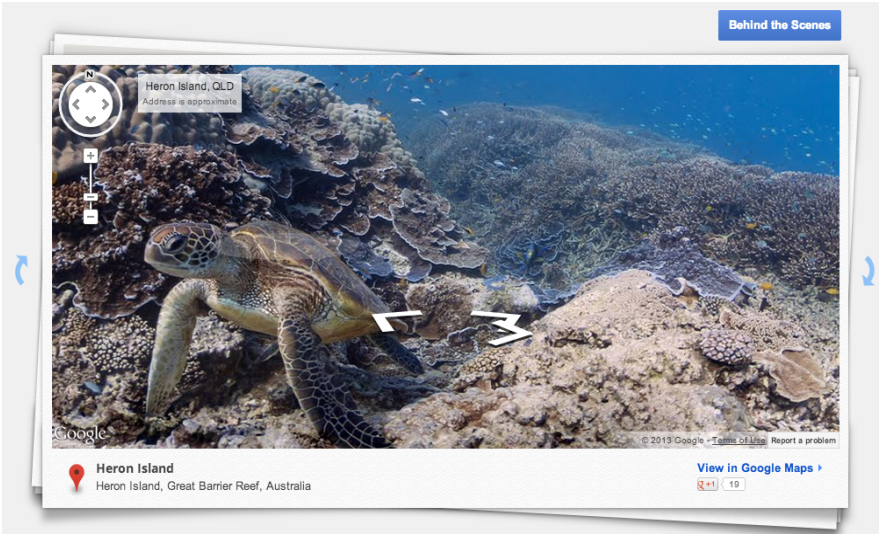


Oceans
Challenges and Opportunities

Google Ocean

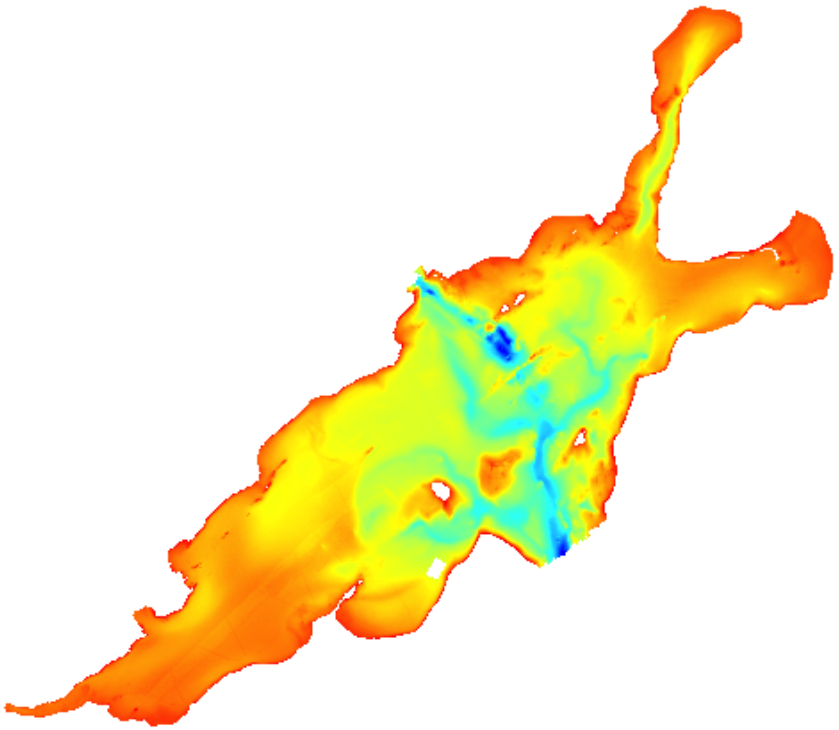
Maio, Portugal

Kurt Schwehr

http://earth.google.com/ocean

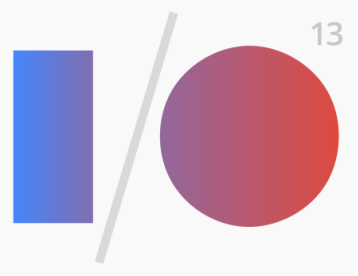
http://maps.google.com/ocean

http://schwehr.org/blog



More at Google I/O 2013

http://schwehr.org/blog



Quantum GIS 1.7.3-Wroclaw

File Edit View Layer Settings Plugins Vector Raster Help

Layers

- F00574_MB_2m_MLLW_2of3
- mllw-2960-crop-resample
- mllw-2960-crop
- mllw-2960

Value Tool

Active (Shift+A) Graph

	Layer	Value
1	F00574_MB_2m_MLLW_2of3 Band 1	null (no data)
2	F00574_MB_2m_MLLW_2of3 Band 2	1e+06
3	mllw-2960-crop-resample	-1.44251

Profile

Profile Statistics Setup About

-1.4424
-1.4425
-1.4426
-1.4427
-1.4428
-1.4429
-1.443
-1.4431

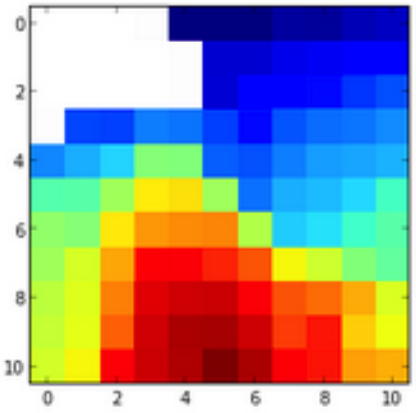
0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000

mllw-2960-crop-resample

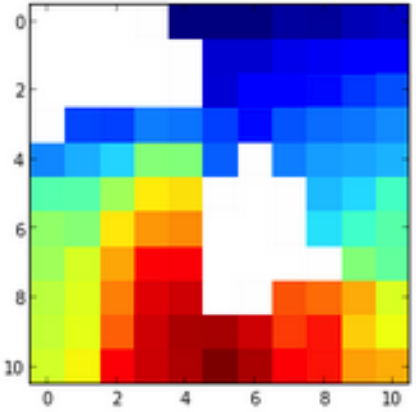
Print Save as PDF Save as SVG Close

IPython Notebooks

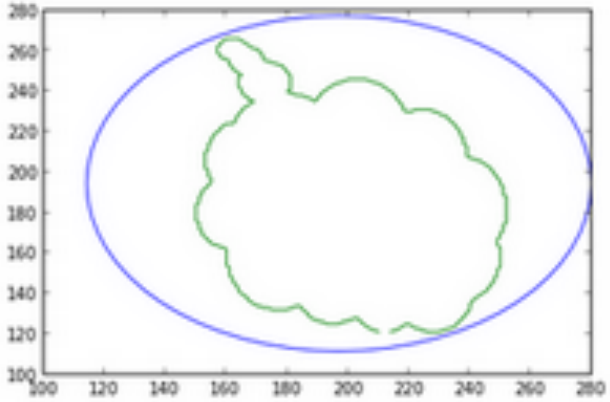
```
In [13]: f1 = FillWithAveNeighbors(data_nd, labels, 2)

In [15]: np.set_printoptions(linewidth=180)

In [18]: imshow(f1, interpolation='none')

Out[18]: (<matplotlib.image.AxesImage at 0x3ec6350>,
          <matplotlib.image.AxesImage at 0x3ec6610>)
```



