

Electronic Navigation Alternatives



“What electronic navigation tools should I be using to navigate with as I go further offshore?”

Or.. How to stay off the Rocks!



Sherry McCampbell
s/v Soggy Paws

Avanti, Beveridge Reef, Aug 2017



“I had no idea the reef was there. I knew we’d hit something and were taking on water. We were ready to abandon ship.”

Robbie Cooper, s/v Avanti, Beveridge Reef, September 2017

**Vestas Wind
Cargado Shoals
2014**

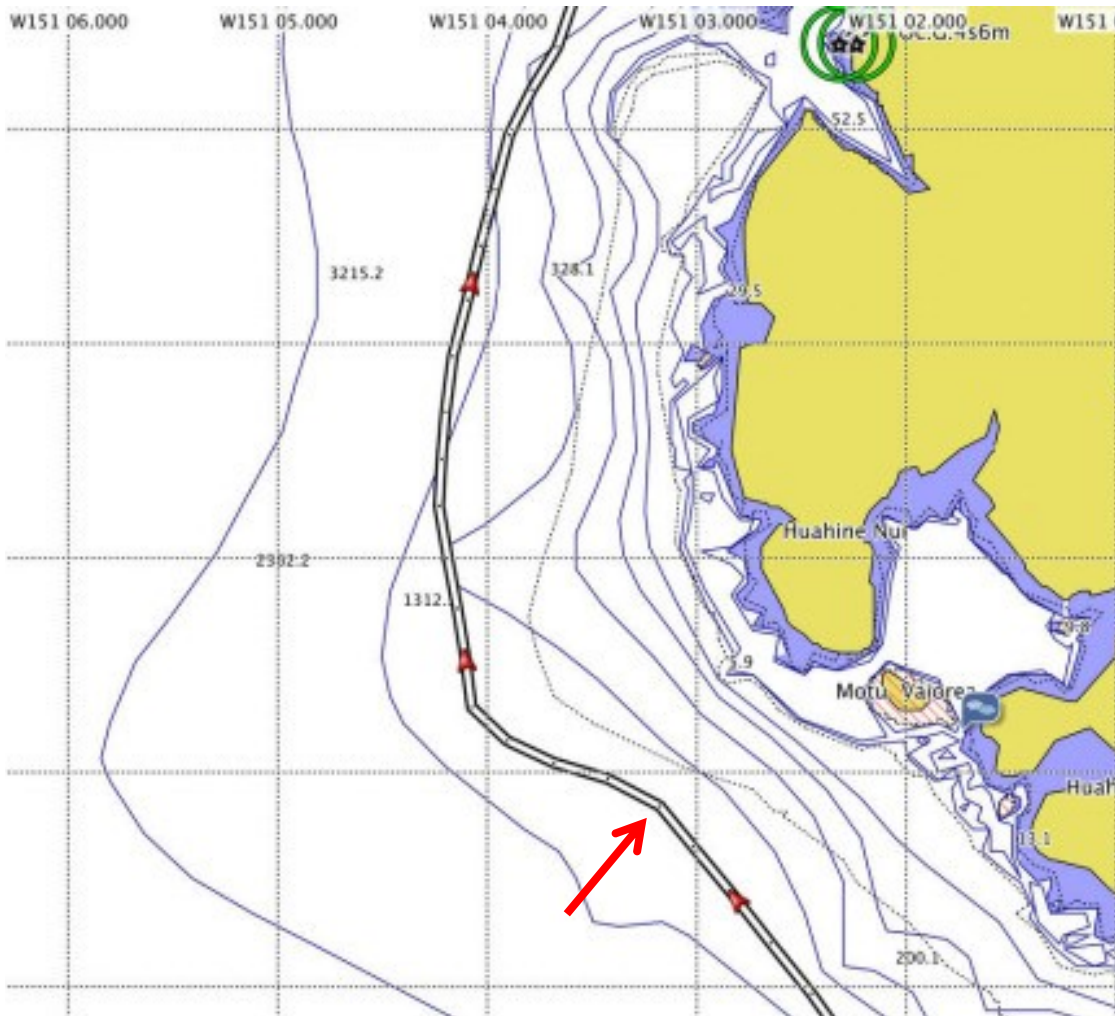


“Team Vestas Wind’s grounding on the Cargados Carajos Shoals comes down to a basic failure in overall passage planning, and an over-reliance on electronic navigation.”



