

# Using GeoVRML for 3D Oceanographic Data Visualizations

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# Overview

## *Update of paper presented at Web3D 2002 Symposium in Tempe, AZ*

- More general implementation using GeoVRML
  - *Works for all dive areas*
  - *Full test of most all GeoVRML nodes, including a few new ones*
- System is in production - over 3,000 dives in database
- User evaluation



# MBARI



## *Monterey Bay Aquarium Research Institute*

- Private non-profit oceanographic research institution
- Located in Moss Landing, CA
- 200+ employees
- 3 Ships, 3 underwater robots
- Acquire a lot of data

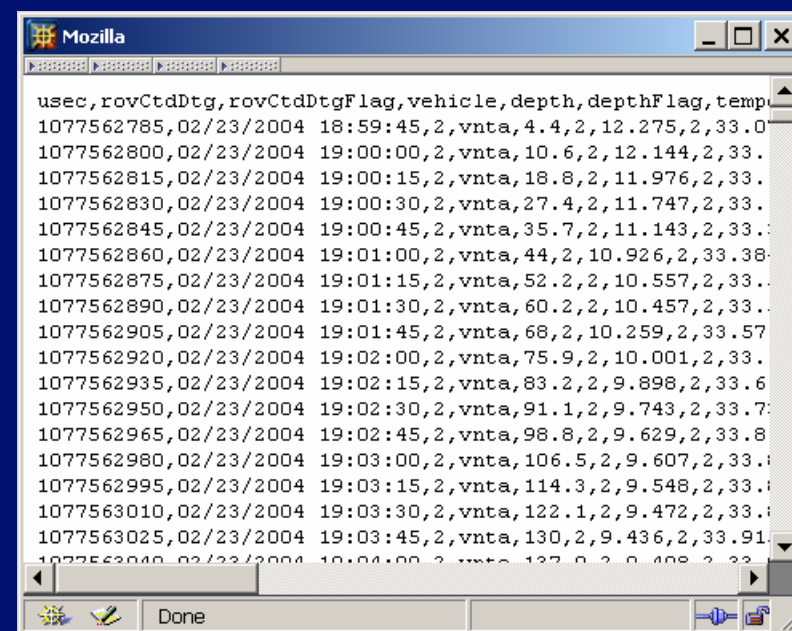


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# Data Archives

## *15 year database of daily explorations*

- Vehicle navigation (Ship & ROV)
- Bathymetric maps (Terrain)
- Environmental data (CTD)
- Video still images
- Video annotations
- Sample archive database
- ...new sensors

A screenshot of a Mozilla browser window displaying a list of data records. The records are organized in a table with columns for time, vehicle, depth, and temperature. The data is as follows:

