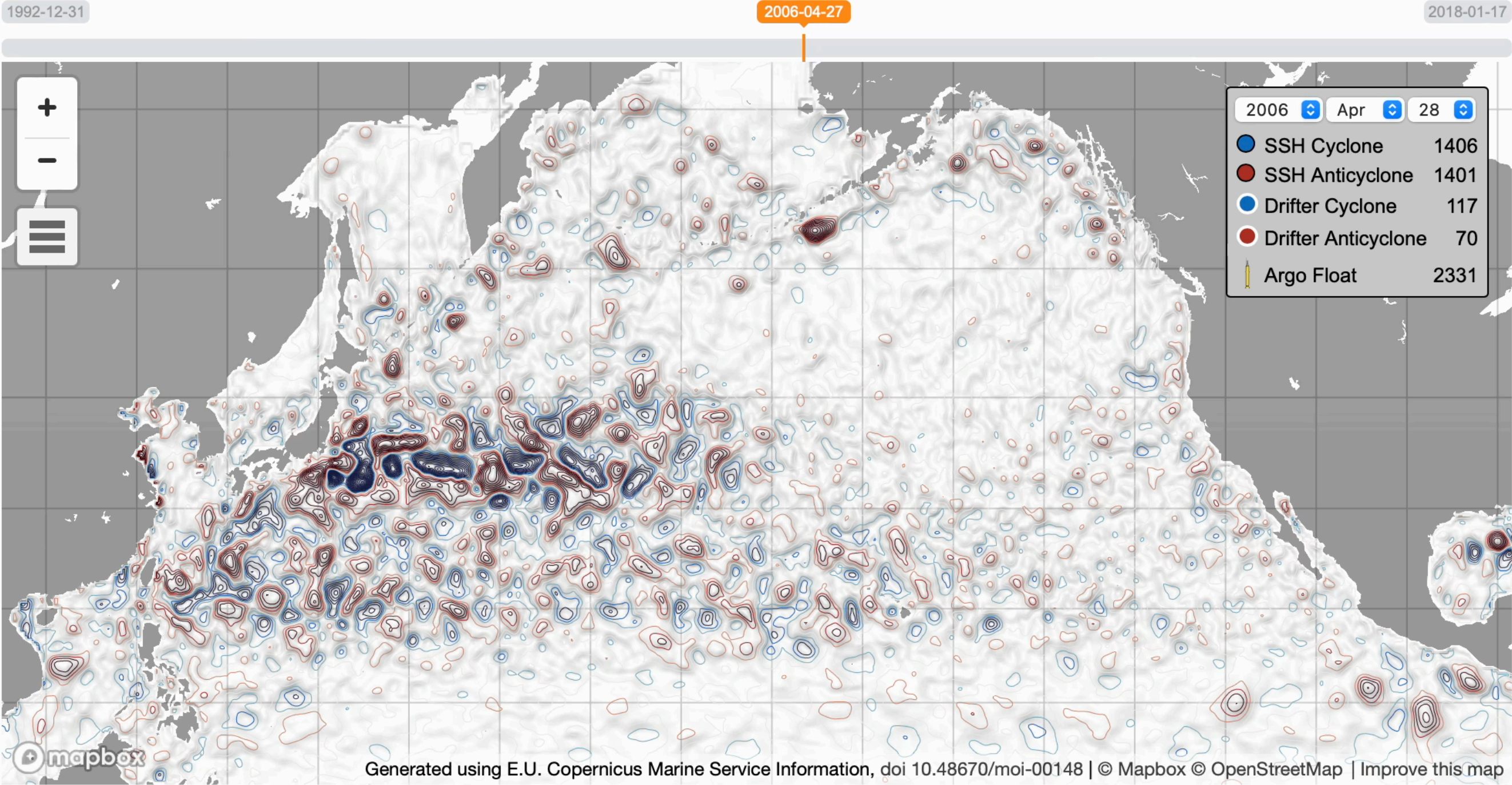
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SSH EddiesDrifter EddiesArgo Floats

Argo ID ▲	Start Date ▲	End Date ▲	Nearby SSH Eddies ▲	Nearby Drifter Eddies ▲	
Argo ID	Date	Date	Min SSH Eddies	Min Drifter Eddies	
19019	2000-12-28	2008-09-23	49	0	
19021	2000-12-29	2007-04-16	61	2	



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# Eddies & Argo Floats

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- ❖ SSH eddies are from the Chelton & Schlax eddy tracking method.
- ❖ Drifter eddies are identified using the Lilly & Perez-Brunius (2021) method.
- ❖ Fast co-location depends on indexing, spatial indexing and good SQL queries.