“When they asked us what happened and we told them that our chart did not show reef, they asked us if we had been using Navionics charts, and I said yes. He then shook his head and said that at least five boats end up on those reefs a year who were using Navionics charts.”

Moonshadow's Close Call



We had plotted a route that kept us outside the 300-foot depth contours

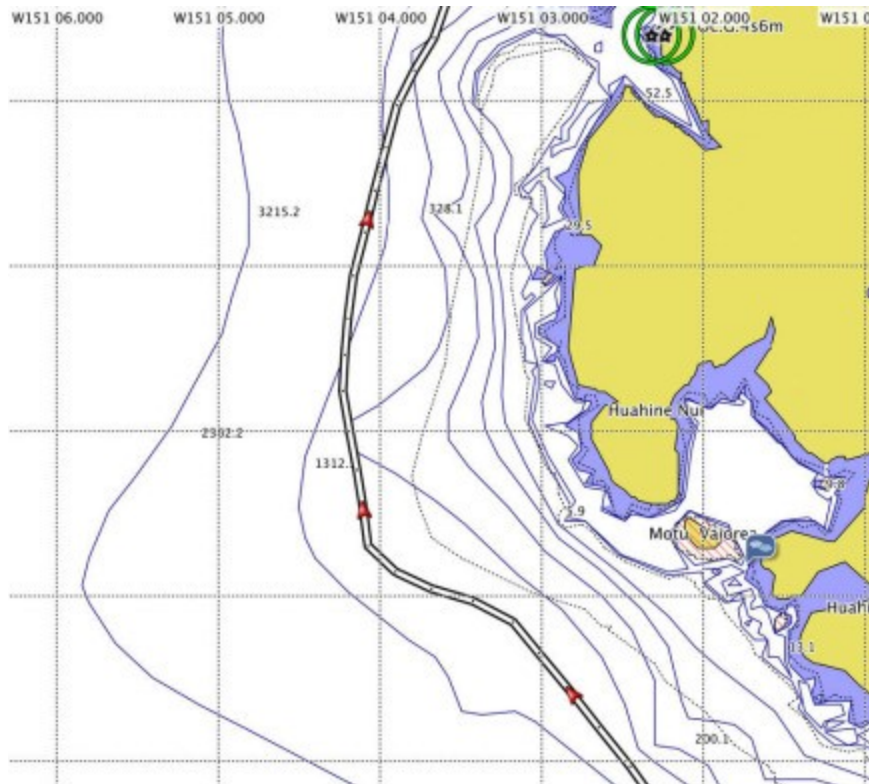
Moonshadow's Close Call



We looked up, and to our horror found that we were only about 900 feet from the surf!

Had it been nighttime, we almost certainly would have ended up in that surf

Side-by-Side Comparison



**USS Guardian
Tubataha Reef
2010**



The coastal scale electronic chart supplied to USS *Guardian* was flawed due to human error on the part of the NGA. This error **mis-located the Tubataha Reef by 7.8 nautical miles** from its actual location. NGA was aware of this error in 2011 and updated a smaller scale electronic chart, but failed to publish a correction for the larger scale chart that the USS *Guardian* was using when she ran aground.