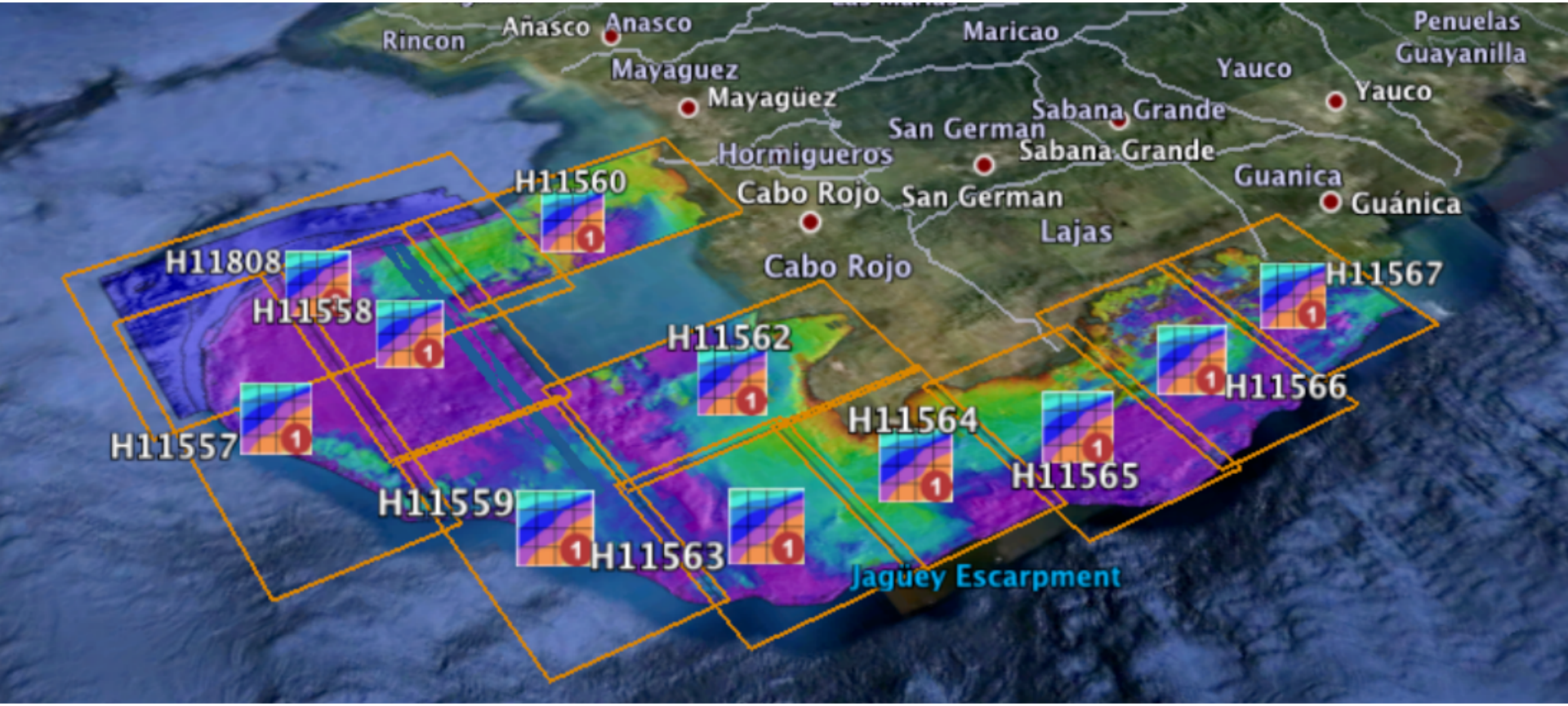

```
In [19]: imshow(data_nd, interpolation='none')

Out[19]: <matplotlib.image.AxesImage at 0x41b9f10>
```



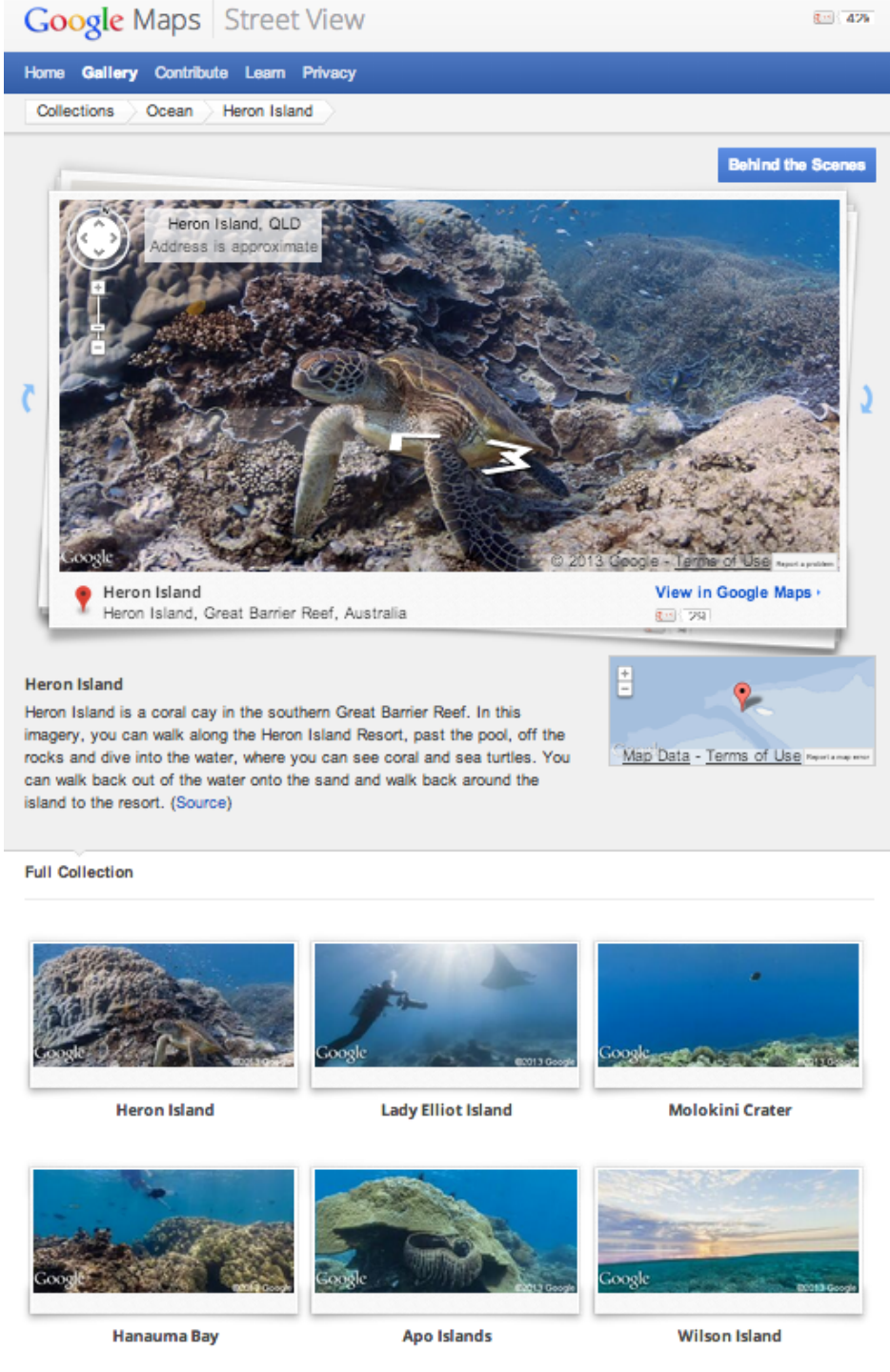

```
In [97]: (c_x, c_y), radius = cv2.minEnclosingCircle(cnt)
         c_x, c_y, radius # (197.0, 194.5, 82.92139434814453)
         center = shapely.geometry.Point(c_x, c_y)
         circle = np.array(center.buffer(radius).boundary.coords)
         len(circle) # 66 points
         plot(circle[:,0], circle[:,1])
         plot(x,y)

Out[97]: [<matplotlib.lines.Line2D at 0x7ba81d0>]
```