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# Data Filtering

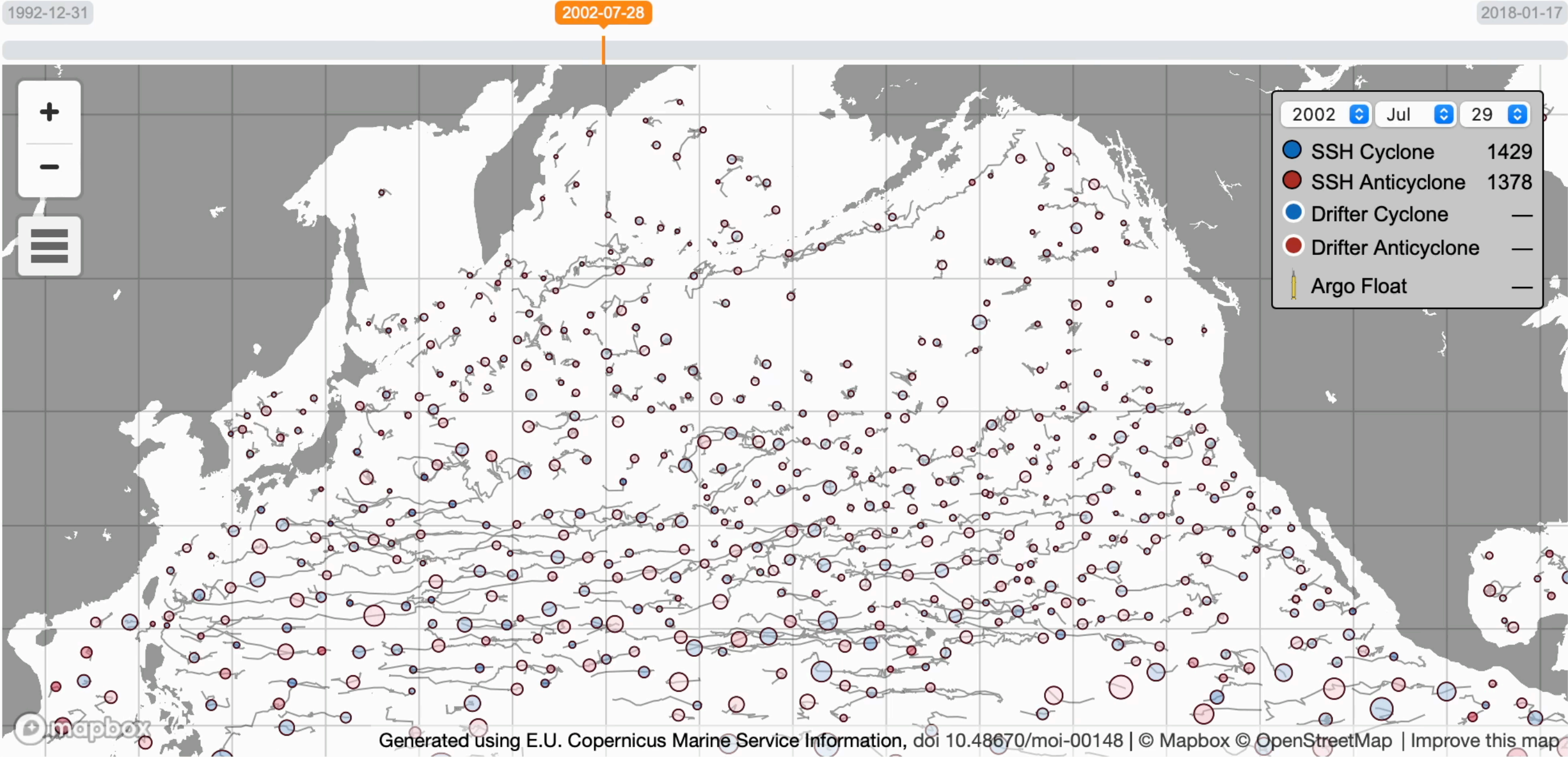
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SSH Eddies <input checked="" type="checkbox"/> Drifter Eddies <input type="checkbox"/> Argo Floats <input type="checkbox"/>							
Eddy ID ▲	Start Date ▲	End Date ▲	Age (days) ▲	Amplitude (RMS) ▲	Rotation ▲	Nearby Argo Floats ▲	Nearby Drifter Eddies ▲
Eddy ID	Date	Date	Min Age	Min Amplitude	Select	Min Argo	Min Drifter
55491	2000-10-21	2003-02-23	855	6	Anticyclonic	0	10
55611	2000-10-26	2002-11-03	738	8	Anticyclonic	0	3
55911	2000-11-11	2002-12-04	753	7	Anticyclonic	0	8
56389	2000-12-05	2003-07-17	954	6	Anticyclonic	0	20



