Creating Ocean Floor Image Topography Maps Using ROV Videos

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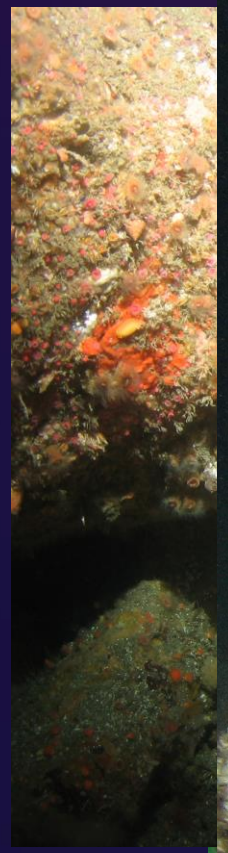
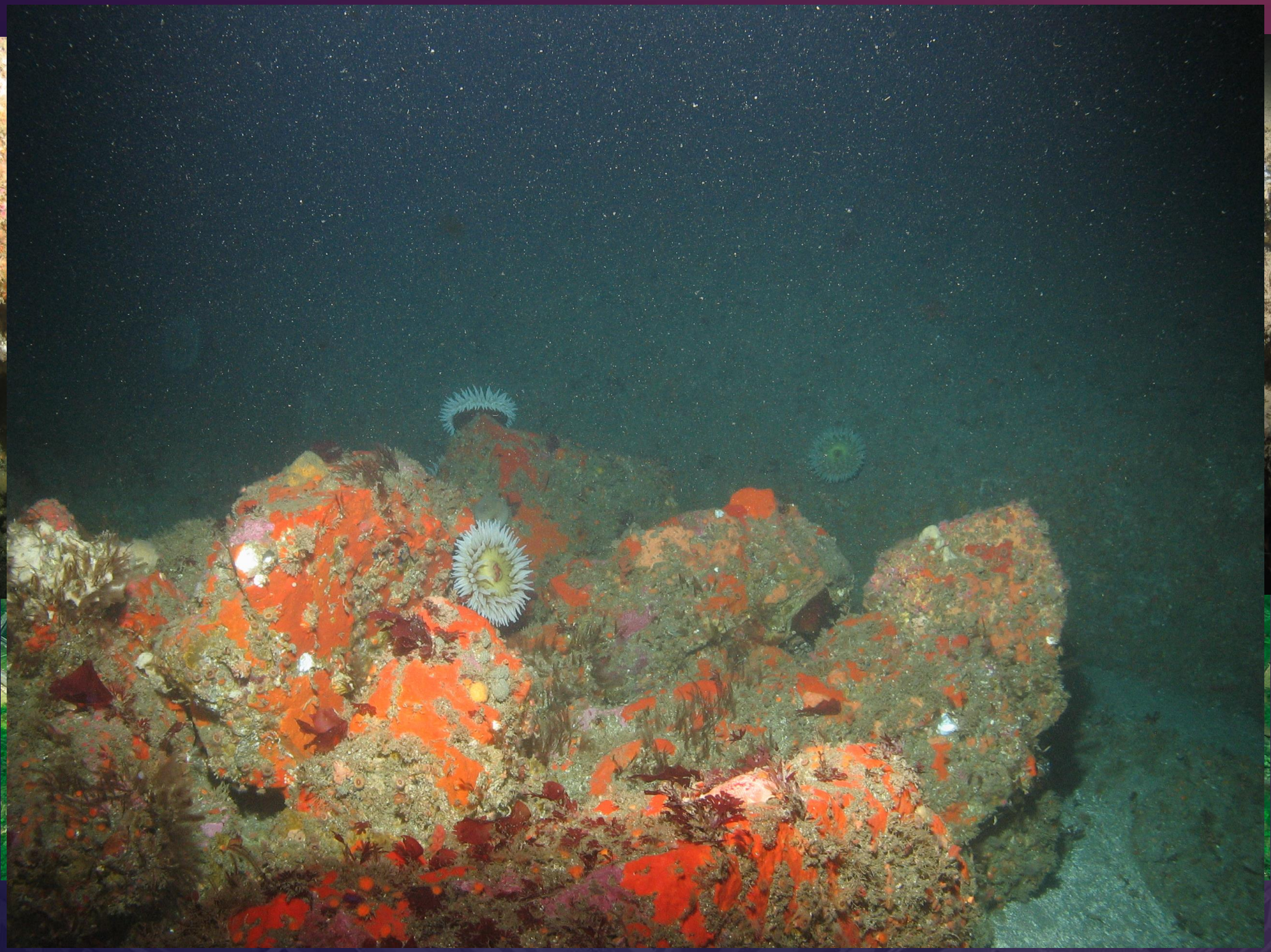
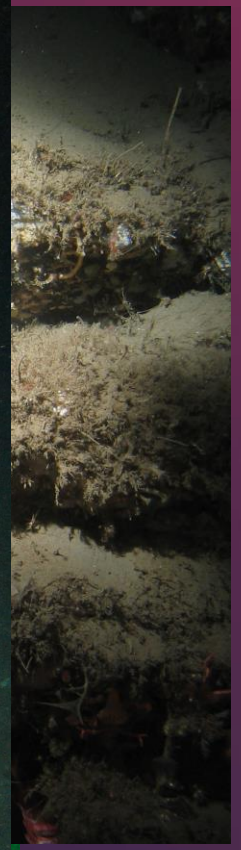
ESRI USER CONFERENCE

