



# Okeanos Explorer ROV Dive Summary

## Dive Information

<p>General Location Map</p>	
<p>General Area Descriptor</p>	<p>U.S. Mid-Atlantic, Frank R. Lautenberg Deep Sea Coral Protection Area</p>
<p>Site Name</p>	<p>Norfolk Deep Seep</p>
<p>Science Team Leads</p>	<p>Amy Wagner (CSUS) and Alexis Weinnig (Temple)</p>
<p>Expedition Coordinator</p>	<p>Kasey Cantwell (NOAA-OER)</p>
<p>ROV Dive Supervisor</p>	<p>Chris Ritter (GFOE)</p>
<p>Mapping Lead</p>	<p>Shannon Hoy (NOAA-OER)</p>

## ROV Dive Name

<p>Cruise</p>	<p>EX1903L2</p>
<p>Dive Number</p>	<p>Dive 19</p>



## Scientists Involved (provide name, affiliation, email)

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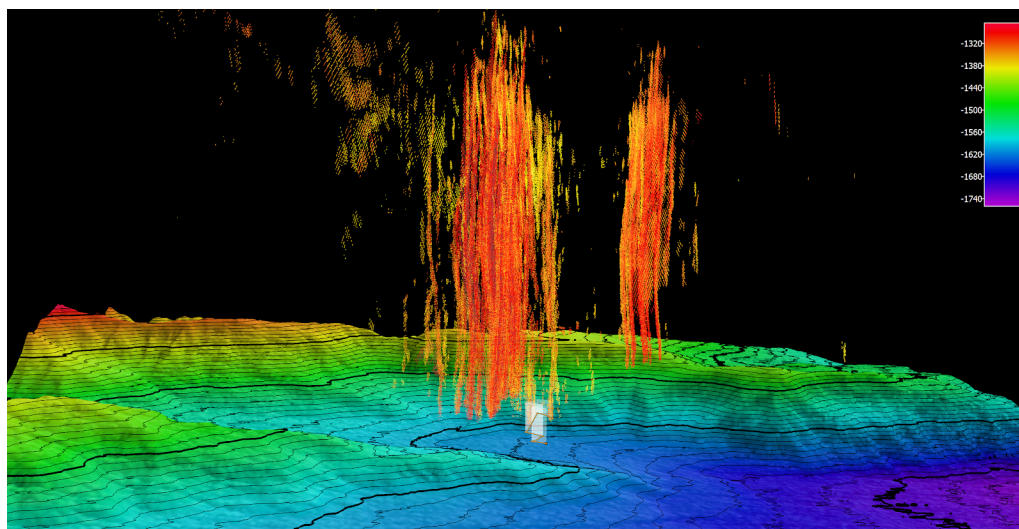
Tamara	Frank	tfrank1@nova.edu	Nova Southeastern University
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Dive Purpose	The primary objective of this dive is to explore and characterize ecological conditions and geological features at a dense area of effusive gas seeps. These seeps have not been previously characterized and will serve as a point of ecological and geological comparison with seeps to the immediate northwest and northeast.
Dive Description	<p>The Norfolk Canyon deep seep site was the first location of seafloor methane discharge discovered by the NOAA Ship <i>Okeanos Explorer</i> in 2012. ROV and HOV observations of benthic communities at proximal seeps approximately 500 meters to the northwest and 1000 meters to the northeast indicated effusive gas discharge, robust chemosynthetic ecosystems, extensive beds of <i>Bathymodiolus</i> mussels, abundant carbonate rock, and ubiquitous bacterial mats. The location for this dive was chosen for its proximity to these previously explored seep sites with the prospect of finding similar ecological and geological features that would allow for comparison with the proximal seep sites.</p> <p>Multibeam mapping was performed the night prior to the dive at the projected dive site to search for the presence of bubbles in the water column. Mapping data did confirm abundant bubble plumes from the previously explored seep sites and apparent smaller plumes near the targeted waypoints. The dive track was slightly modified from the planned track to accommodate some offset between the targets and the mapped bubble plumes.</p> <p>After a slight delay in launch, the ROV reached bottom at 13:38 UTC at 1601 m. The first couple hundred meters of the dive track were mostly soft, silty sediment with some brittle stars (Ophiuroidea), fish (Halosaur, <i>Antimora rostrata</i>), urchins, anemones, sea pens and empty <i>Bathymodiolus</i> mussel shells. After traveling approximately 200 meters, we started to encounter some small bacterial mats followed shortly thereafter by some outcrops of authigenic carbonate rocks and live <i>Bathymodiolus childressi</i>. A number of Chimaera were also seen throughout the dive in addition to some octopus (<i>Muusoctopus johnsonianus</i>) and skates. A large area of <i>Bathymodiolus</i> and bacterial mat was found about halfway through the dive track and beneath an area where bubbles were detected in the water column during overnight mapping. The majority of mussels were <i>Bathymodiolus childressi</i>, however, at least one <i>Bathymodiolus heckerae</i> was observed. Unfortunately, no active seeps (i.e. bubbles) were seen. After moving away from this large area of mussels and bacterial mat, no live mussels were observed throughout the rest of the dive. At around 600 m into the dive track, we approached an area of small mounds with very cloudy water. As we moved in closer, we could see that there was a fluid flowing from underneath the sediment creating small “volcanoes”. No change in temperature or salinity was detected on the D2 CTD. This was a previously undocumented observation at seep sites on the Atlantic margin.</p>
Notable Observations	Fluid flowing from underneath the sediment creating small “volcanoes”. No change in temperature or salinity was detected on the D2 CTD. This was a previously undocumented observation at seep sites on the Atlantic margin.