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# Individual Eddies

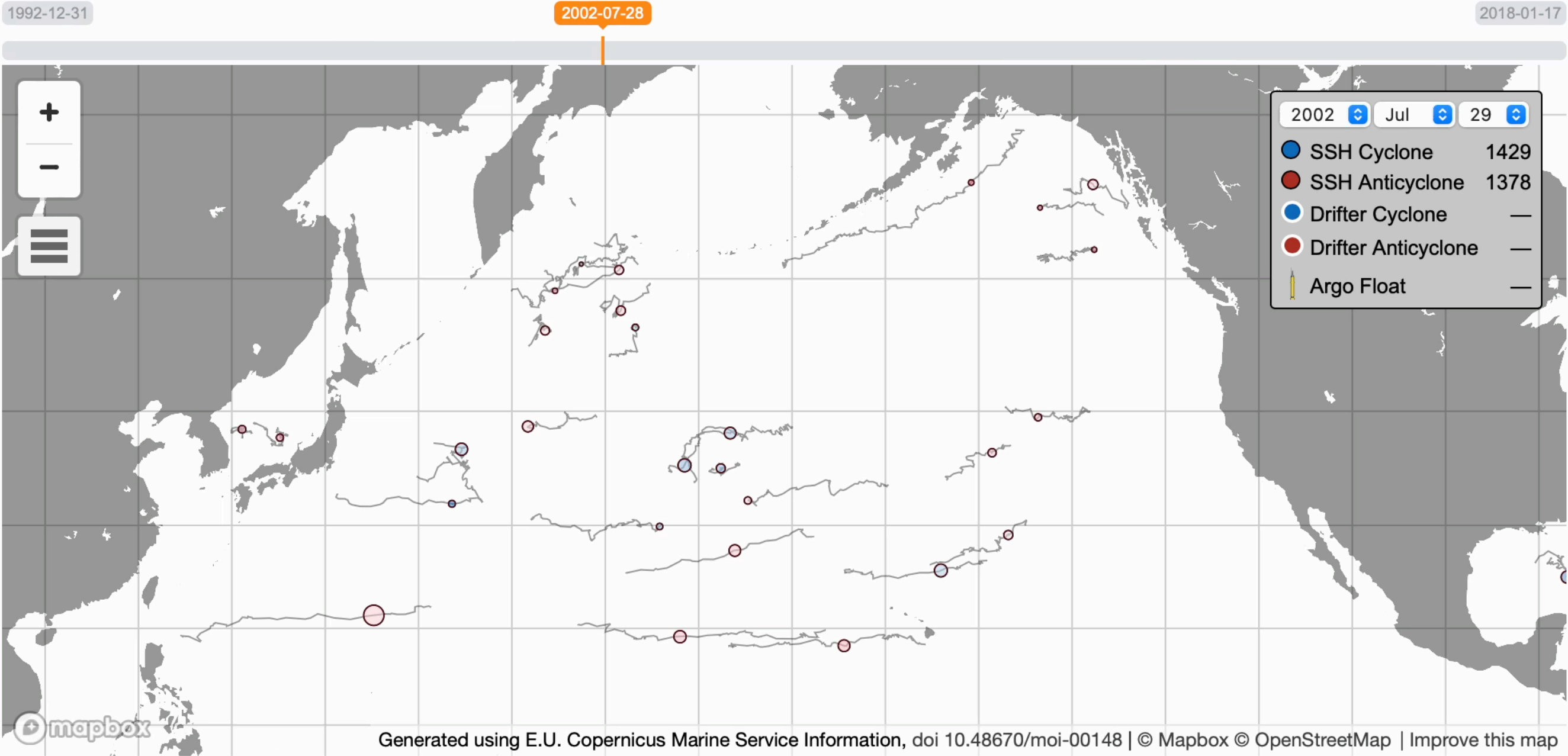
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SSH Eddies <input checked="" type="checkbox"/> Drifter Eddies <input type="checkbox"/> Argo Floats <input type="checkbox"/>							
Eddy ID ▲	Start Date ▲	End Date ▲	Age (days) ▲	Amplitude (RMS) ▲	Rotation ▲	Nearby Argo Floats ▲	Nearby Drifter Eddies ▲
Eddy ID	Date	Date	365	Min Amplitude	Select	Min Argo	Min Drifter
55491	2000-10-21	2003-02-23	855	6	Anticyclonic	0	10
55611	2000-10-26	2002-11-03	738	8	Anticyclonic	0	3
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# OceanEddies