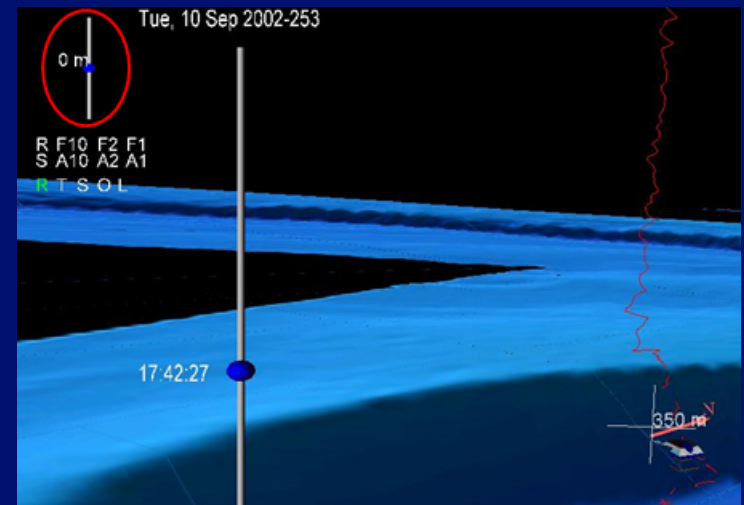
usec	rovCtdDtg	rovCtdDtgFlag	vehicle	depth	depthFlag	temp
1077562785	02/23/2004	18:59:45,2	vnta,4.4,2	12.275,2	33.0	
1077562800	02/23/2004	19:00:00,2	vnta,10.6,2	12.144,2	33.	
1077562815	02/23/2004	19:00:15,2	vnta,18.8,2	11.976,2	33.	
1077562830	02/23/2004	19:00:30,2	vnta,27.4,2	11.747,2	33.	
1077562845	02/23/2004	19:00:45,2	vnta,35.7,2	11.143,2	33.	
1077562860	02/23/2004	19:01:00,2	vnta,44,2	10.926,2	33.38	
1077562875	02/23/2004	19:01:15,2	vnta,52.2,2	10.557,2	33.	
1077562890	02/23/2004	19:01:30,2	vnta,60.2,2	10.457,2	33.	
1077562905	02/23/2004	19:01:45,2	vnta,68,2	10.259,2	33.57	
1077562920	02/23/2004	19:02:00,2	vnta,75.9,2	10.001,2	33.	
1077562935	02/23/2004	19:02:15,2	vnta,83.2,2	9.898,2	33.6	
1077562950	02/23/2004	19:02:30,2	vnta,91.1,2	9.743,2	33.7	
1077562965	02/23/2004	19:02:45,2	vnta,98.8,2	9.629,2	33.8	
1077562980	02/23/2004	19:03:00,2	vnta,106.5,2	9.607,2	33.	
1077562995	02/23/2004	19:03:15,2	vnta,114.3,2	9.548,2	33.	
1077563010	02/23/2004	19:03:30,2	vnta,122.1,2	9.472,2	33.	
1077563025	02/23/2004	19:03:45,2	vnta,130,2	9.436,2	33.91	
1077563040	02/23/2004	19:04:00,2	vnta,137.8,2	9.408,2	33.	



# GeoTransform node

*Needed in 3D Replay to translate GeoCoordinate geometry normal to the ellipsoid*

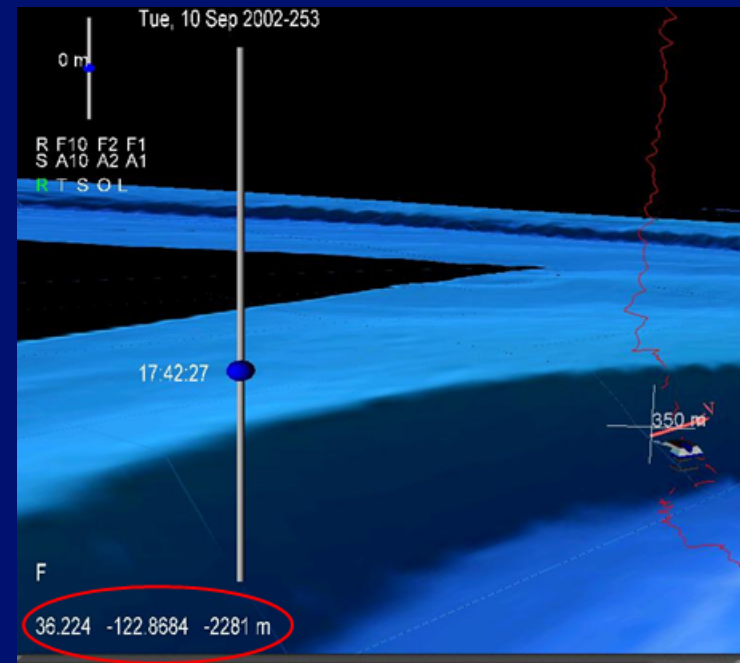
- Use like VRML97 Transform
- Lets us see dive data that may be obscured by terrain model
- Example in GeoVRML 1.1 installer