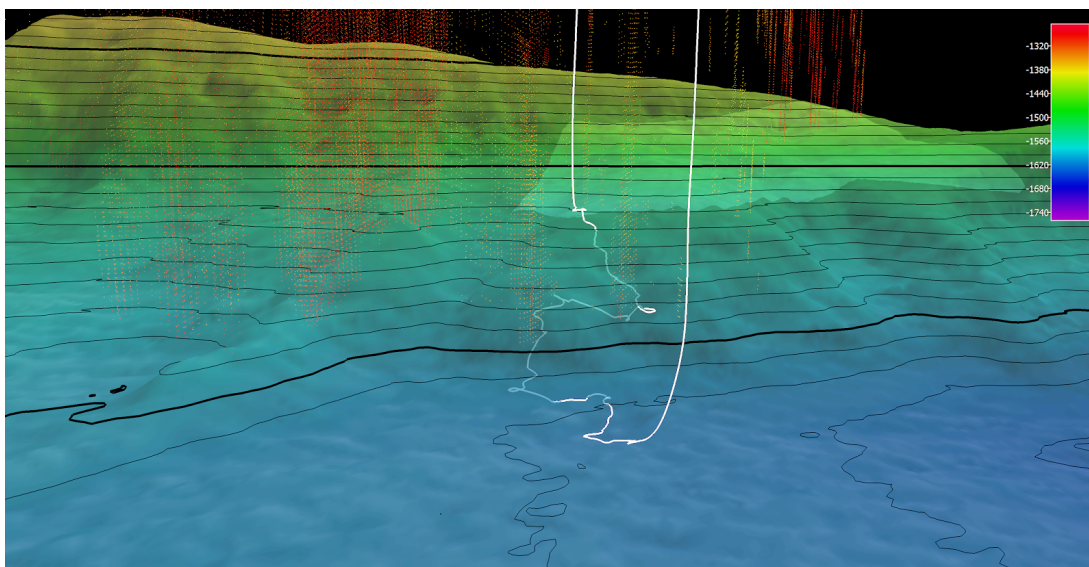


Community Presence/Absence (community is defined as more than two species)	<ul style="list-style-type: none"> <li>✓ Corals and Sponges</li> <li>✓ Chemosynthetic Community</li> <li>✓ High biodiversity Community</li> <li>✓ Active Seep or Vent</li> <li>✓ Extinct Seep or Vent</li> <li>✓ Hydrates</li> </ul>
Feature Type	Vent/Seep Communities and Microbial Communities, Shelf Valley, Authigenic Carbonate Outcrop
SeaTube Link (science annotation system)	<a href="https://data.oceannetworks.ca/SeaTubeV2?resourceTypeid=1000&amp;resourceid=23621&amp;divid=1523">https://data.oceannetworks.ca/SeaTubeV2?resourceTypeid=1000&amp;resourceid=23621&amp;divid=1523</a>