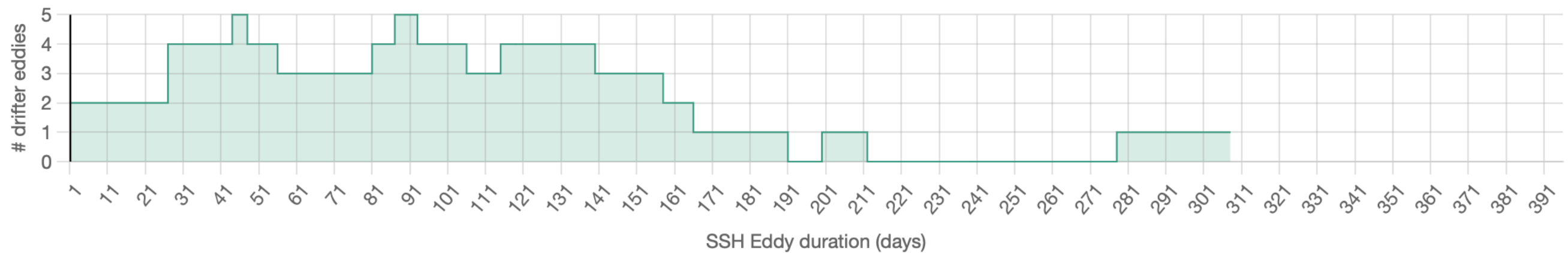
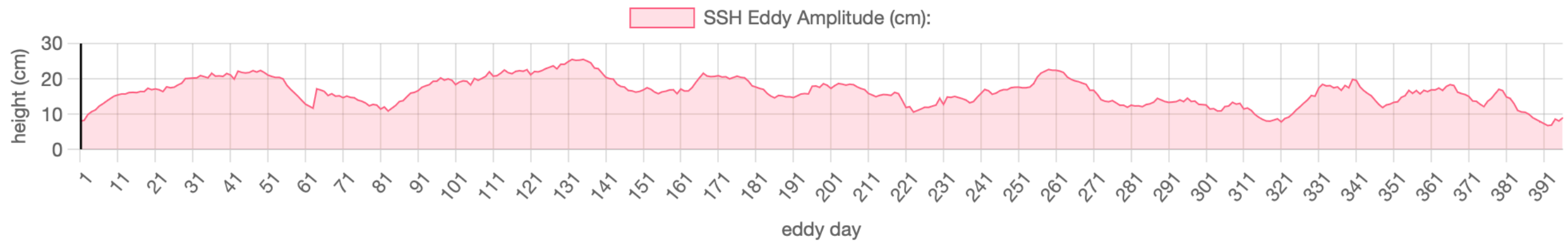
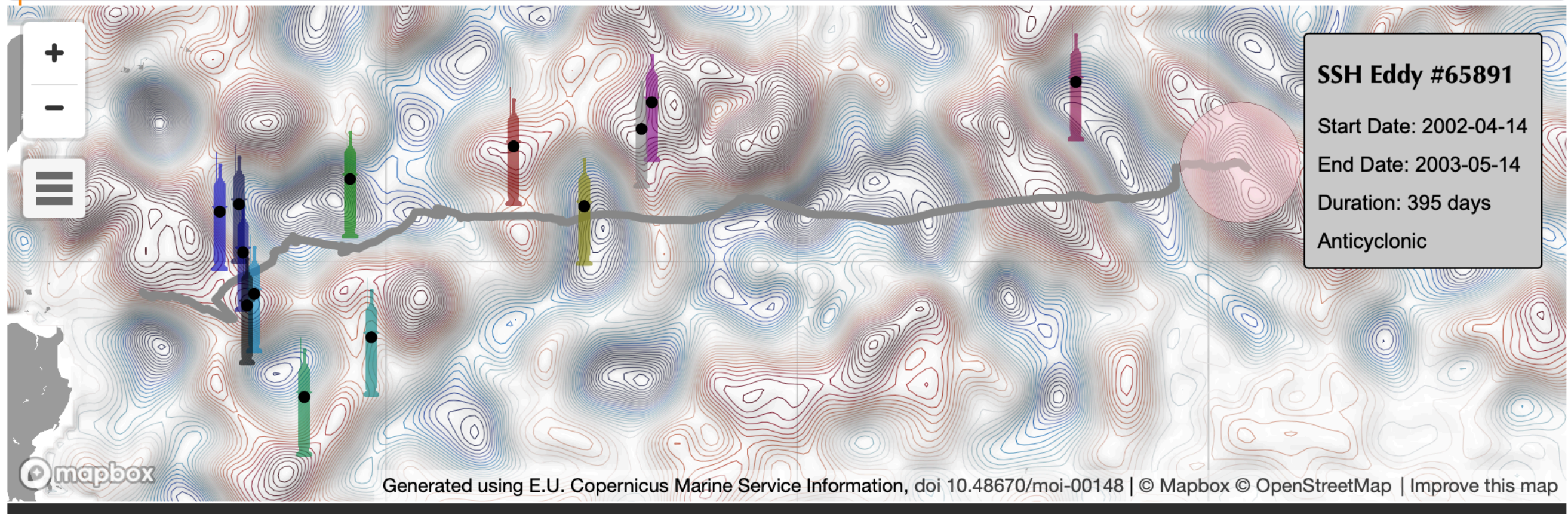
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2002-04-13