GDAL + Python --> Google Earth

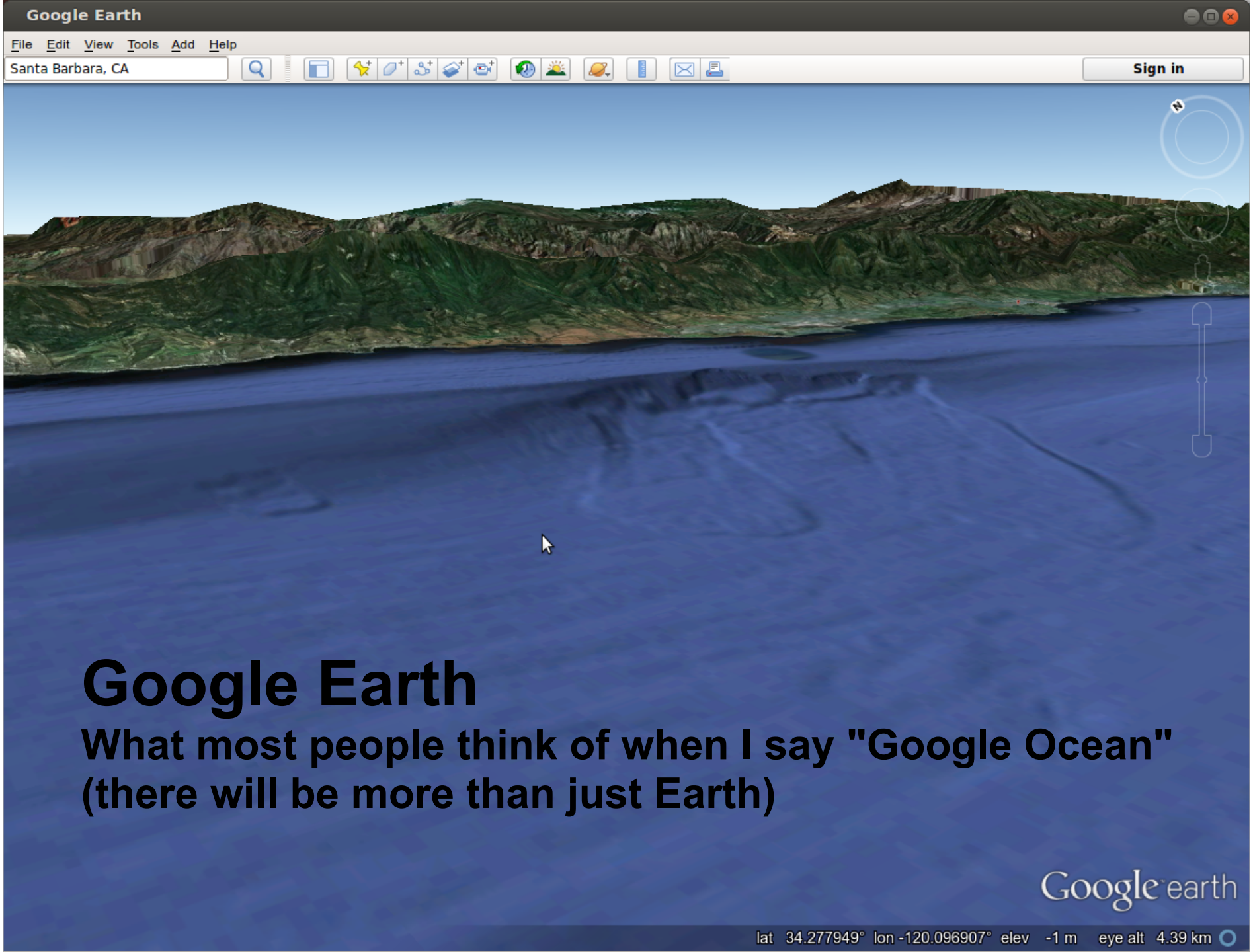


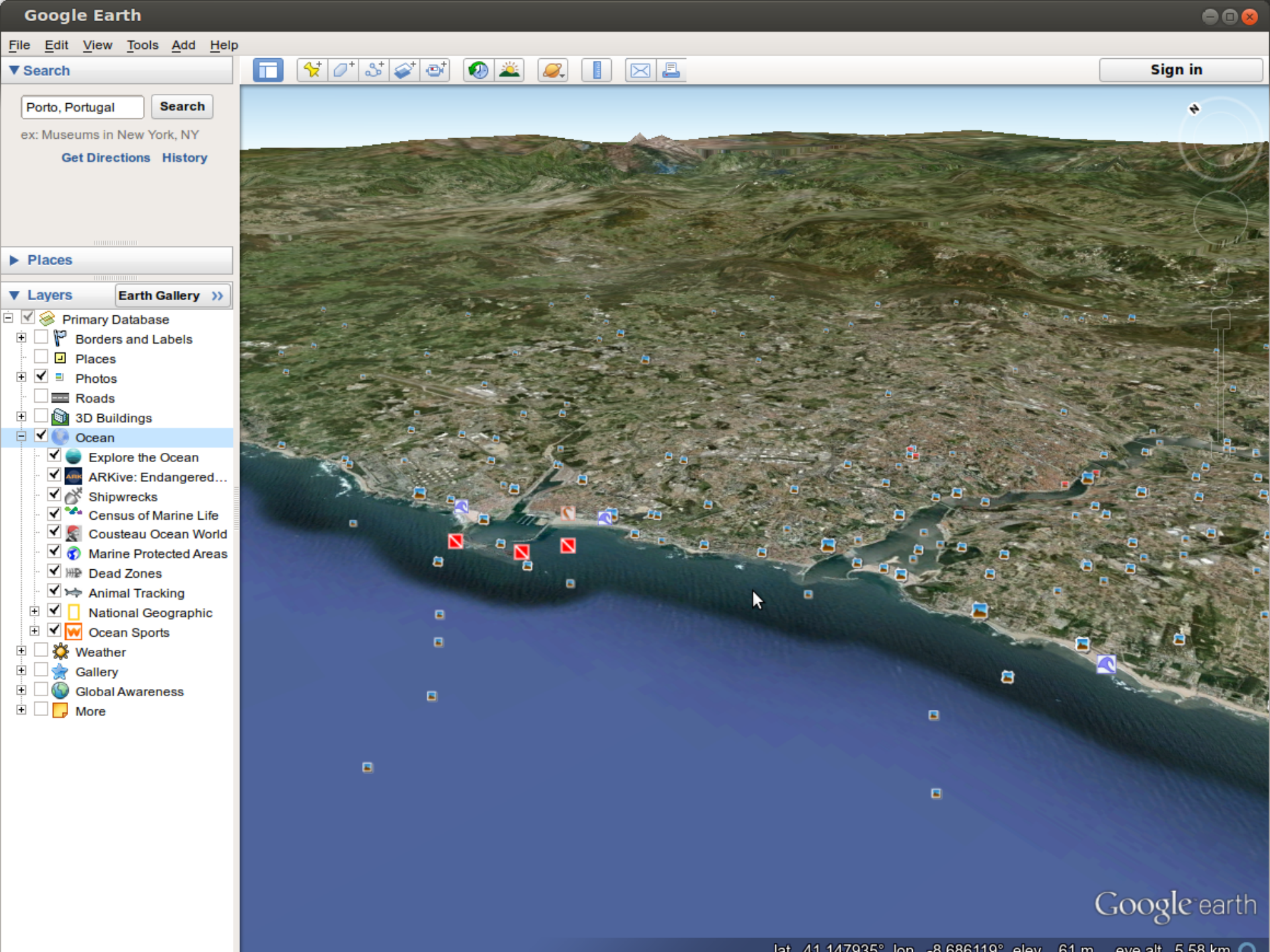
http://maps.google.com/ocean



The oceans are strange places

Google tools can help to manage and explore ocean data.


Google Earth
File Edit View Tools Add Help
Santa Barbara, CA
Sign in
Google Earth
What most people think of when I say "Google Ocean"
(there will be more than just Earth)
Google earth
lat 34.277949° lon -120.096907° elev -1 m eye alt 4.39 km


Google Earth
File Edit View Tools Add Help
Search
Porto, Portugal
Search
ex: Museums in New York, NY
Get Directions History
Places
Layers
Earth Gallery
Primary Database
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Explore the Ocean
ARKive: Endangered...
Shipwrecks
Census of Marine Life
Cousteau Ocean World
Marine Protected Areas
Dead Zones
Animal Tracking
National Geographic
Ocean Sports
Weather
Gallery
Global Awareness
More
Sign in
Google earth

Google Earth

File Edit View Tools Add Help

Search

Porto, Portugal Search

ex: Museums in New York, NY

Get Directions History

Places