NW Australia, June 2016

Southern Fiji, June 2017

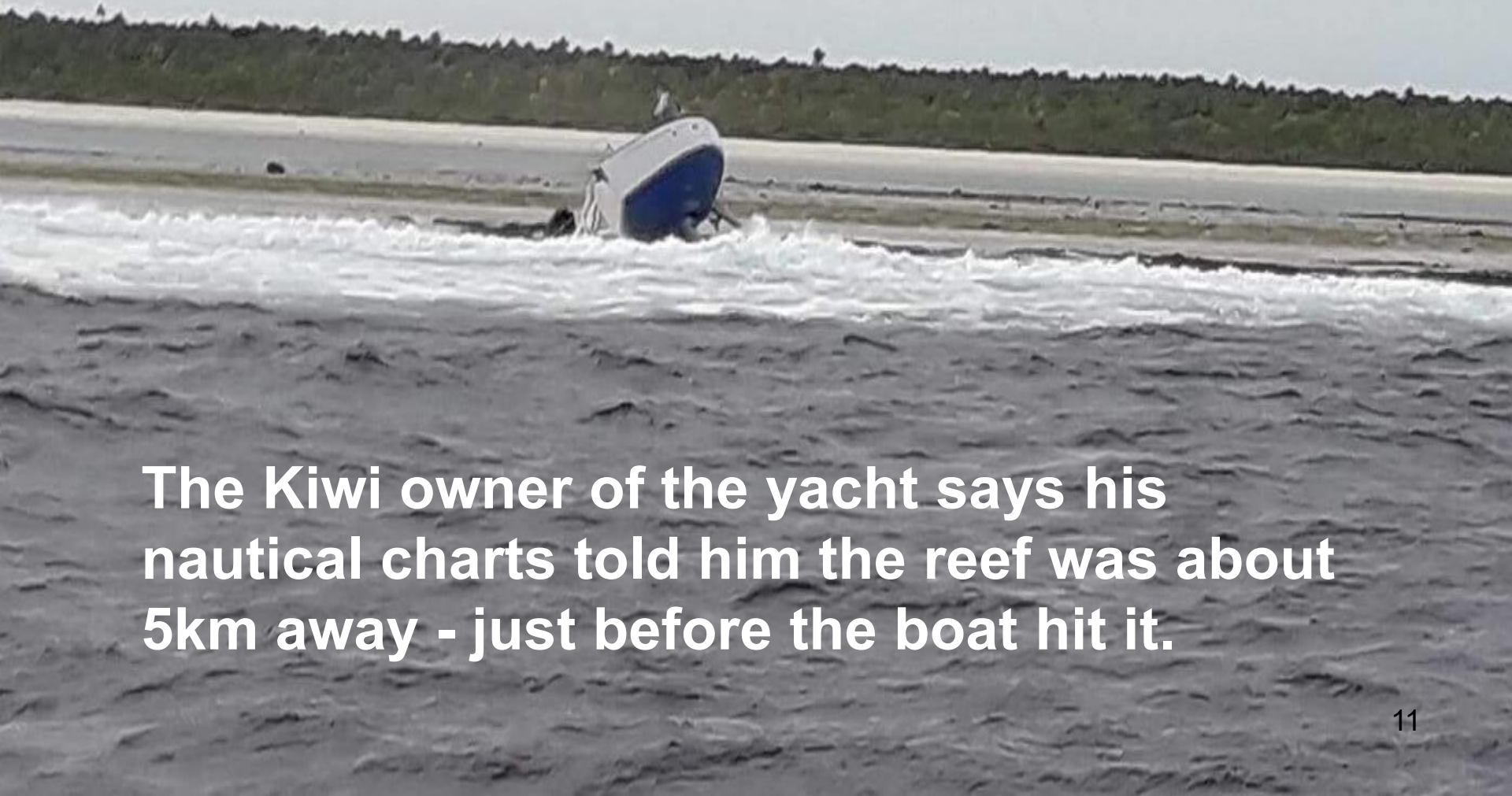
60 ft Oyster with Crew of 4, at night



“They decided to go to Fiji instead of Tonga because of an equipment failure, then activated a distress beacon at 4am after going aground on a reef”

Southern Fiji, June 2017

60 ft Oyster with Crew of 4, at night



The Kiwi owner of the yacht says his nautical charts told him the reef was about 5km away - just before the boat hit it.

Southern Fiji, June 2017

60 ft Oyster with Crew of 4, at night



“The radar never picked up the reef and the plotter on the radar base said we were three miles off, but the two plotters were incorrect by three miles. We just hit the edge of the reef.”

Topics

- Be suspicious of your charts
- Why not to use your iPad / Android tablet as your only navigation tool
- Why not to use your chartplotter as your only navigation tool
- Paper vs Raster vs Vector vs Satellite Charts
- Validating the accuracy for the next stop
- Navigating at night
- Introducing the power of Sat2Chart
- Introducing the power of OpenCPN

Note: All tools and resources referenced in this presentation are linked on the reference pages at the end.