2003-05-13





# OceanEddies

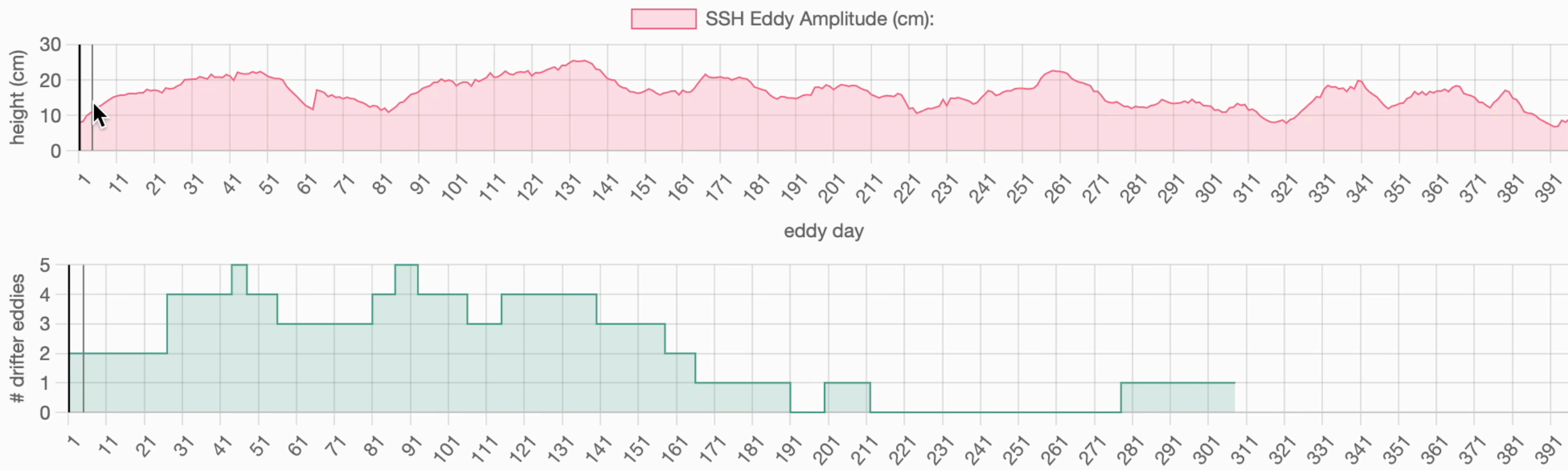
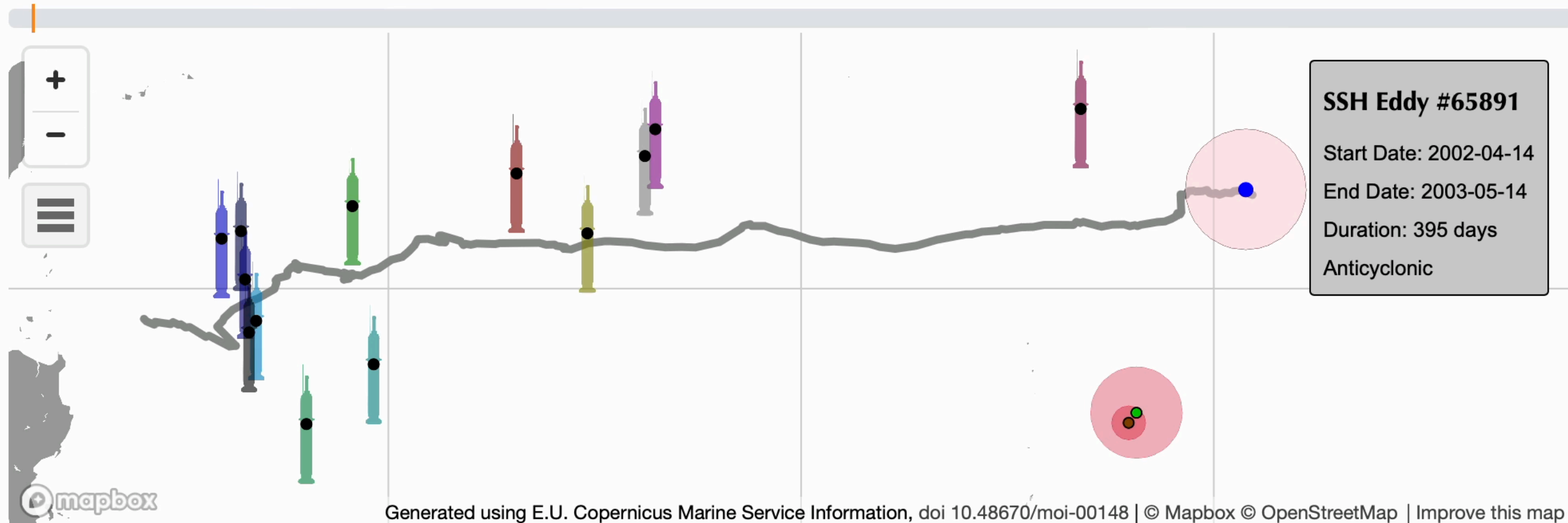
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2002-04-16