### Overall Map of the ROV Dive Area

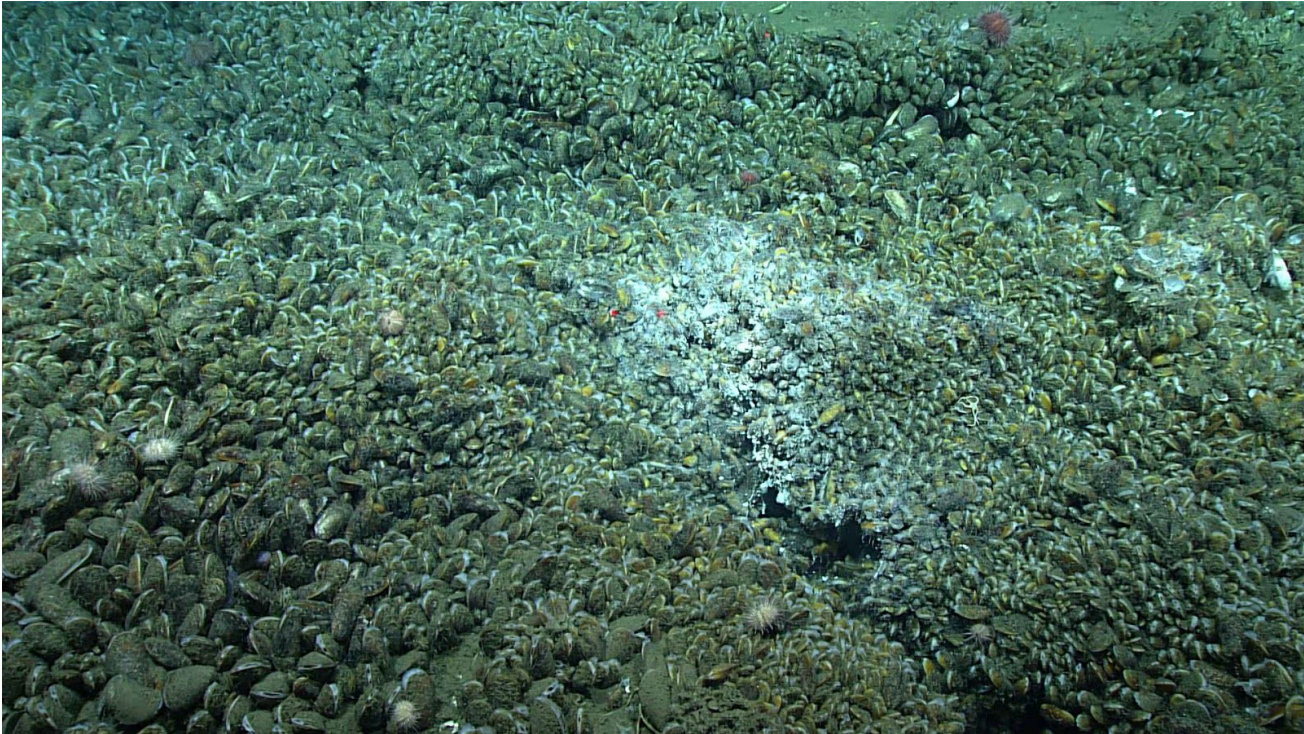