Paper Charts

- Satisfyingly “there” feel
- Only as good as the survey they are based on
- A pain in the ass to keep updated
- Bulky, expensive, hard to acquire
- Hard to store large quantities
- They can blow away, they can get wet
- But islands don't disappear!

Traditional Raster Charts

- Essentially a scanned paper chart
- All paper chart info is retained
- Easiest to adjust to using (if you are familiar with paper charts)
- Take up MUCH more electronic storage space (vs Vector charts)
 - 24 CD's to cover the world, partially
- Everything zooms at the same rate

Raster vs Vector



Vector Charts

- Vector charts have been drawn from paper charts by *someone*
- Are only as accurate as the underlying chart they were made from
- Take up SIGNIFICANTLY less space on electronic storage
 - The Whole World in one folder
- Contain lines, “objects”, and “data”

Raster vs Vector

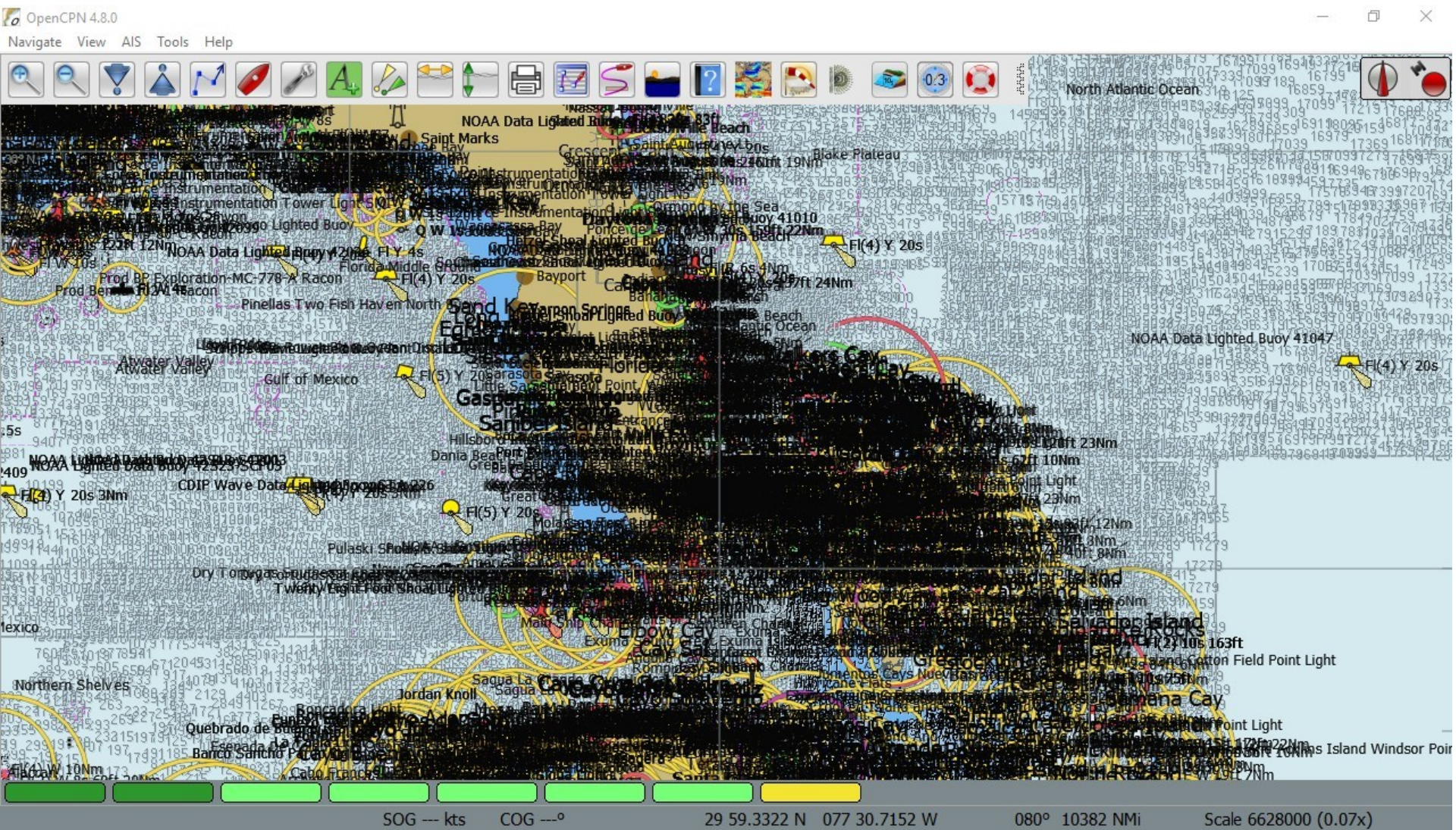


Vector Charts

- Most chart plotters are using vector charts
- Most tablet/phone apps are using vector charts
- Take a significantly smarter program to display and use
- Very powerful if used correctly
- Sometimes confusing to use and/or set up (flexibility = complexity)

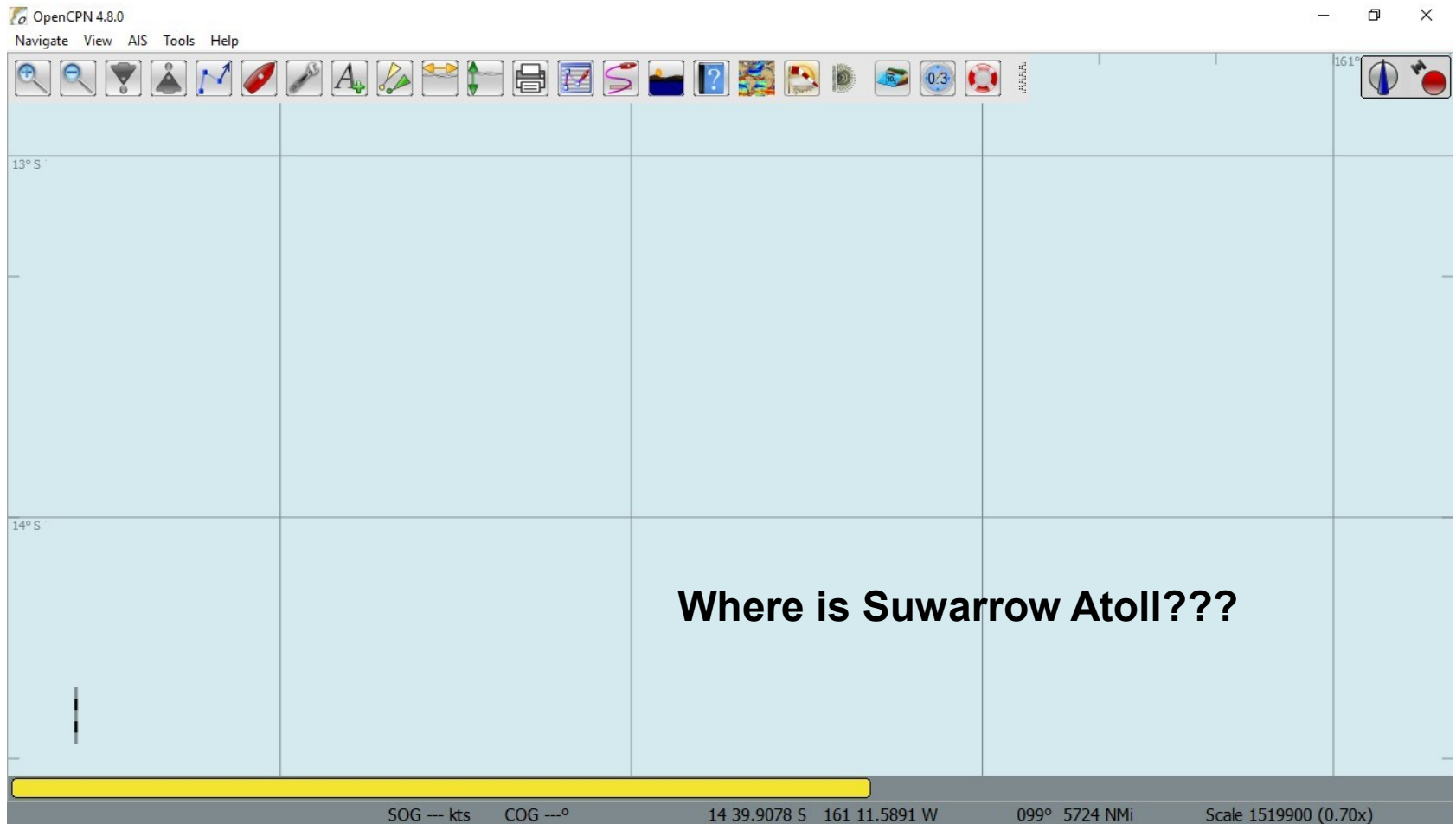
Too Much Detail!