2003-05-13





# Data & Analysis Scripts

- ❖ Download 'nearby' data for each eddy and float.
- ❖ Script to read and plot the data in Matlab.

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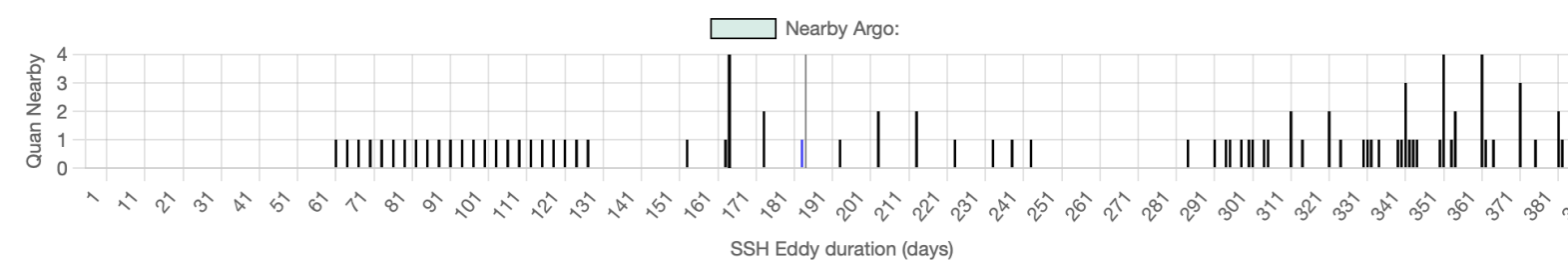
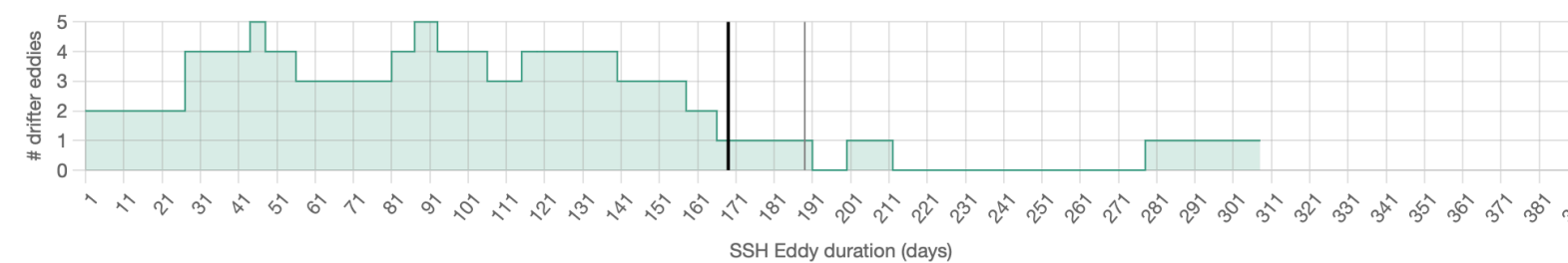
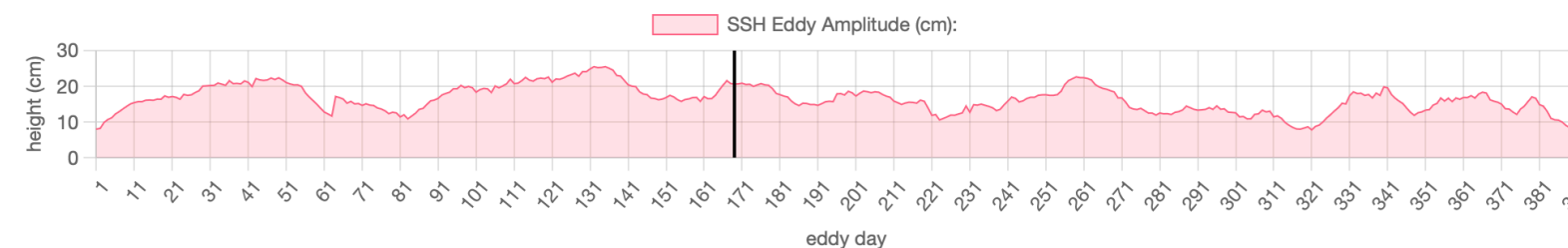