Layers Earth Gallery

- Primary Database
  - Borders and Labels
  - Places
  - Photos
    - Panoramio
    - 360 Cities
  - Roads
  - 3D Buildings
  - Ocean
    - Explore the Ocean
    - ARKive: Endangered...
    - Shipwrecks
    - Census of Marine Life
    - Cousteau Ocean World
    - Marine Protected Areas
    - Dead Zones
    - Animal Tracking
    - National Geographic
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  - Weather
  - Gallery
  - Global Awareness
  - More

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Europe's Grand Canyon

National Oceanography Centre, Southampton

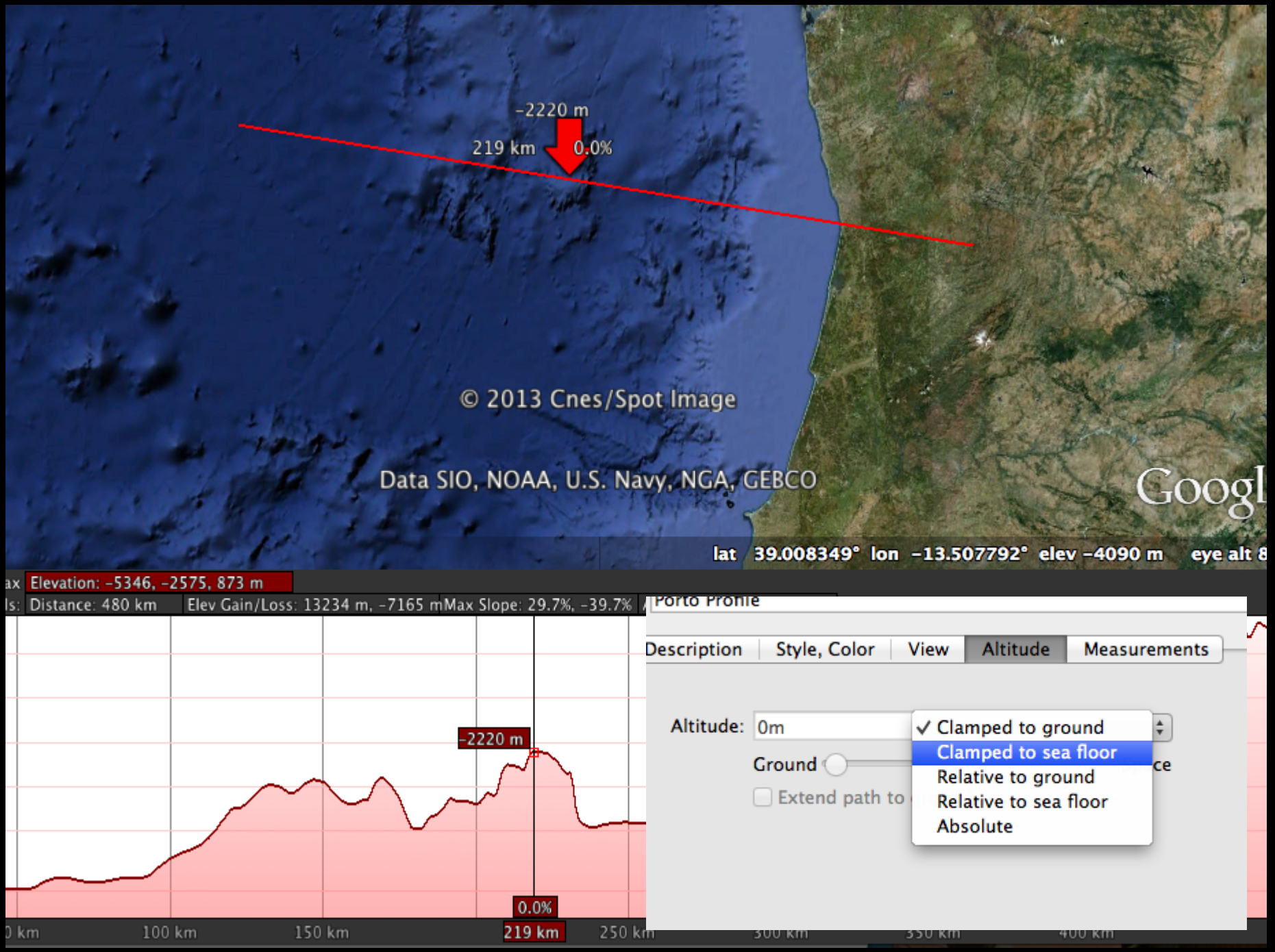
The Nazaré canyon is a simple submarine canyon system that extends 150km from the coast of Portugal to the Iberian Abyssal Plain at >5000 m water depth. Although the canyon head is close to the beach it does not connect with a river, but still acts as a major conduit of sediment because it intersects the continental shelf and captures all along-slope sediment transport. Fauna in the canyon is highly diverse, reflecting a multitude of different habitats