(this is configurable)



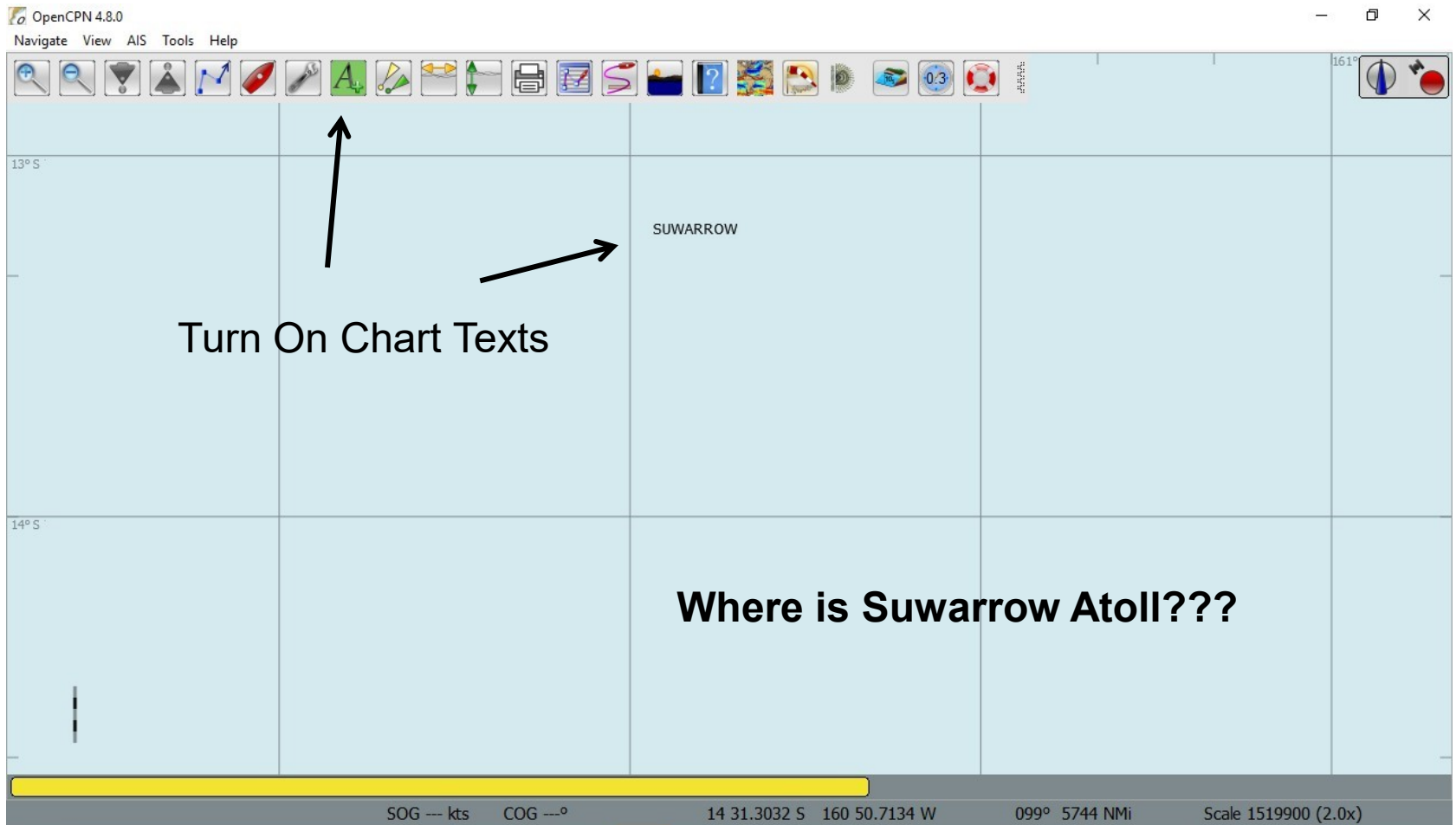
Problems with Vector Charts

The Disappearing Island – Chart Zooms