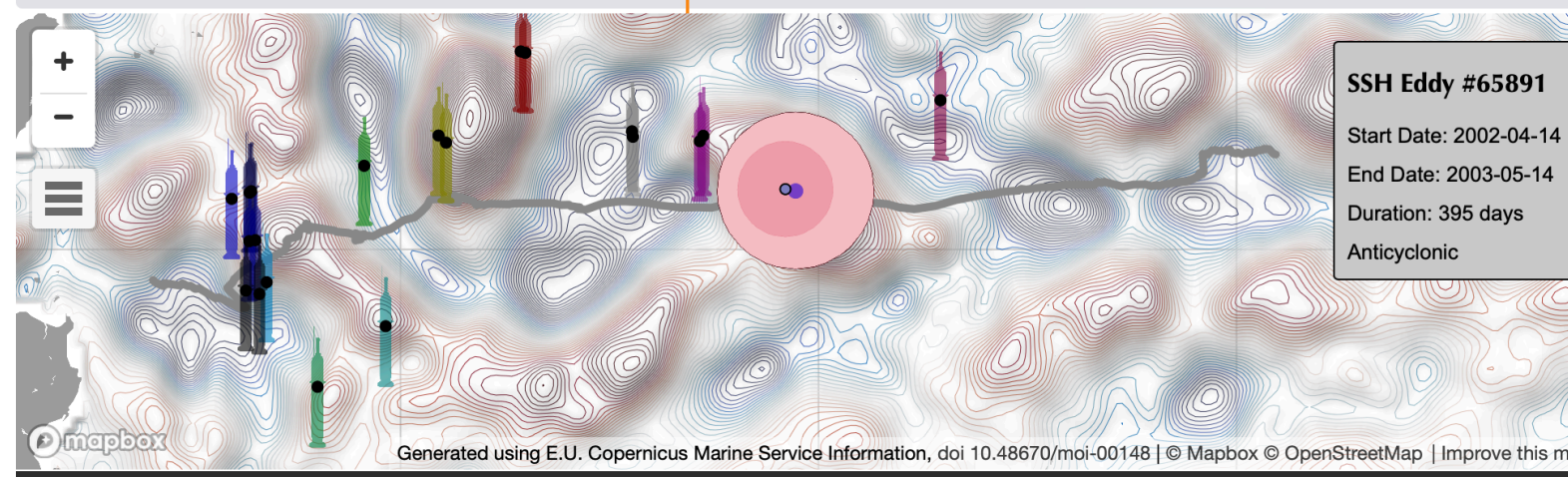
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2002-04-13

2002-09-27

2003-05-14



[Download Argo data](#)

[Download eddy](#)

[Download nearby drifter eddies](#)

[Matlab Sample Scripts](#)



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# Explore!