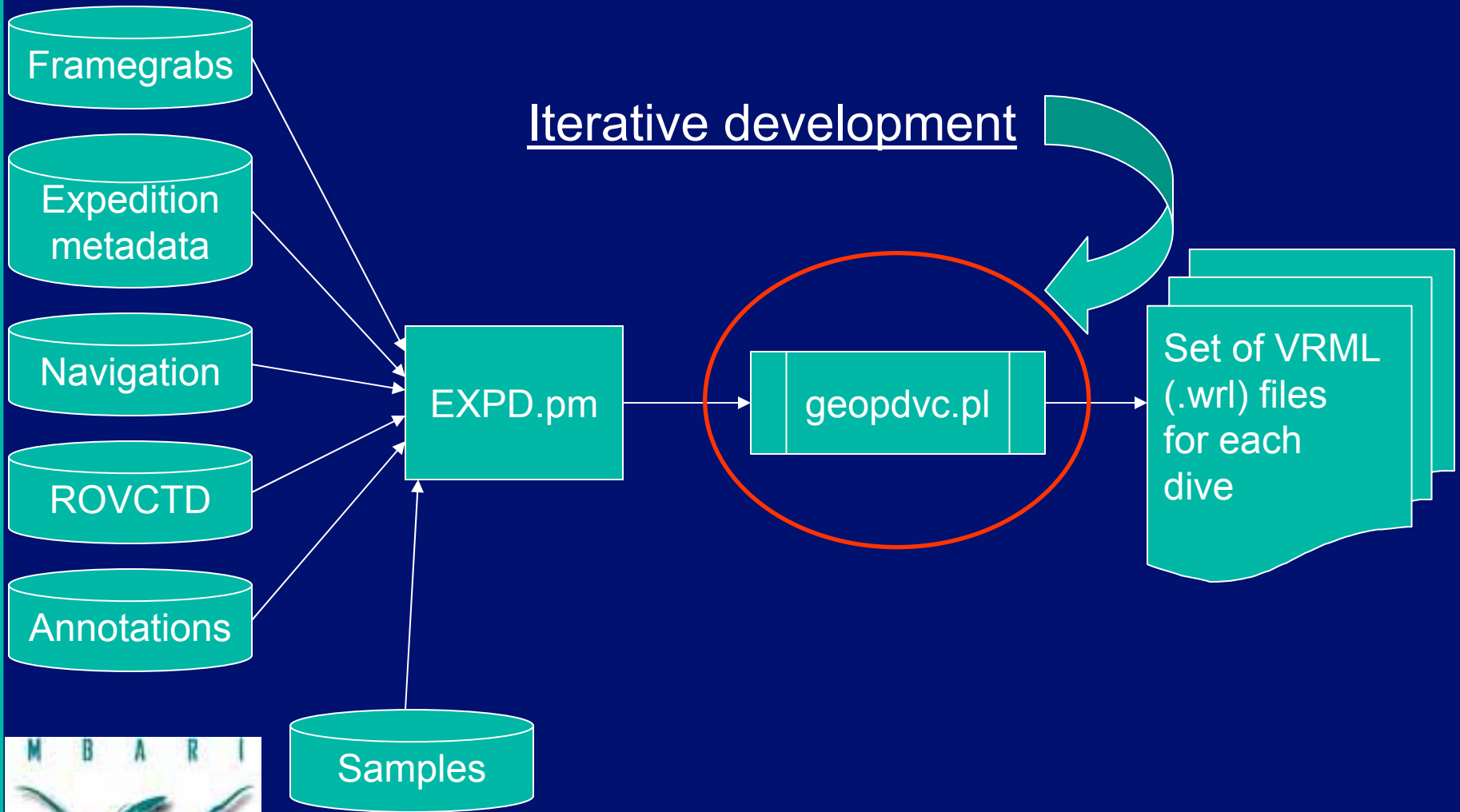
# GeoProximitySensor node

*Needed in 3D Replay to give user feedback on geographic position of viewpoint*