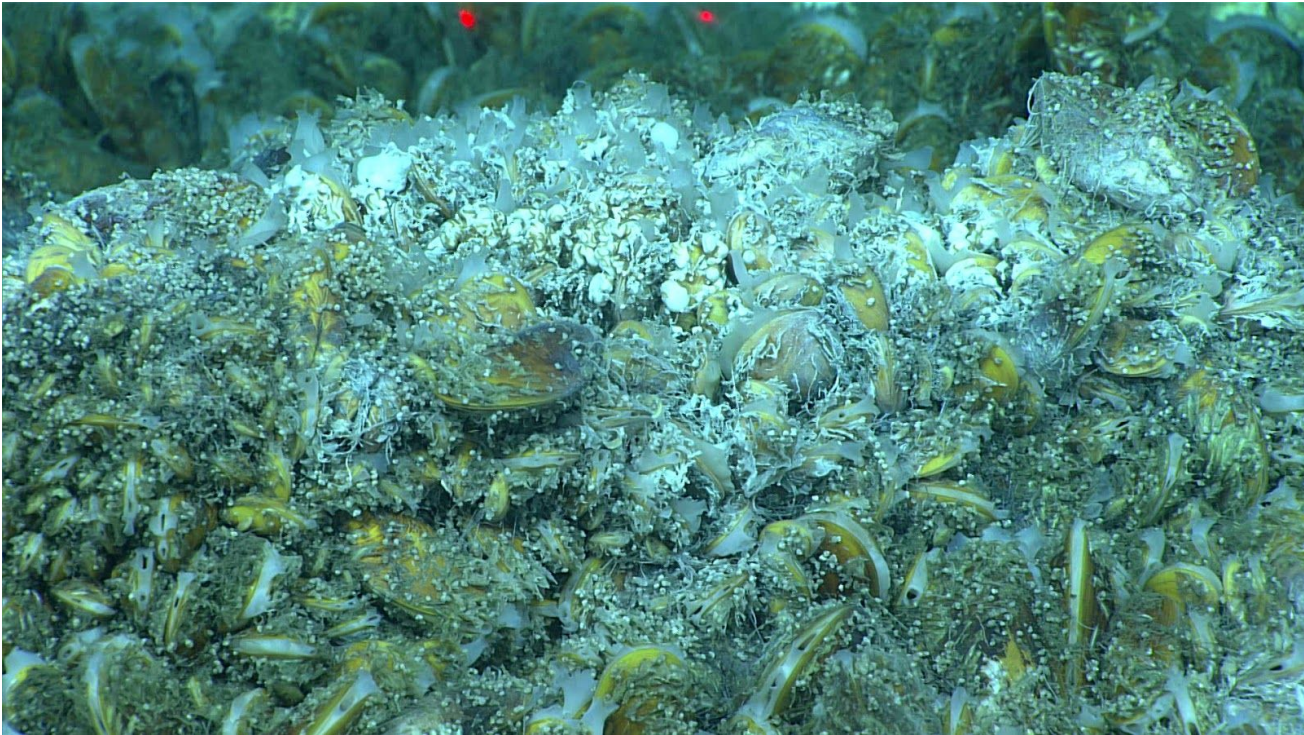