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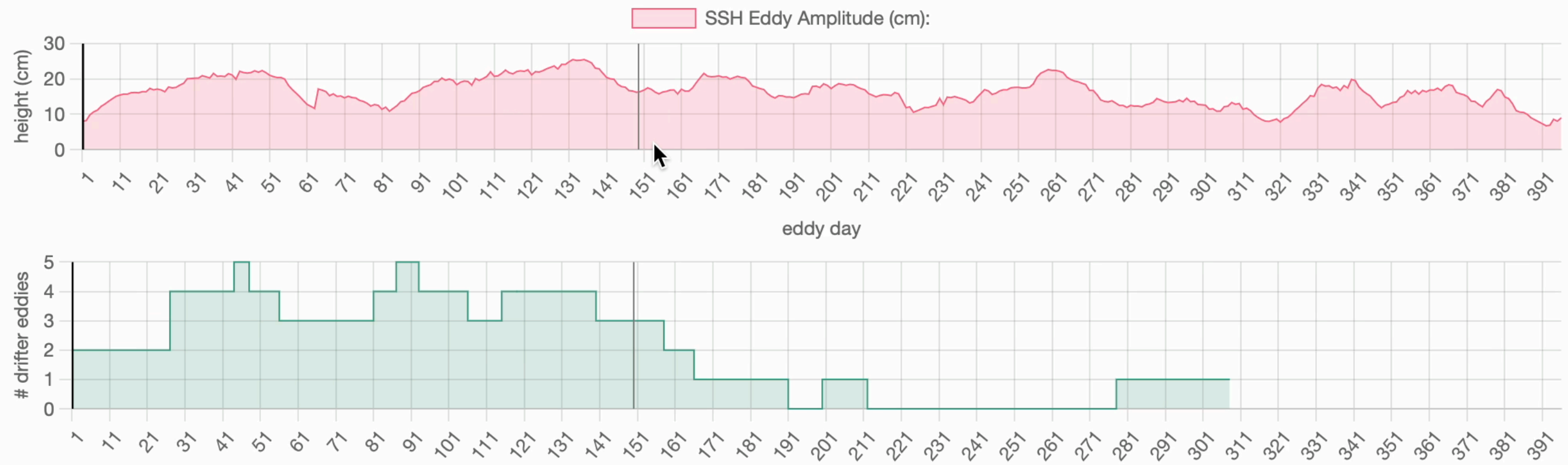
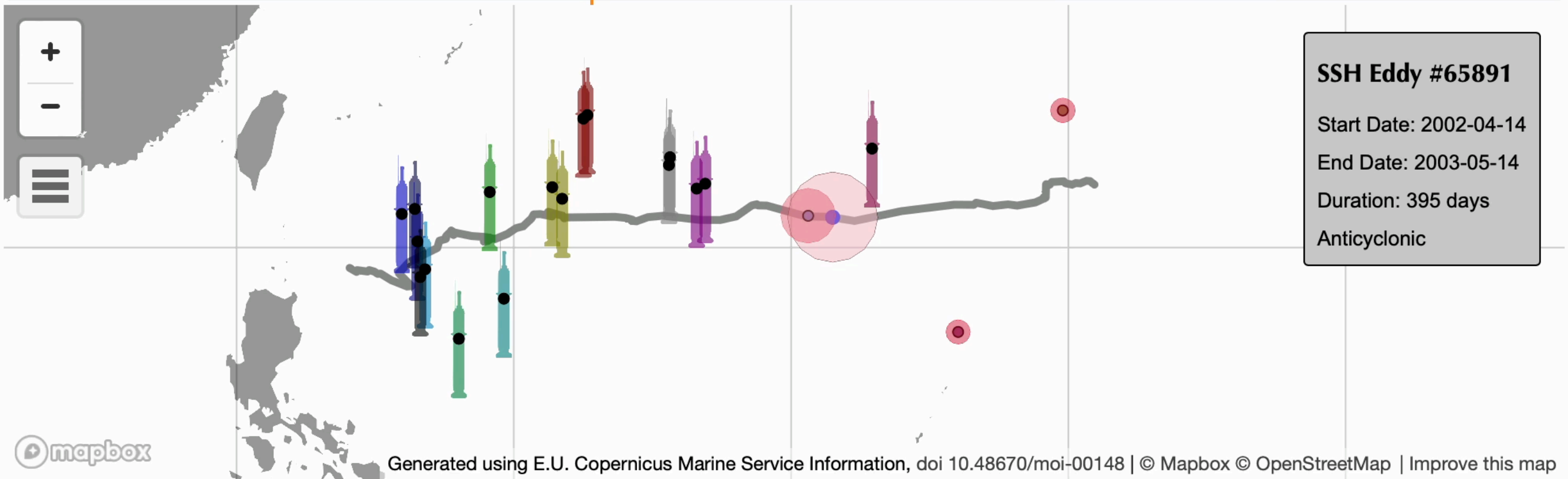
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2002-04-13

2002-09-08

2003-05-13





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# Explore!

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- ❖ Lots of data to explore, download, and analyze.
- ❖ We continue to do our own science on these (and other) co-located datasets.



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# Data Hosting Challenges

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- ❖ Hosted on AWS for 1 year thanks to a grant from Amazon.
- ❖ Speed is essential, but usage charges can be very expensive very quickly.
- ❖ So *please* don't start downloading all the map tiles. :-)



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# Future Direction

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- ❖ Is this valuable? How should we focus our efforts?
- ❖ What features would help the most? Delayed real-time?  
Specific downloads?