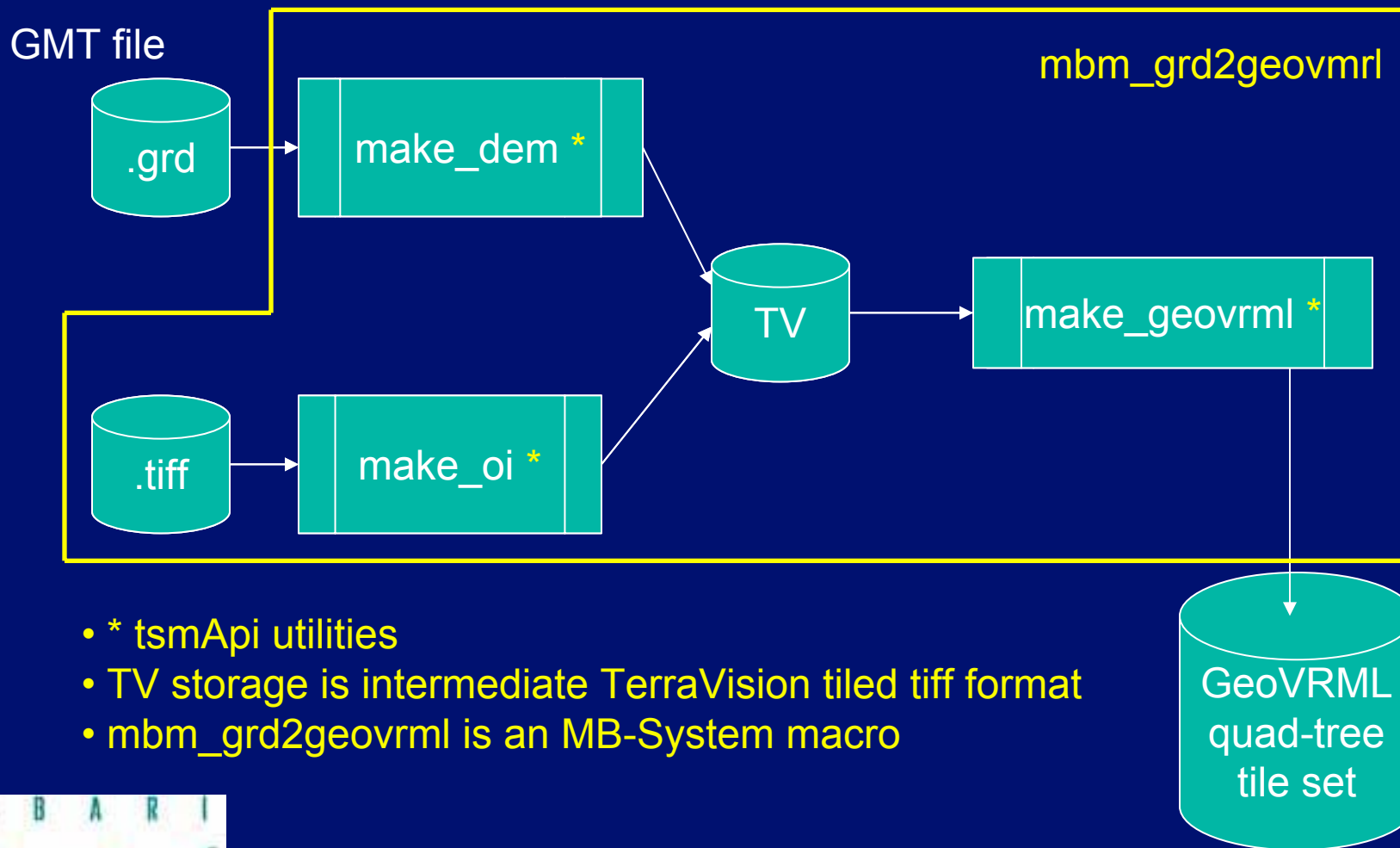
- Use like VRML97 ProximitySensor
- Position displayed in HUD
- Example in GeoVRML 1.1 installer