Learn More:
HERMIONE submarine canyon resesarch

Curated by MISSIONBLUE

Google earth

lat 40.198905° lon -8.290660° elev 272 m eye alt 64.55 km


-2220 m
219 km
0.0%
© 2013 Cnes/Spot Image
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Googl
lat 39.008349° lon -13.507792° elev -4090 m
eye alt 8
Elevation: -5346, -2575, 873 m
Distance: 480 km
Elev Gain/Loss: 13234 m, -7165 m
Max Slope: 29.7%, -39.7%
Porto Profile
Description
Style, Color
View
Altitude
Measurements
Altitude:
0m
Clamped to ground
Clamped to sea floor
Relative to ground
Relative to sea floor
Absolute
Ground
Extend path to
-2220 m
0.0%
100 km
150 km
219 km
250 km

GulfofMaine-15.kmz - Goc

https://maps.google.com

+Kurt Search Images Maps Play YouTube News Gmail Drive Calendar More

Google

http://vislab-ccom.unh.edu/~schwehr/GoogleEarth/GulfofMaine-1

Kurt Schwehr 0 + Share

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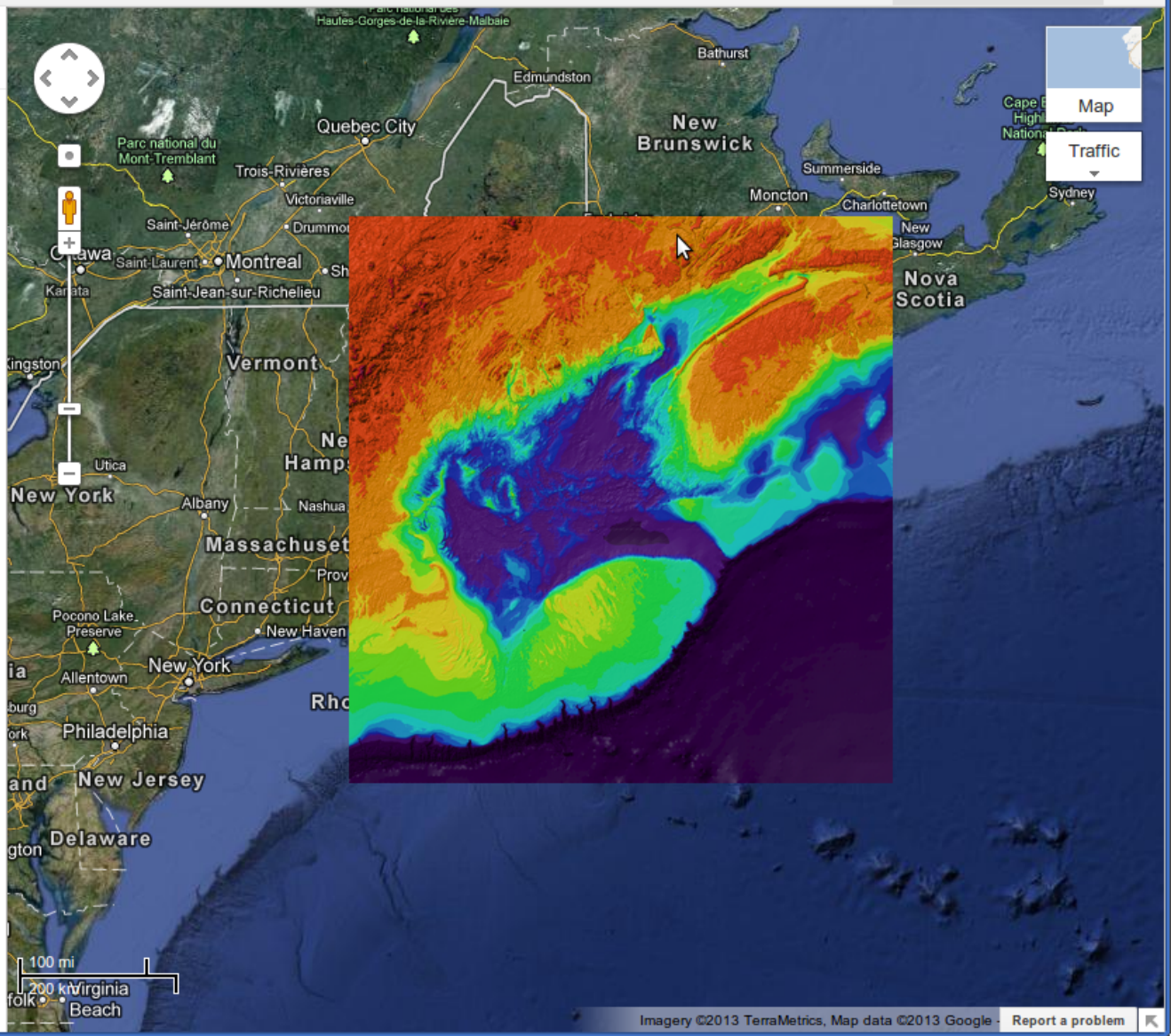
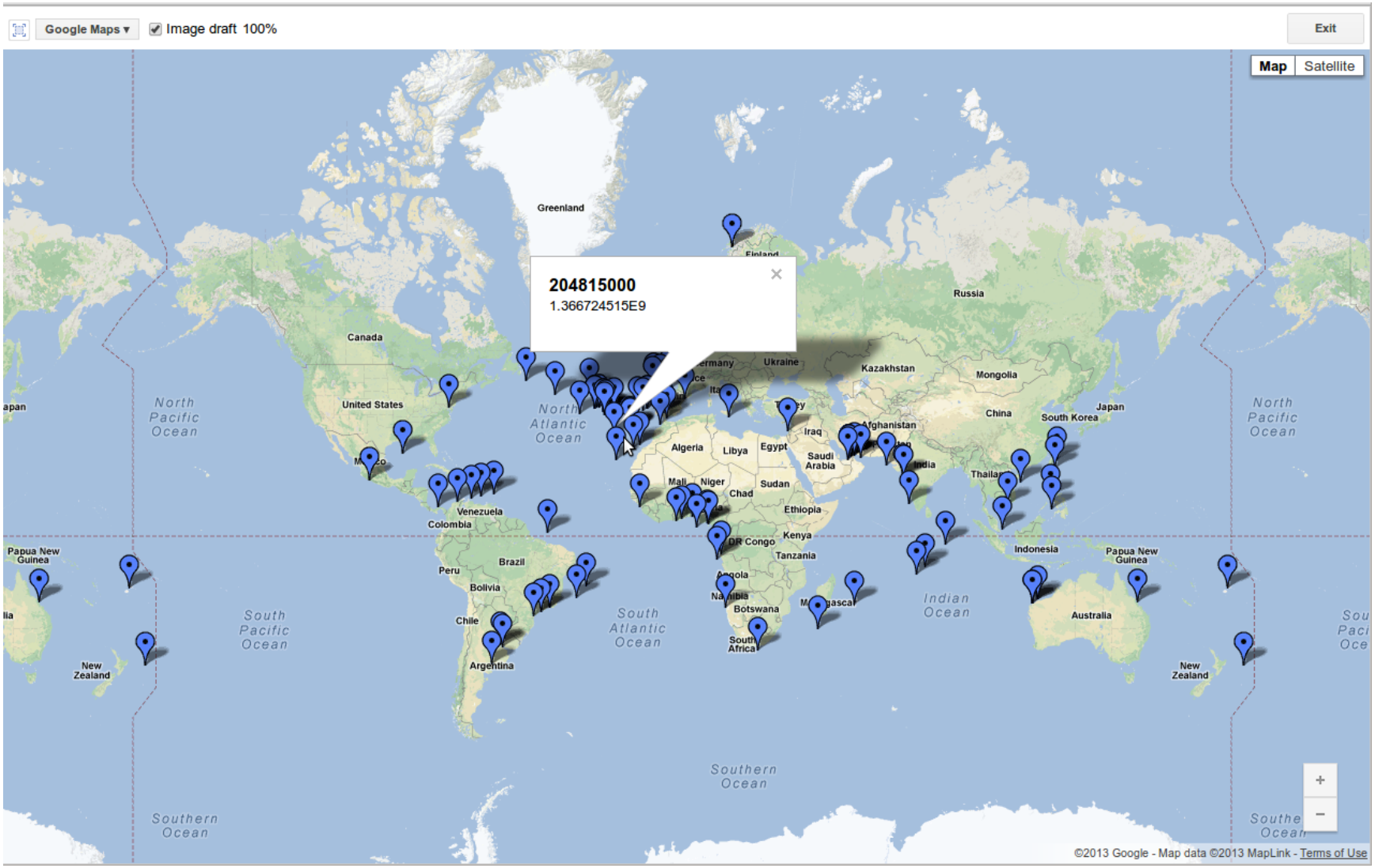
The content displayed below and overlaid onto this map is provided by a third party, and Google is not responsible for it. Information you enter below may become available to the third party.