Objective

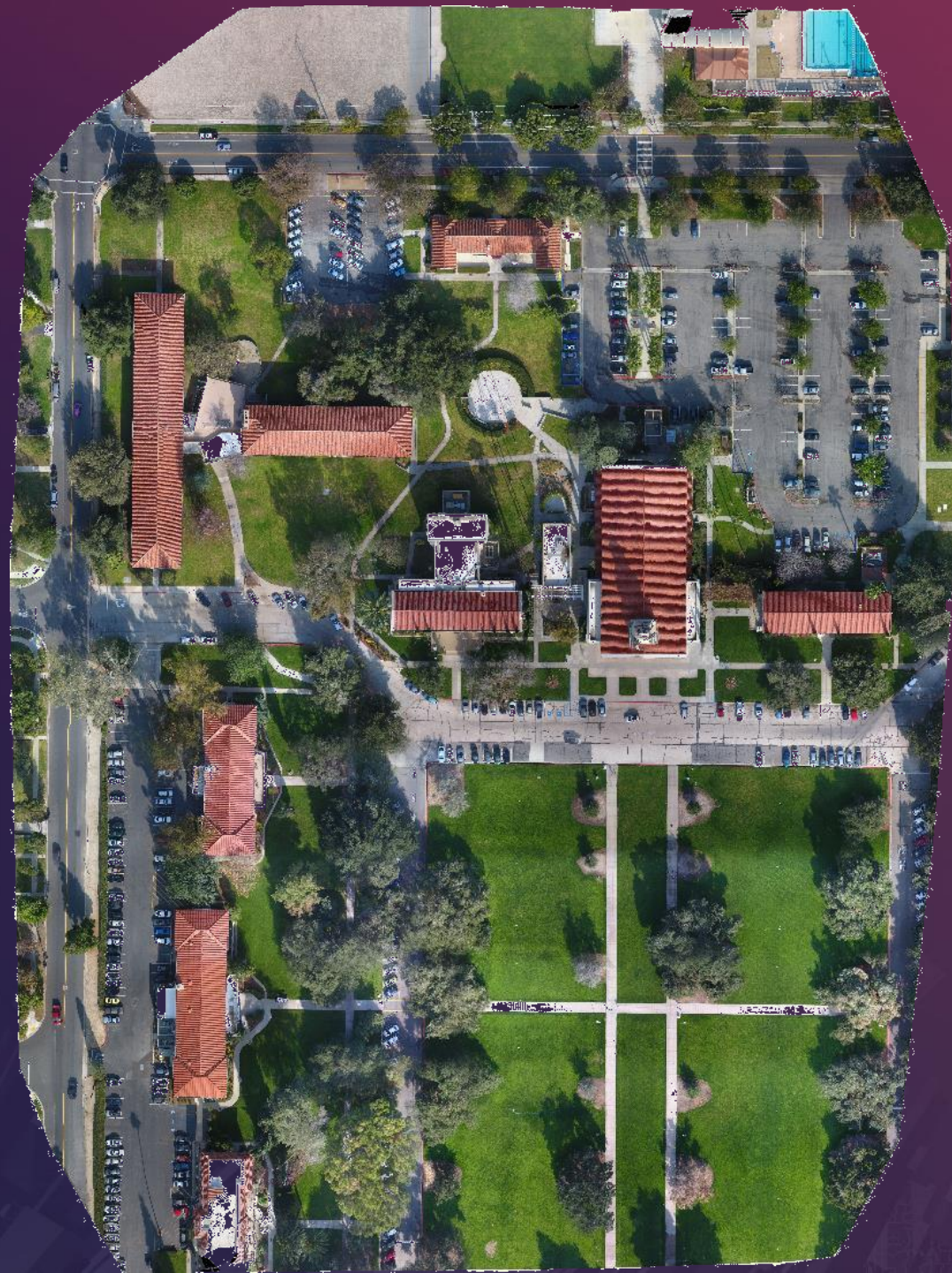
To create a seafloor image map from an underwater video