# ROV Dive Data Flow



# Terrain Data Flow

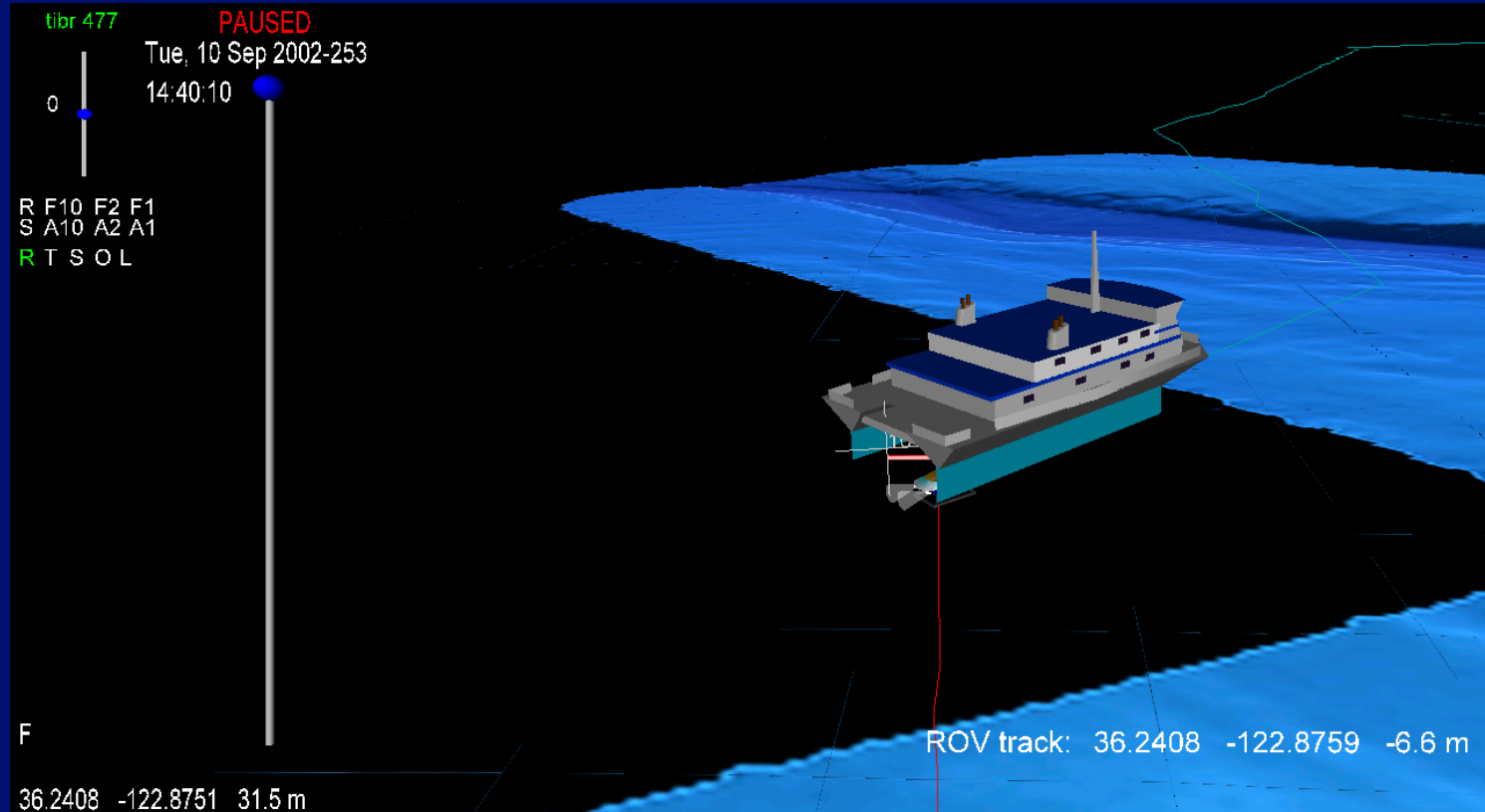


- \* tsmApi utilities
- TV storage is intermediate TerraVision tiled tiff format
- mbm\_grd2geovrml is an MB-System macro