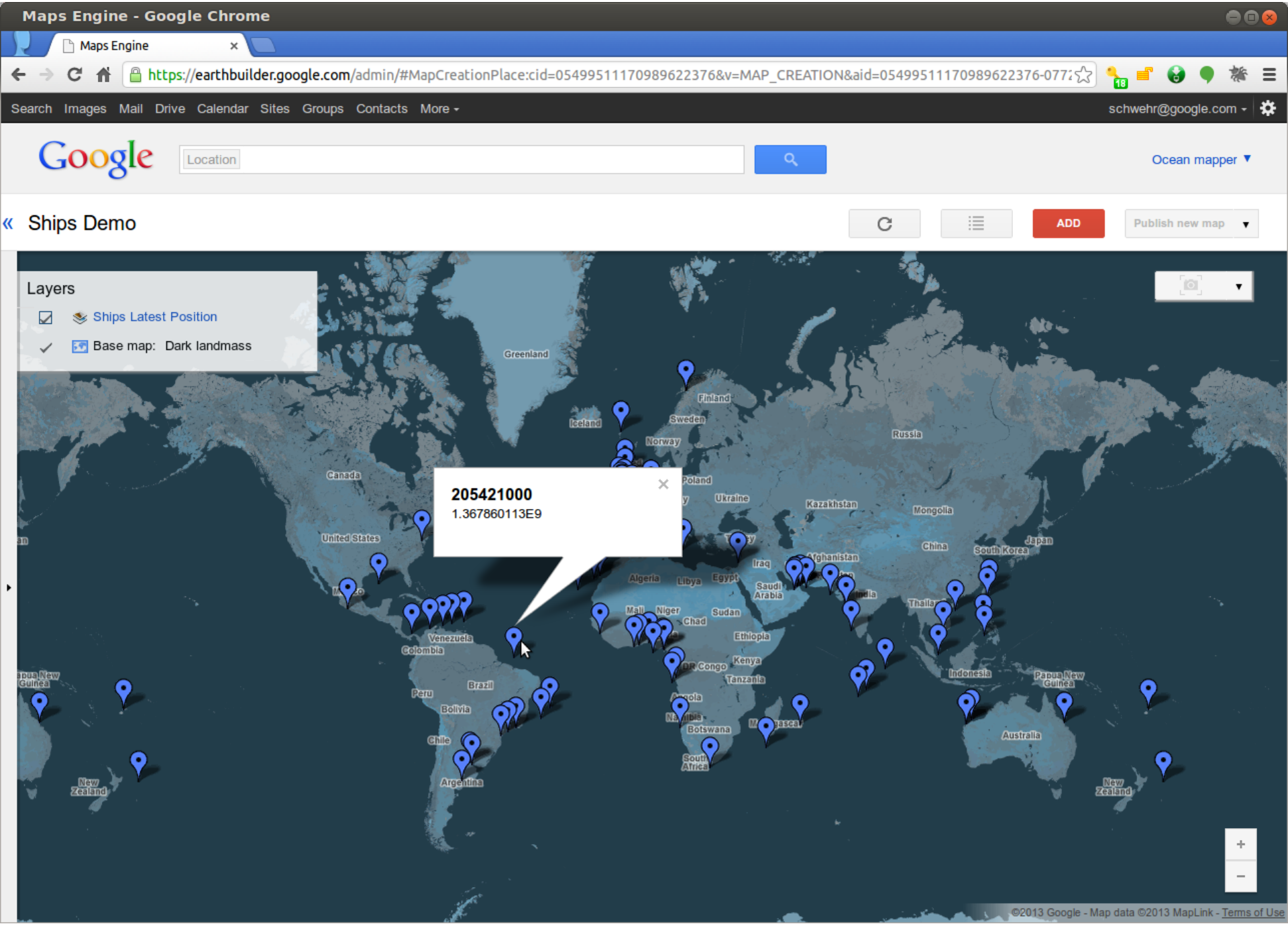
GulfofMaine-15.kmz

- Gulf of Maine Bathymetry
  - Gulf Of Maine bathymetry
    geom15.grd converted to a geotiff with the Fledermaus mapsheet command from: ht
  - Gulf of Maine (gom)



http://mapsengine.google.com




Maps Engine - Google Chrome
Maps Engine
https://earthbuilder.google.com/admin/#MapCreationPlace:cid=05499511170989622376&v=MAP_CREATION&aid=05499511170989622376-077
Search Images Mail Drive Calendar Sites Groups Contacts More
schwehr@google.com
Google
Location
Ocean mapper
Ships Demo
ADD
Publish new map
Layers
Ships Latest Position
Base map: Dark landmass
205421000
1.367860113E9
Greenland
Iceland
Finland
Sweden
Norway
Russia
Canada
Poland
Ukraine
Kazakhstan
Mongolia
China
South Korea
Japan
United States
Iraq
Afghanistan
Algeria
Libya
Egypt
Saudi Arabia
Thailand
Mali
Niger
Chad
Sudan
Ethiopia
Venezuela
Colombia
Kenya
DR Congo
Tanzania
Indonesia
Papua New Guinea
Peru
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Google Earth Engine - Google Chrome

Google Earth Engine

earthengine.google.org/#intro/AralSea

Google

Search anywhere (e.g. "Las Vegas") to see its timelapse...