Aerial Image Mapping with Drone



Photogrammetry Software

- ✓ Image Overlap
- ✓ Identify Control Points

More overlap = more control points = better image & 3D products

Using this technology

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Can we create a seafloor image?

Challenges

- ✓ Low Light
- ✓ Low Visibility
- ✓ GPS signal
- ✓ Dense

↓

Using a video

Seafloor Video

Marine Applied Research & Exploration (MARE)

- ✓ ROV
- ✓ Existing seafloor videos
- ✓ Position and sensor data

Remotely Operated Vehicle (ROV)

ROV Beagle: 450 lbs
F/D/R, stereo, HD, SD camera
50ft+ boat needed
7-9 crew required

Fly 1 to 2 meters above bottom
Move slow and constant speed

Preparation

1. Finding ROV video sections for different ocean conditions
2. Create short video clips
3. Extract position data for each clip

ROV Video to Images

Photogrammetry software can be used to:

- ✓ **Extract the frame images from the video**
- ✓ **Geocode**
- ✓ **Create one image**

Capture frame images from video

- ✓ **Every 1 second = enough overlap**
- ✓ **1 second = 30 frames**

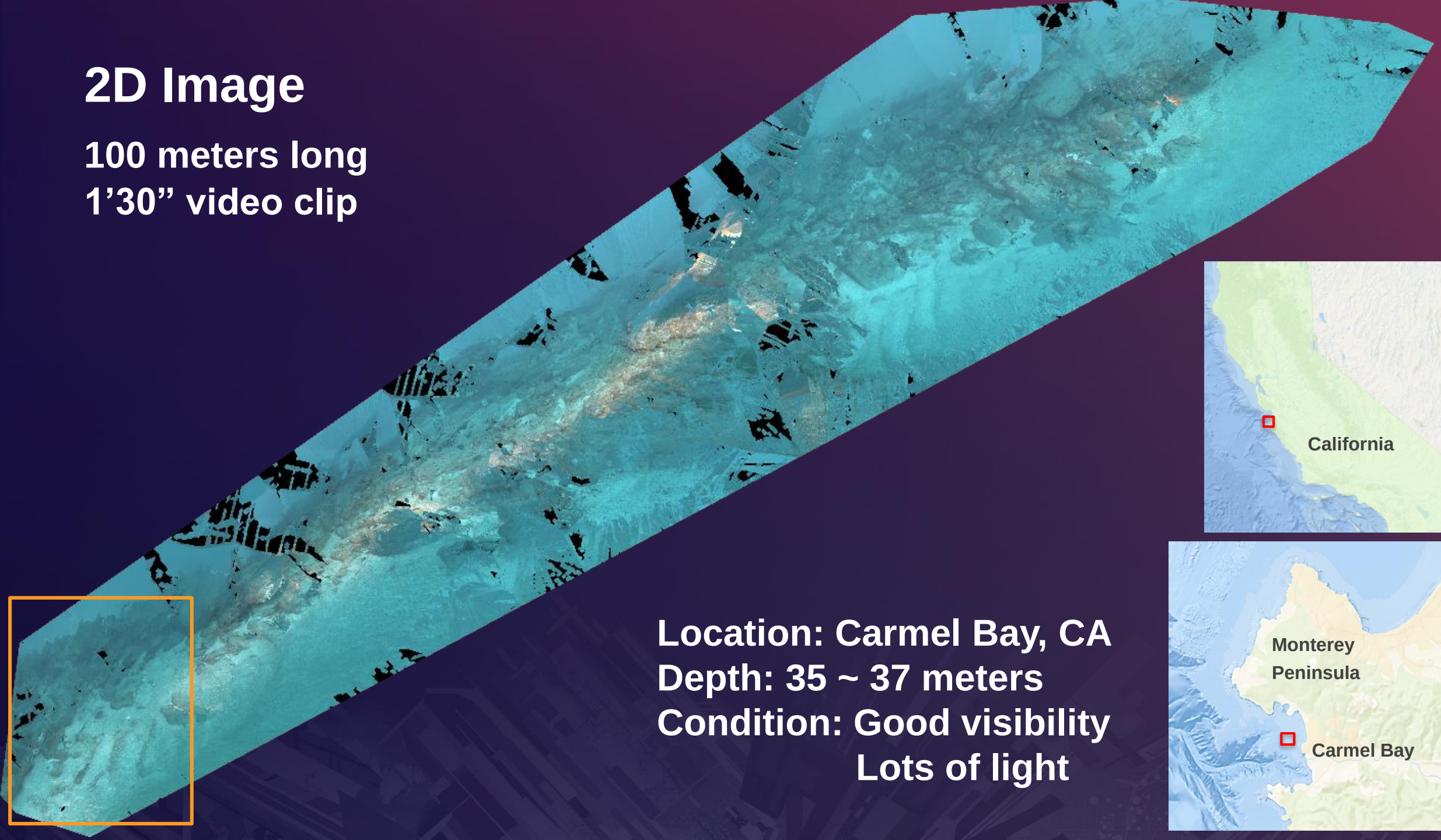
Result

I successfully created a good seafloor image from the ROV video

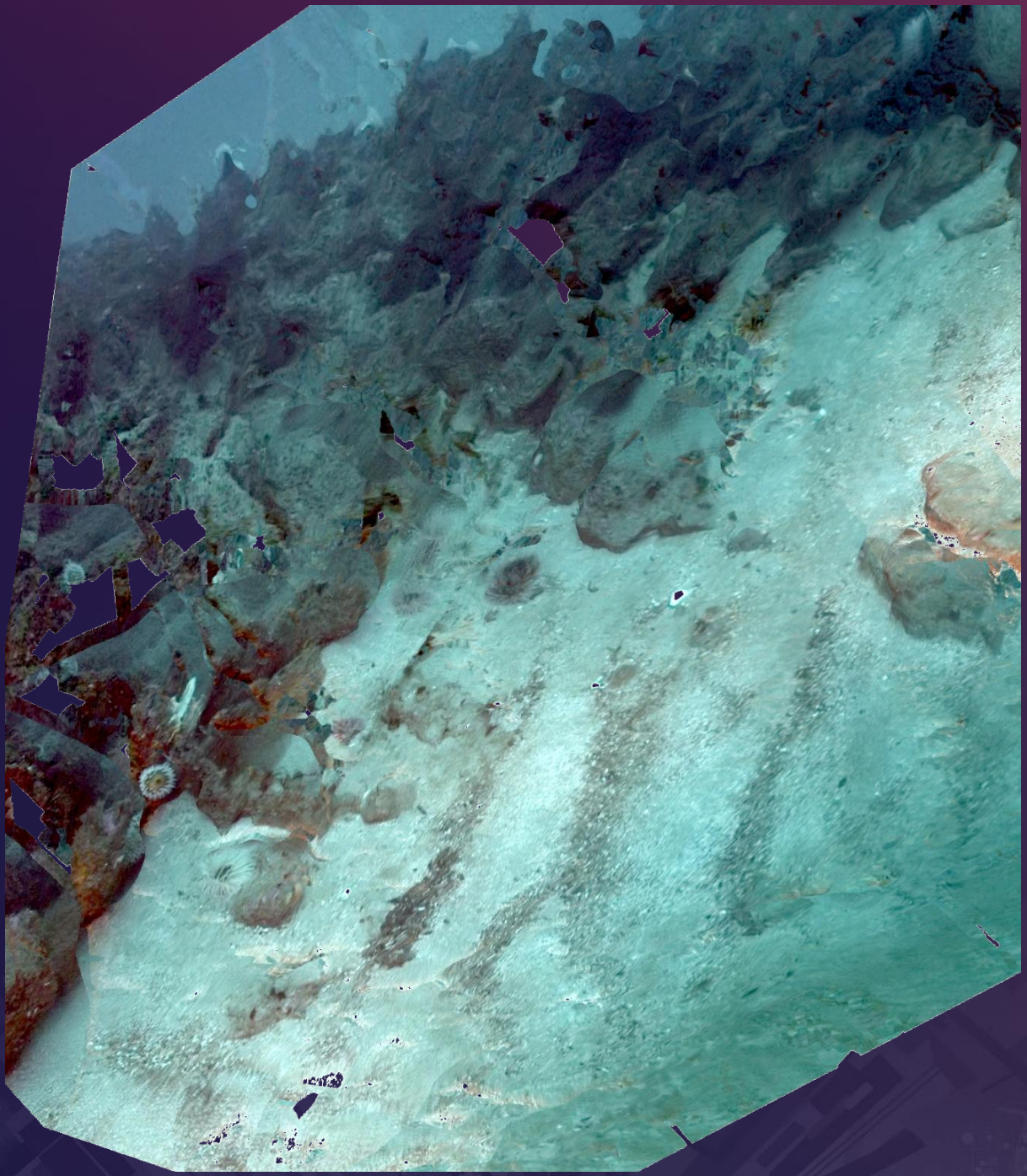
Seafloor Image from ROV Video

2D Image

100 meters long
1’30” video clip

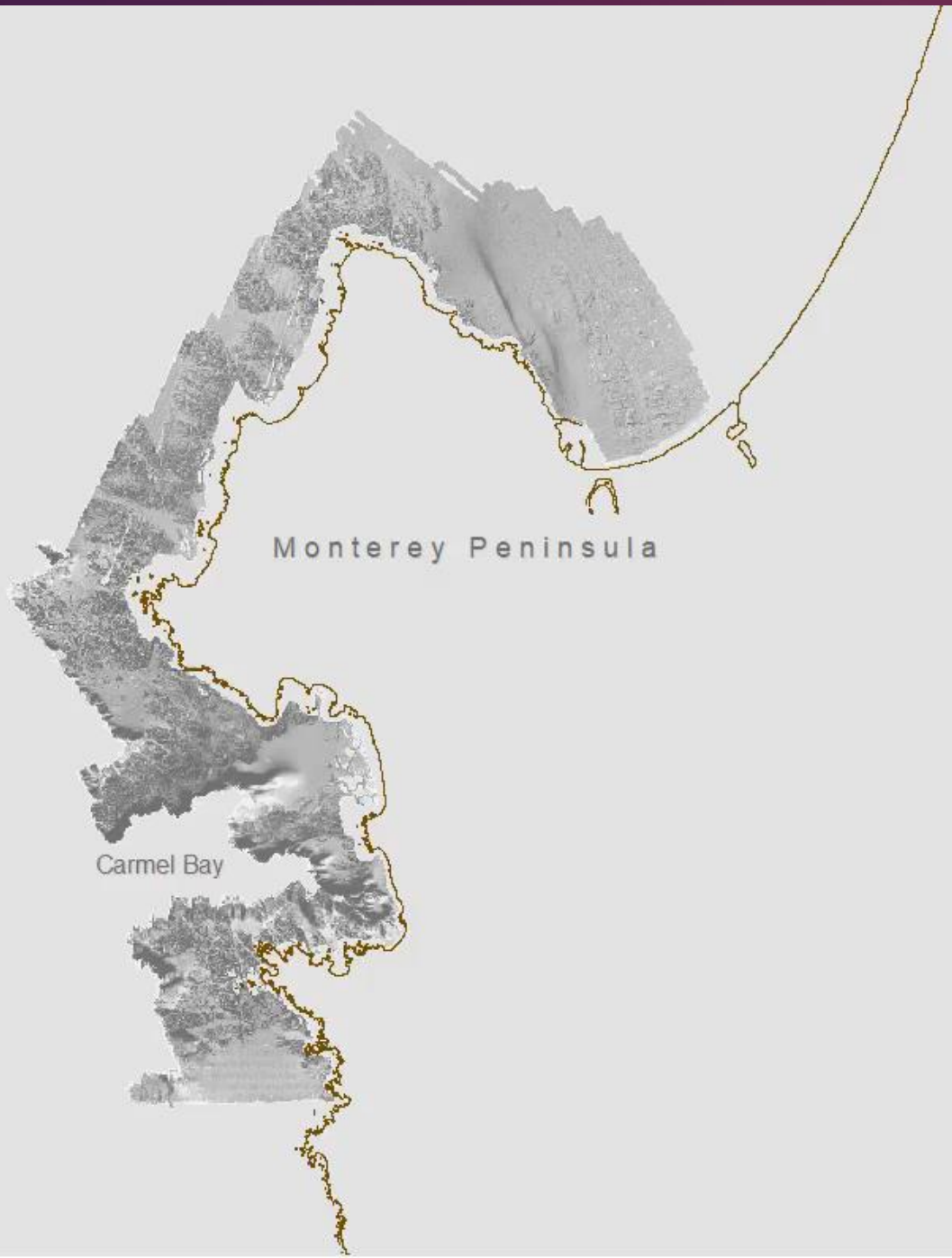


Location: Carmel Bay, CA
Depth: 35 ~ 37 meters
Condition: Good visibility
Lots of light