### Close-up Map of Main Dive Site

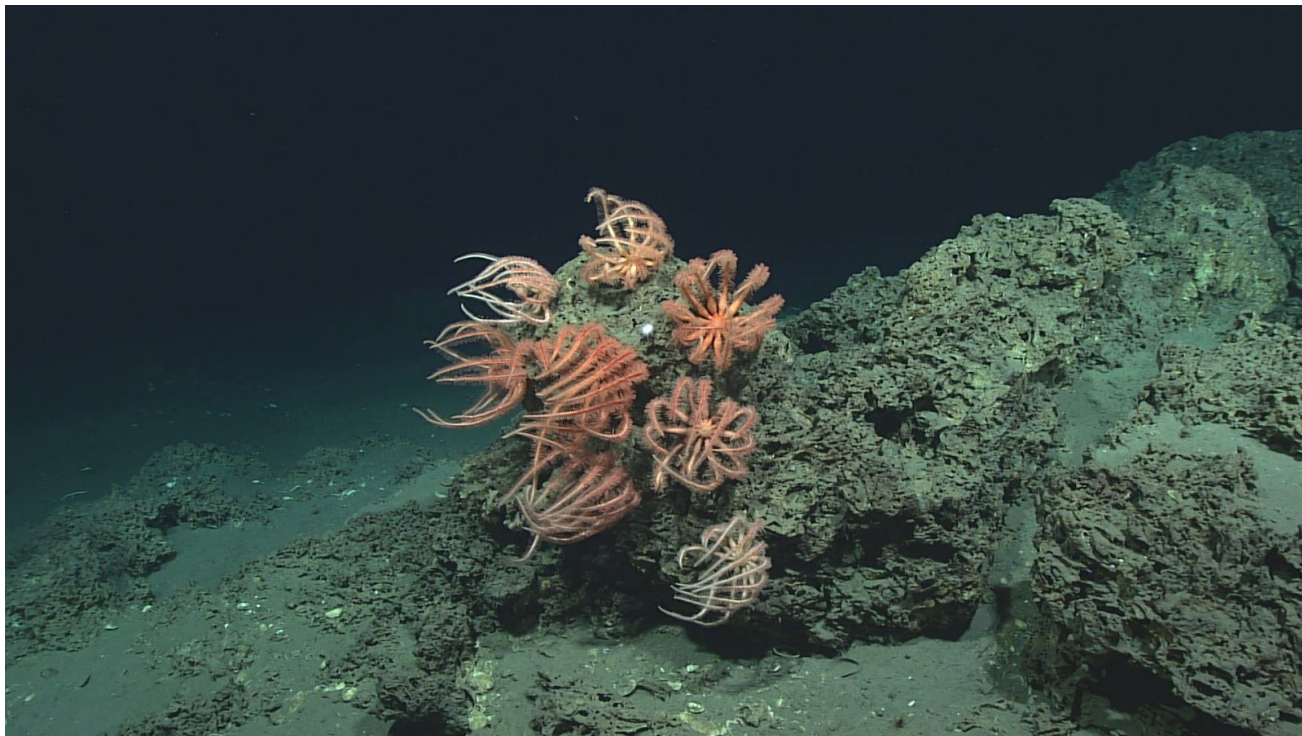
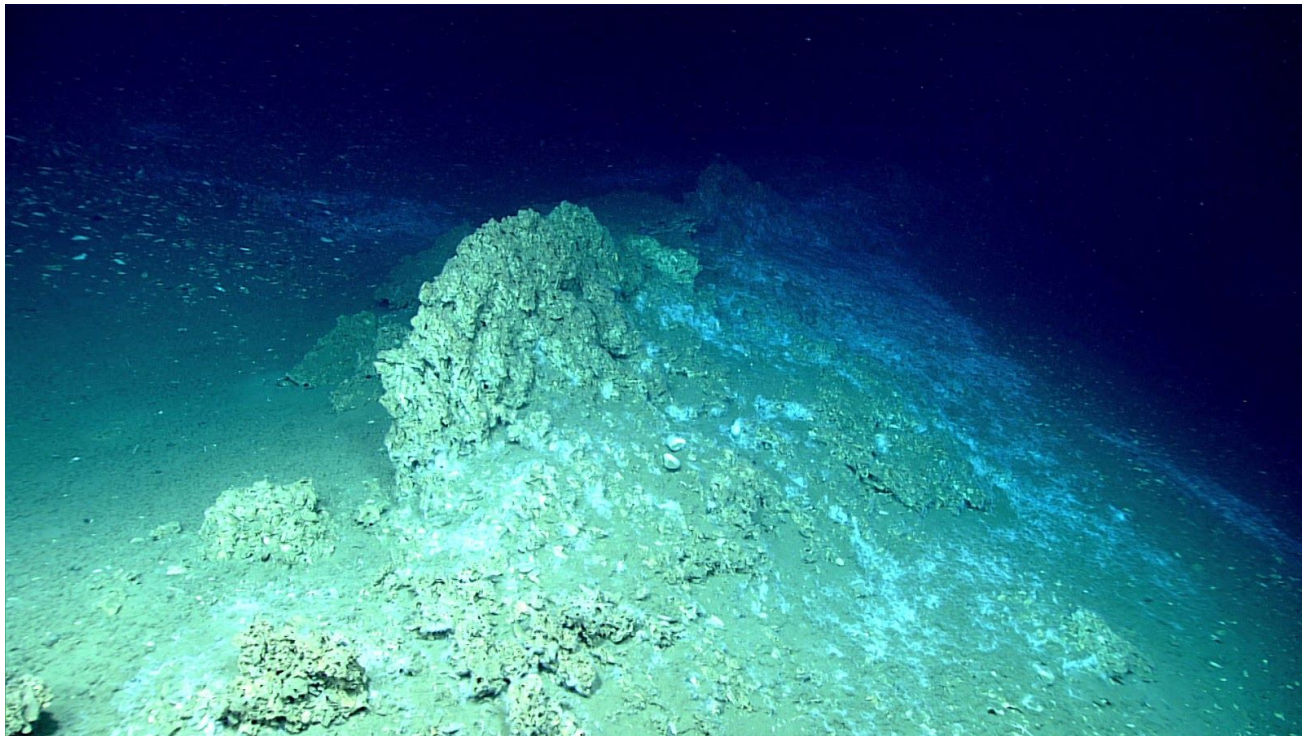