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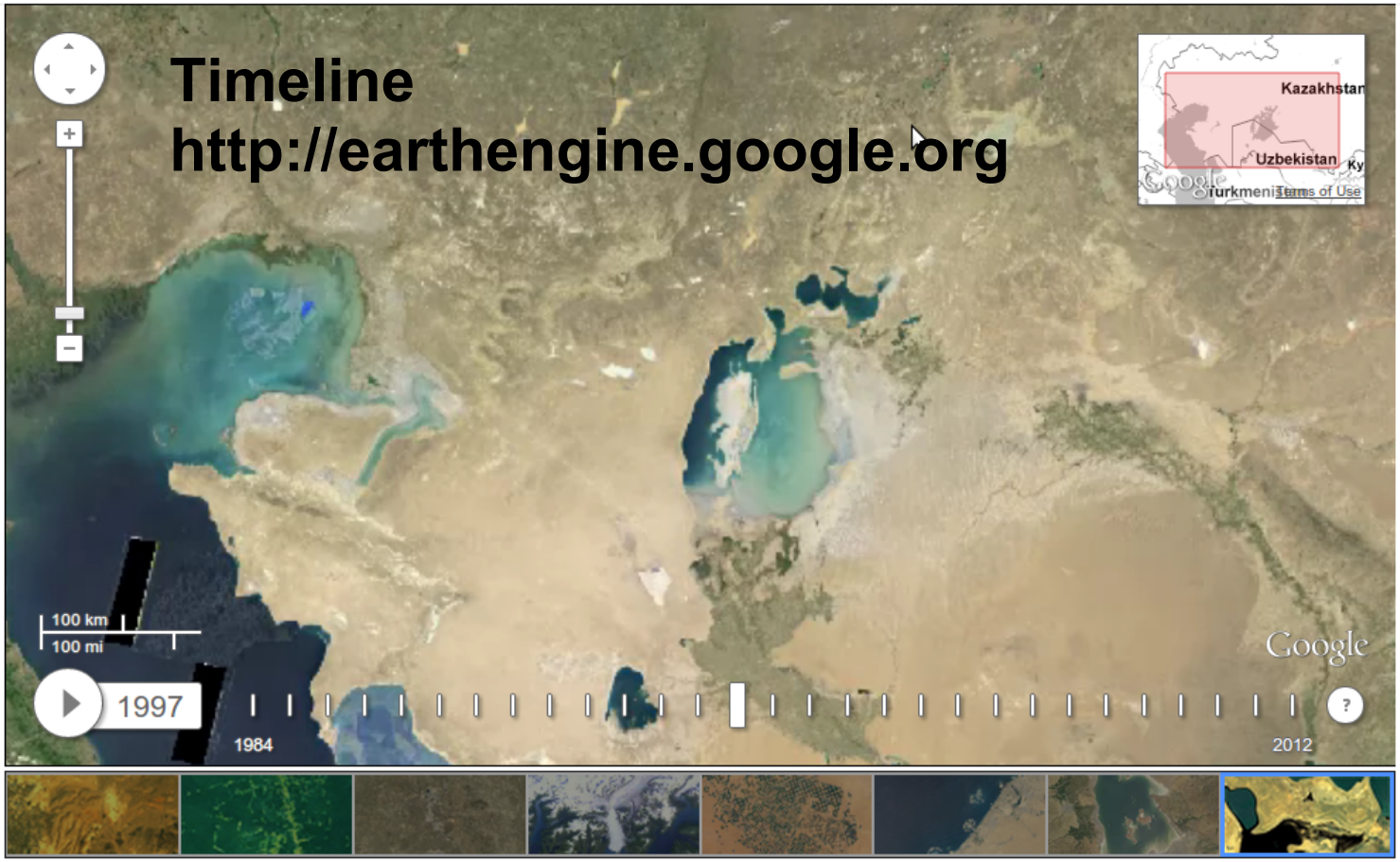
Earth Engine › Landsat Annual Timelapse 1984-2012

Home | Data Catalog | Workspace



Now viewing: Drying of the Aral Sea

Share this view

Explore a global timelapse of our planet, constructed from Landsat satellite imagery. With water diverted to irrigation, the inland Aral Sea has shrunk dramatically. Many areas were completely dry by 2009. Each frame of

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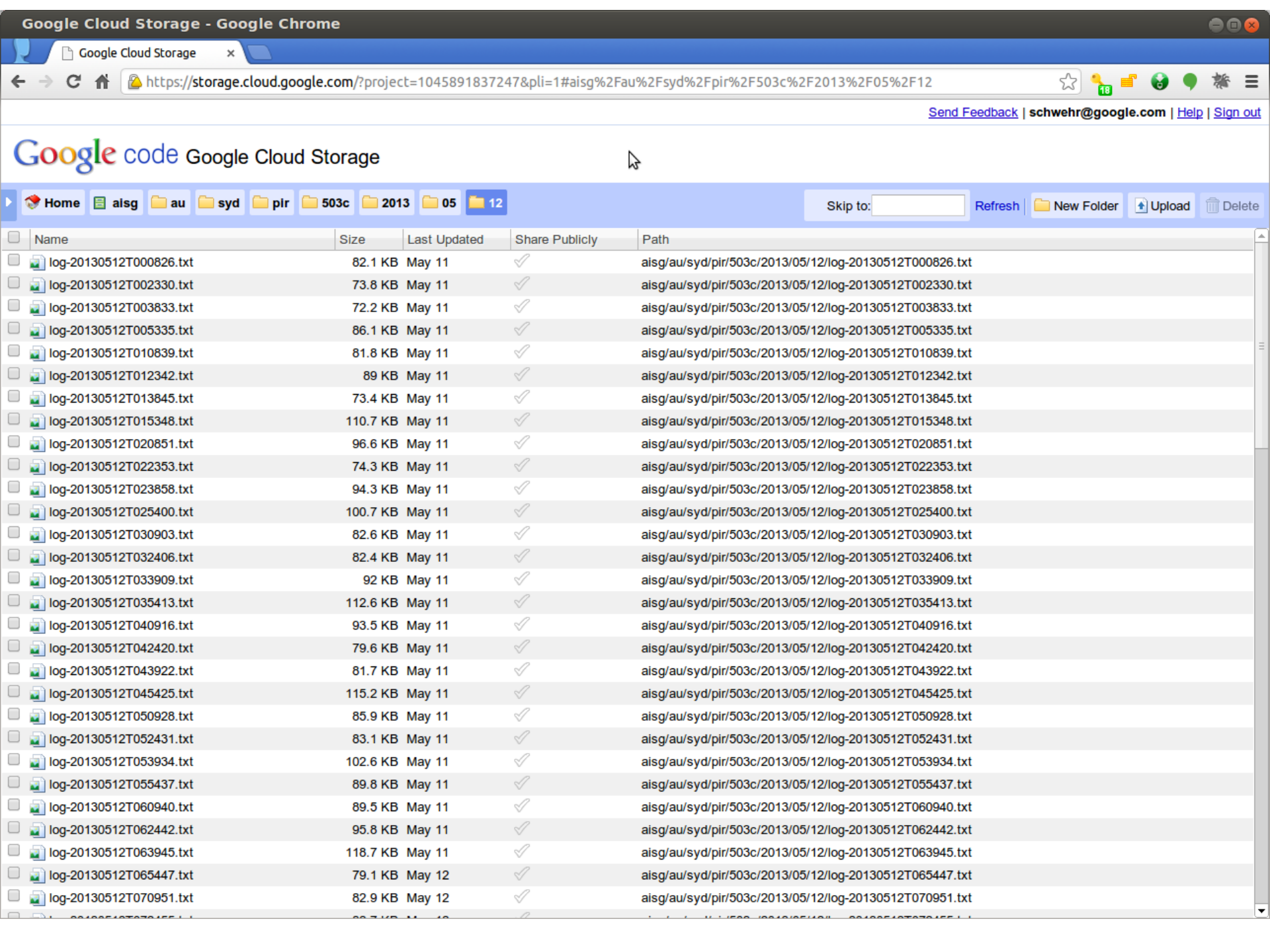
  - And anything you want
- BigQuery (bq)
- Earth Engine (ee)
- And many other APIs
  - Maps
  - Terrain
  - etc