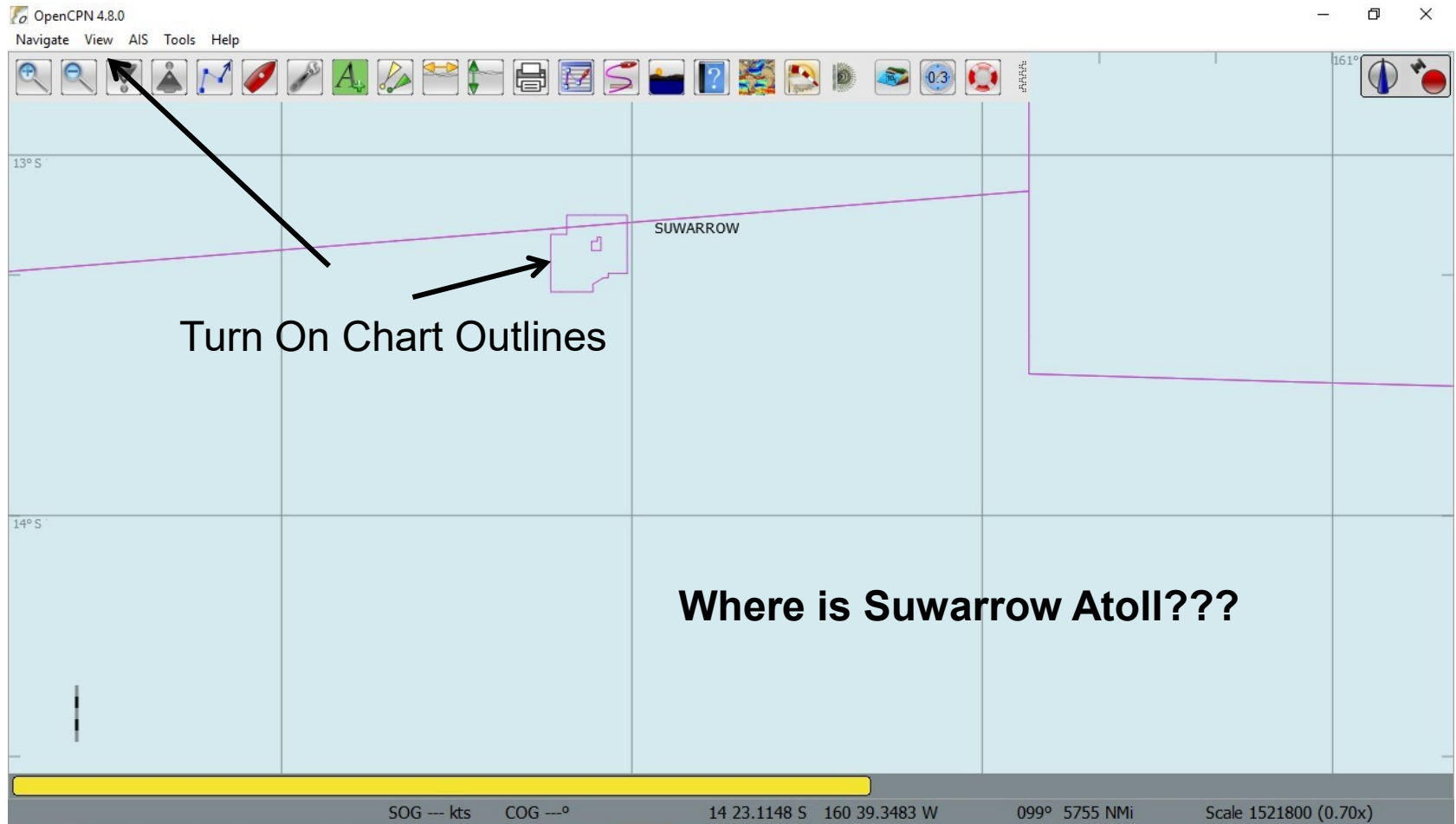
Problems with Vector Charts

The Disappearing Island – Chart Zooms



Problems with Vector Charts

The Disappearing Island – Chart Zooms