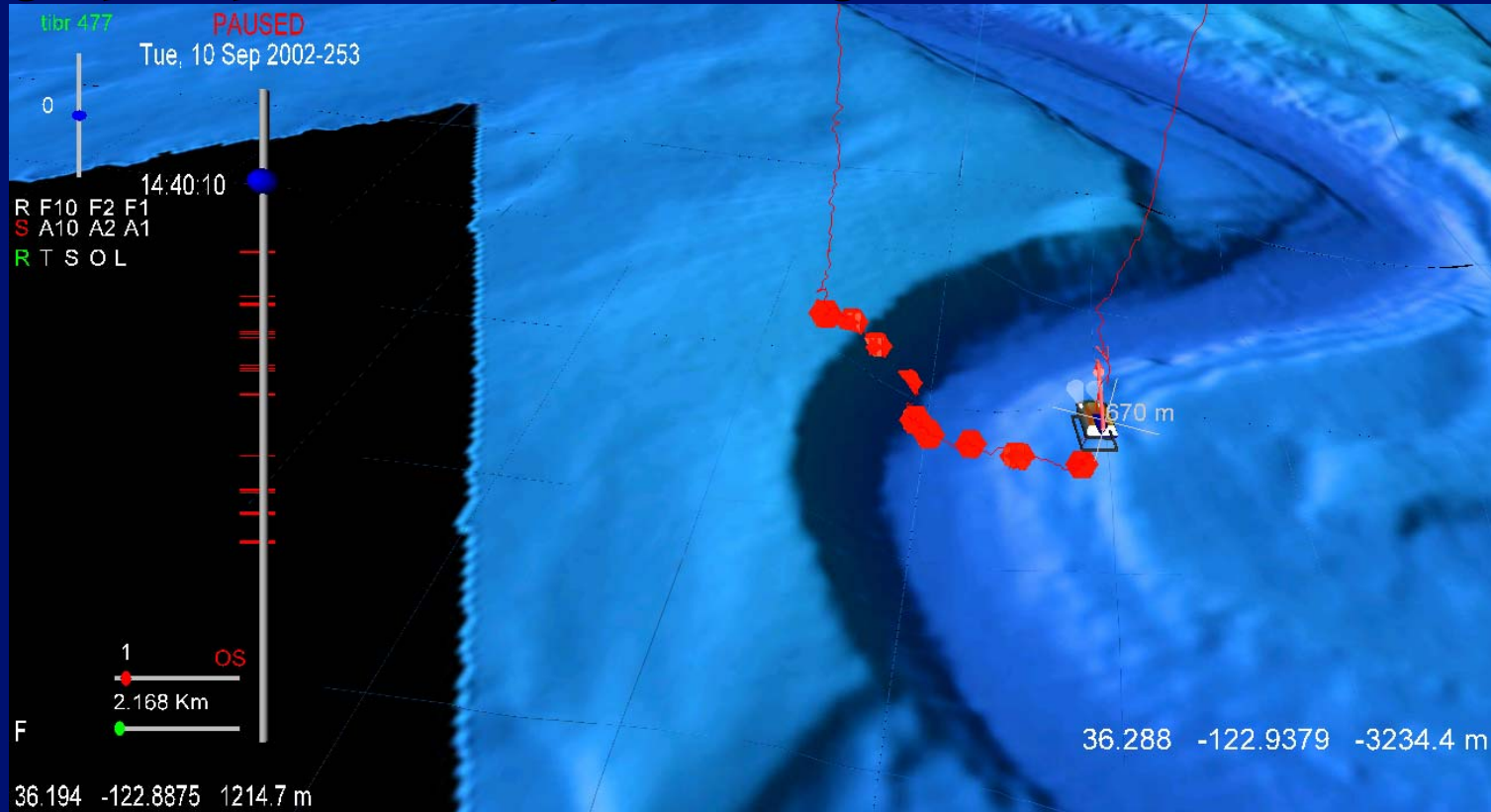
# GeoPowerDivePlayback node

## *HUD controls to Interpolator and Load Controls*



# GeoIconImage node

## Geographic placement of icon/image



# Expedition Database query



MBARI Expeditions - Netscape

Advanced Search of Expedition Database

Enter any parameters and use [keyword search](#)

Join fields below with:  AND  OR

ShipName

DiveNumber

Date Choices

Start Date First of

Purpose

Site/Track

Accomplishments

Operator Comments

Scientist Comments

Return results as  cruise report list  table

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MBARI Expeditions - Netscape

Results of Expedition Search

Scroll through cruises and find associated images and data  
Submit or edit postcruise button

Displaying 6 expeditions in table

Date	Expedition Report	3D Replay <sup>0</sup>	A
3/13/01	Bruce Robison	<input checked="" type="checkbox"/> <a href="#">tibr261</a>	278 dive
		<input checked="" type="checkbox"/> <a href="#">tibr262</a>	338 dive
	<a href="#">wfly2001072-2001087</a>	<input checked="" type="checkbox"/> <a href="#">tibr263</a>	176 dive
	Completed	<input checked="" type="checkbox"/> <a href="#">tibr268</a>	153 dive
	Edit Dives:	<input checked="" type="checkbox"/> <a href="#">tibr269</a>	153 dive
	<a href="#">tibr261</a>	<input checked="" type="checkbox"/> <a href="#">tibr270</a>	754 dive
	<a href="#">tibr262</a>	<input checked="" type="checkbox"/> <a href="#">tibr271</a>	110 dive
	<a href="#">tibr263</a>	<a href="#">View these 7 dives</a>	455
	<a href="#">tibr264</a>		

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MBARI 3D Replay - Netscape

Construct 3D Replay

Make selections and generate 3D view or files for transfer to your PC

[tibr301 log file](#)     [tibr302 log file](#)

<input type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>	<input type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>	<input checked="" type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>	<input type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>	<input type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>	<input type="radio"/> <a href="#">tibr301</a> <a href="#">tibr302</a>
<input type="radio"/> KohalaA_bath 30 m x 32 m	<input type="radio"/> KohalaA_ssdtl 30 m x 32 m	<input checked="" type="radio"/> KohalaB_bath 20 m x 21 m	<input type="radio"/> KohalaB_ssdtl 20 m x 21 m	<input type="radio"/> NEP_Hawaii_bath 1730 m x 1853 m	<input type="radio"/> No terrain

View in your browser     Generate files for running from another web server:

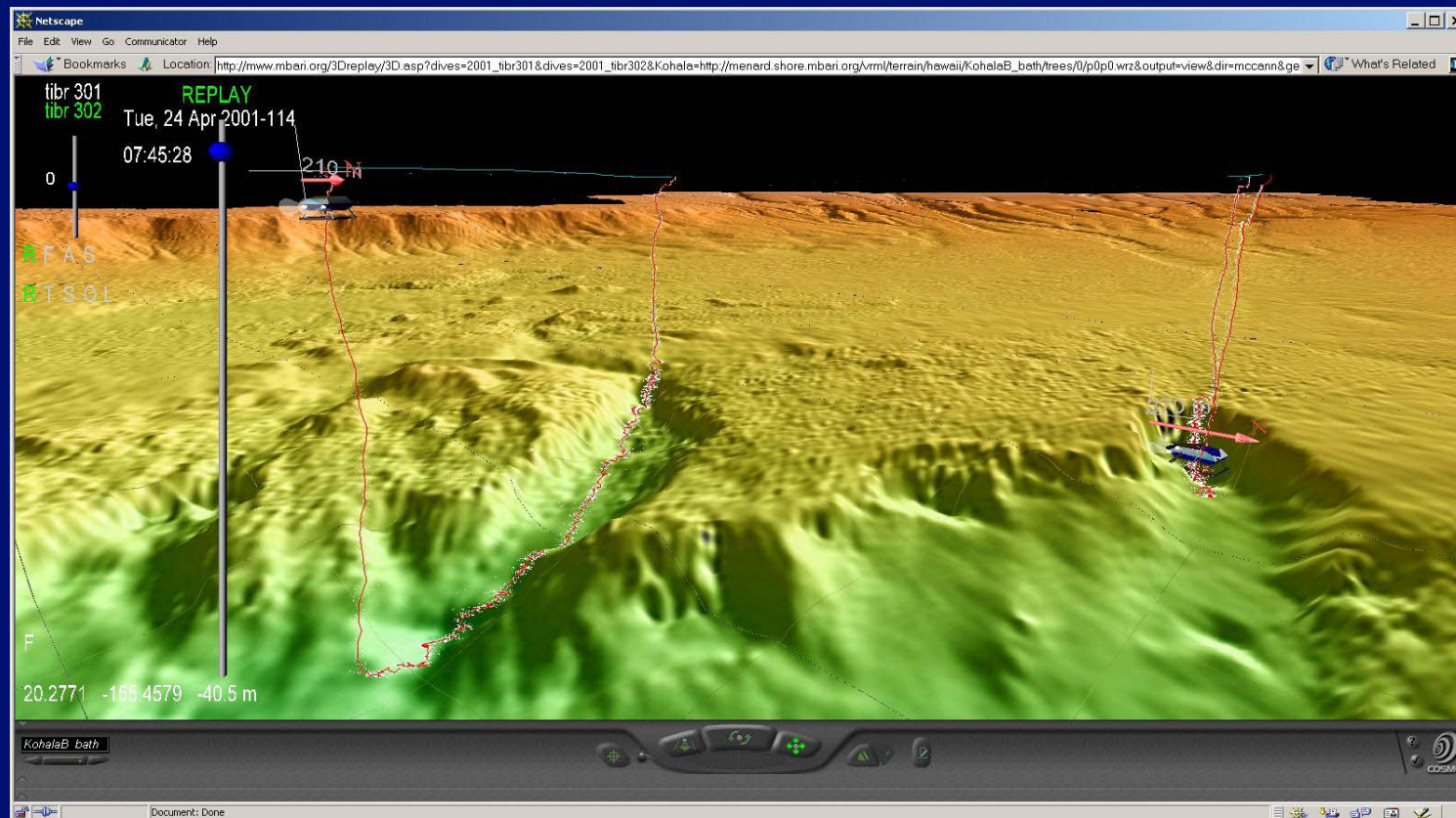
Screen width =     Create files to run on http://

in \\tempest\tempbox\3Dreplay

- Netscape 4.7 recommended, please check software Requirements link below



# 3D Replay Data Visualization



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# Evaluation

*System has been in production for 18 months*

- Over 200 uses
- 3D navigation is difficult for novice users
- Excitement at MBARI following a project update
  - *deployed on R/V Western Flyer*
  - *mixed results for operational use*
- Users suggestions for improvement
  - *A video inset window*
  - *retuning of terrain tiling to take advantage of faster GPUs*



# Conclusion

## *GeoVRML solves real problems*

- GeoTransform and GeoProximitySensor should be added to the spec
- 3D navigation on the desktop needs attention
- Look forward to results from the GeoSpatial working group