Google Cloud Storage - Google Chrome
Google Cloud Storage
https://storage.cloud.google.com/?project=1045891837247&pli=1#aisg%2Fau%2Fsyd%2Fpir%2F503c%2F2013%2F05%2F12
Send Feedback | schwehr@google.com | Help | Sign out
Google code Google Cloud Storage
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Skip to: Refresh New Folder Upload Delete
Name Size Last Updated Share Publicly Path
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log-20130512T002330.txt 73.8 KB May 11 aisg/au/syd/pir/503c/2013/05/12/log-20130512T002330.txt
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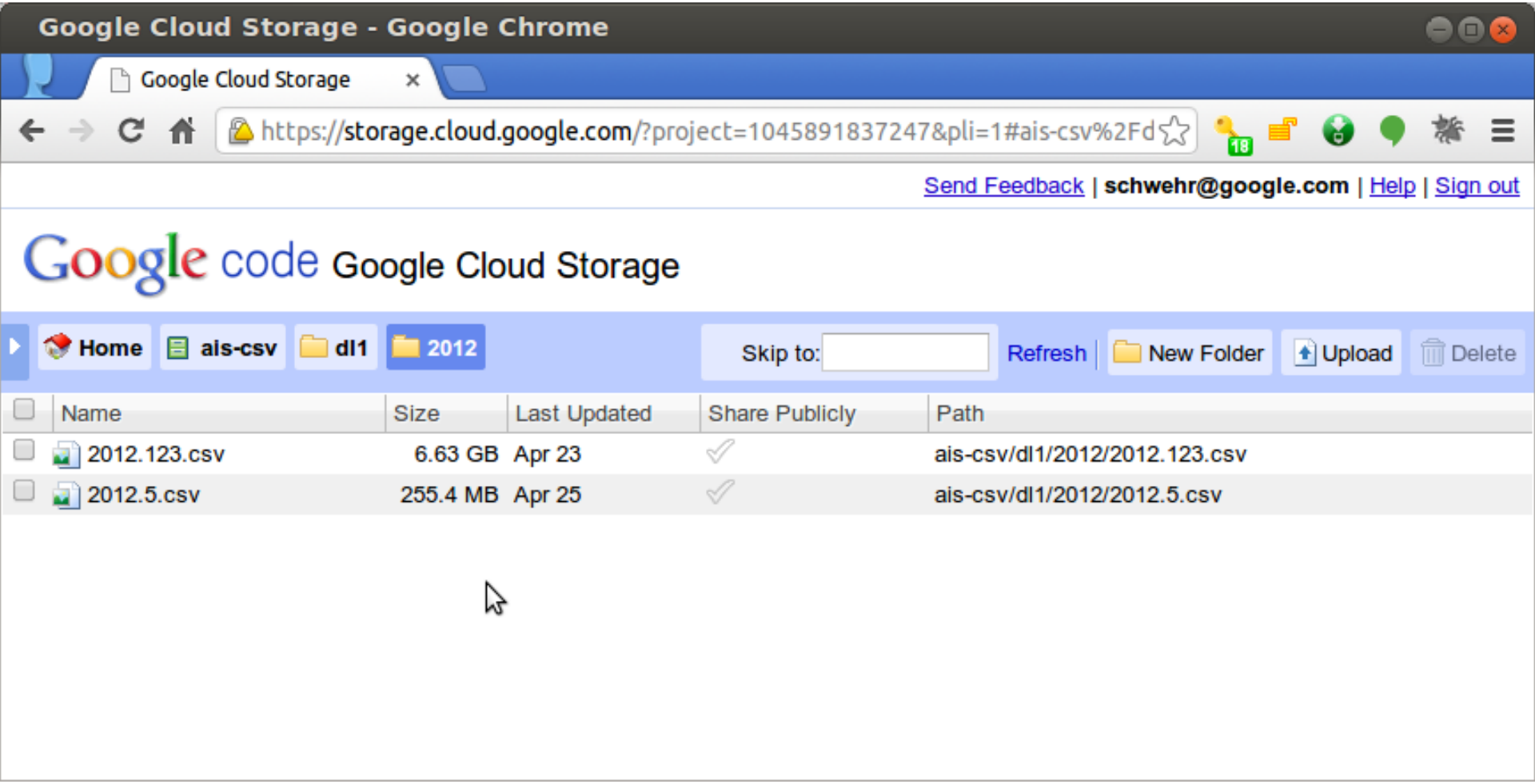
log-20130512T070951.txt 82.9 KB May 12 aisg/au/syd/pir/503c/2013/05/12/log-20130512T070951.txt


Google Cloud Storage - Google Chrome
Google Cloud Storage
https://storage.cloud.google.com/?project=1045891837247&pli=1#ais-csv%2Fd
Send Feedback | schwehr@google.com | Help | Sign out
Google code Google Cloud Storage
Home
ais-csv
dl1
2012
Skip to:
Refresh
New Folder
Upload
Delete
Name
Size
Last Updated
Share Publicly
Path
2012.123.csv
6.63 GB
Apr 23
ais-csv/dl1/2012/2012.123.csv
2012.5.csv
255.4 MB
Apr 25
ais-csv/dl1/2012/2012.5.csv

New Query

```
1 SELECT COUNT(mmsi) FROM (SELECT mmsi as mmsi FROM io.pos123 WHERE REGEXP_MATCH(rcvr, "r00.*") GROUP BY mmsi);
```

RUN QUERY | Save Query | Prettify Query | Show previous query results

Table Details: pos123

Schema | Details | Query Table

Table Info

Table ID	ais-demo-v1:io.pos123
Table Size	69.2 GB
Number of Rows	374,601,235
Creation Time	7:43pm, 22 Apr 2013
Last Modified	4:11pm, 25 Apr 2013

Preview

Row	id	repeat_indicator	mmsi	nav_status	rot_over_range	rot	sog	position_accuracy	x
1	1	0	366880370	0	false	0.0	0.10000000149	0	-71.0250930786
2	1	0	367010390	0	true	-731.386474609	7.80000019073	0	-70.9610595703
3	1	0	367010390	0	true	-731.386474609	7.80000019073	0	-70.9610595703
4	3	0	636090339	5	false	0.0	0.10000000149	0	-70.8772583008
5	1	0	867029470	0	true	-731.386474609	0.20000000298	0	-71.0401000977