**Representative Photos of the Dive**



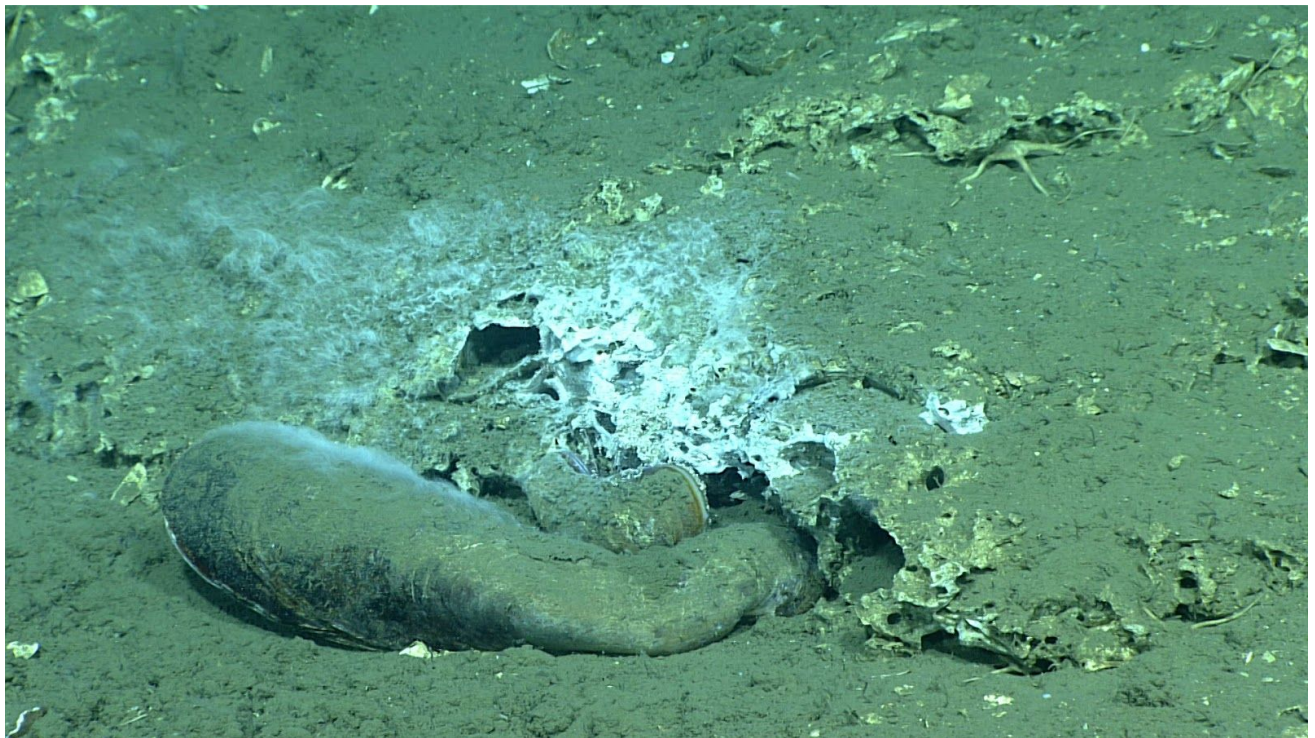








Fluid seeping out of the seafloor





## Samples Collected



Sample ID	EX1903L2_D19_01G
Date (UTC)	20190711
Time (UTC)	173004
Depth (m)	1579.8
Temp. (°C)	3.833
Field ID(s)	Authigenic carbonate
Associates	No associates
Comments	





Sample ID	EX1903L2_D19_02B	
Date (UTC)	20190711	
Time (UTC)	191904	
Depth (m)	1523.3	
Temp. (°C)	3.847	
Field ID(s)	Sea pen (Kophobelemnon?)	
Associates	Associates Sample ID	Field Identification
	EX1903L2_D19_02B_A01	Polychaeta
	EX1903L2_D19_02B_A02	Sediment with bacteria (sent to the Smithsonian)
	EX1903L2_D19_02B_A03	Sediment
Comments		

**Please direct inquiries to:**

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