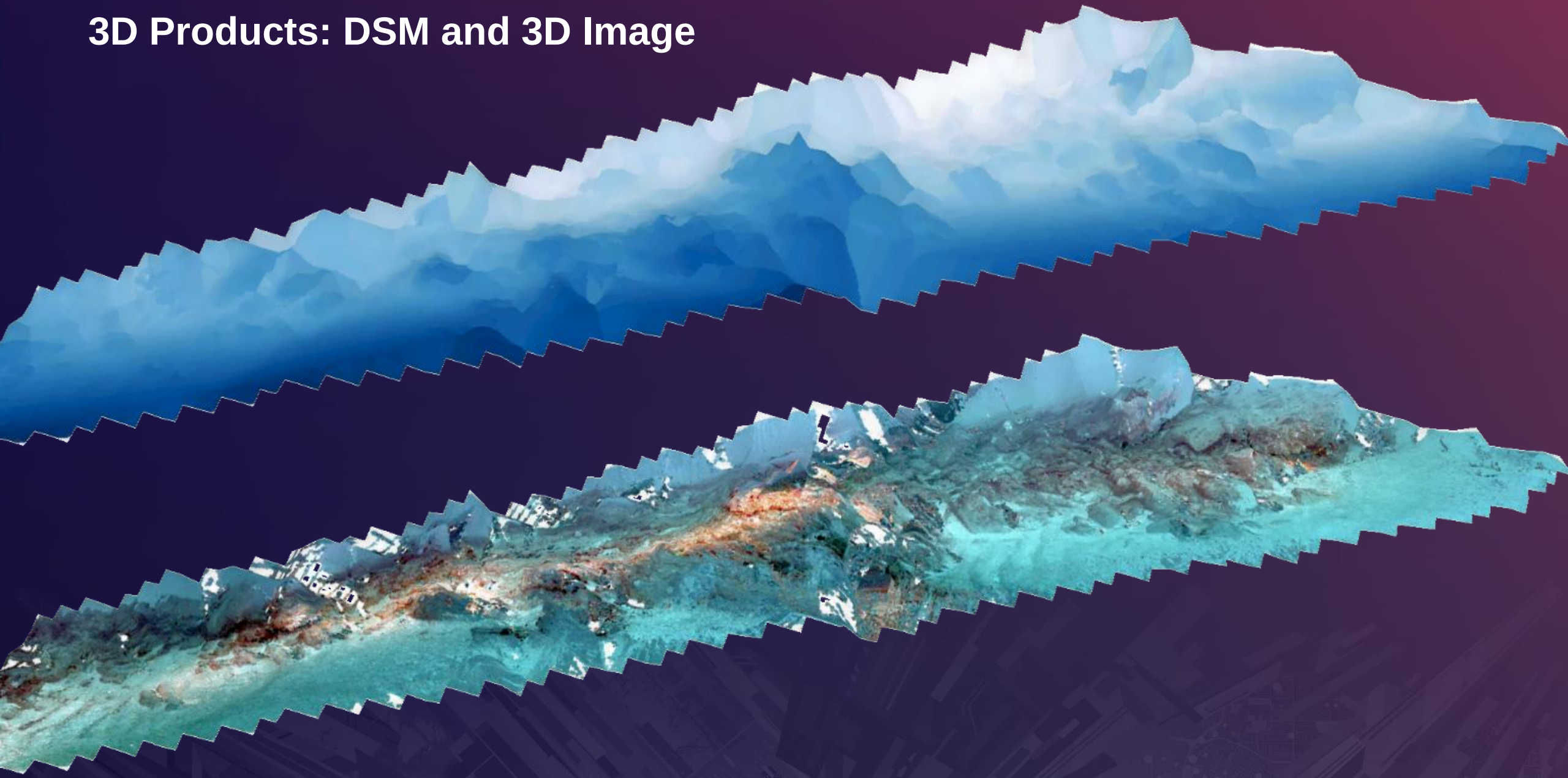
Demo: Video & Image

ArcMap with Full Motion Video Tool



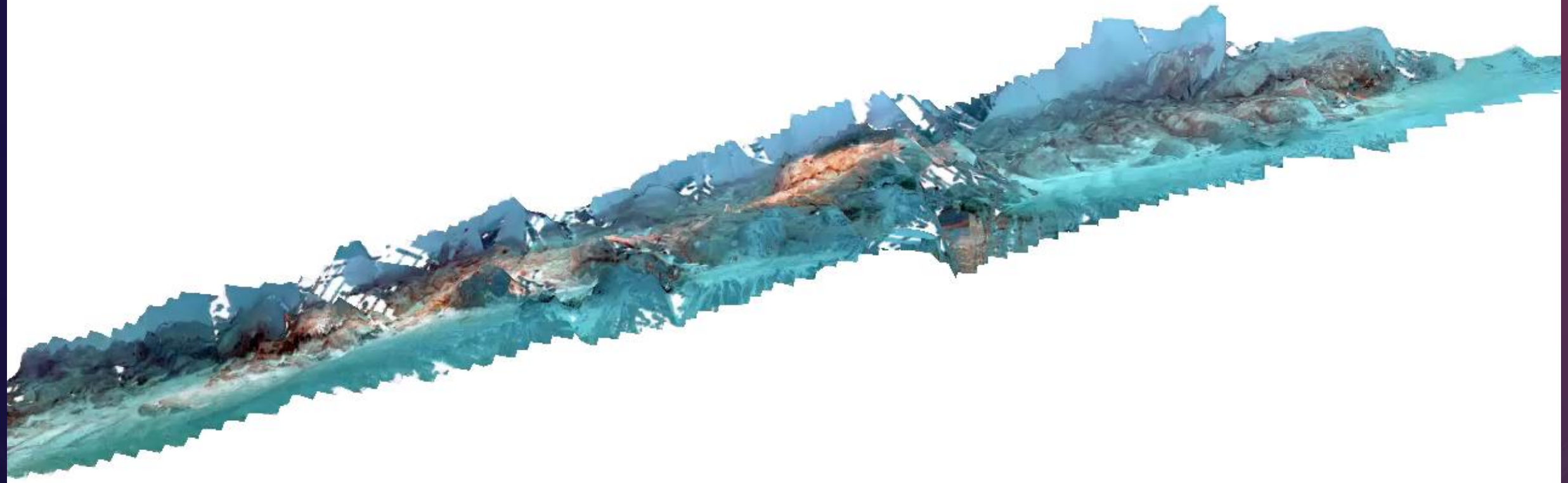
ArcMap with FMV

3D Products: DSM and 3D Image



Seafloor Animation

Created using ArcGIS Pro



Notes from the trials…

During the mapping survey, the ROV should…

- ✓ Never stop

Suggested Ocean Conditions and Video Display

- ✓ Lighter environment is better
- ✓ No kelp
- ✓ No “On Screen Display” in the view
- ✓ No laser dots in the view

Acknowledgement

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Thank you

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