Problems with Vector Charts

The Disappearing Island – Chart Zooms

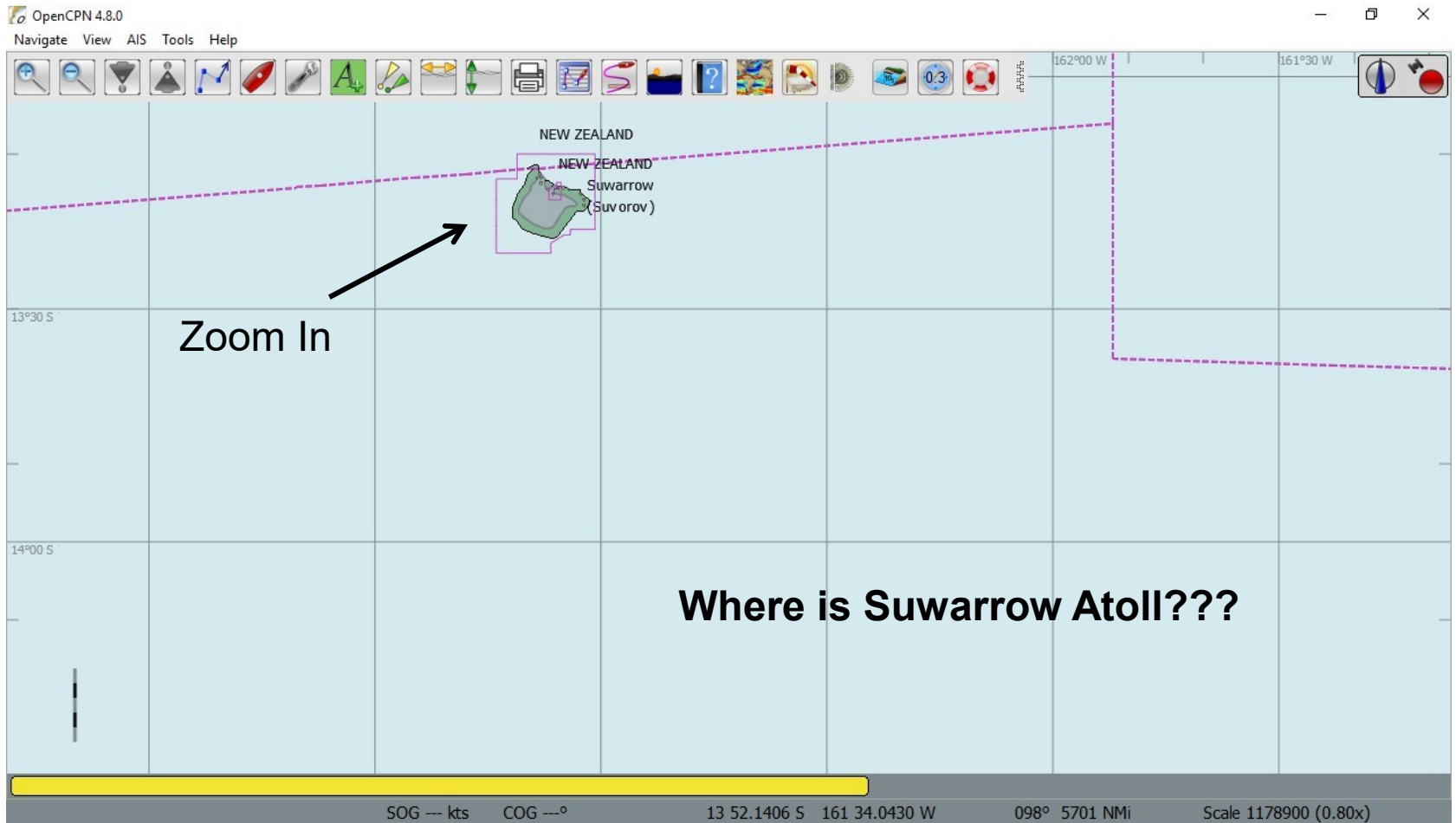


Chart Zooms / Avanti Wreck

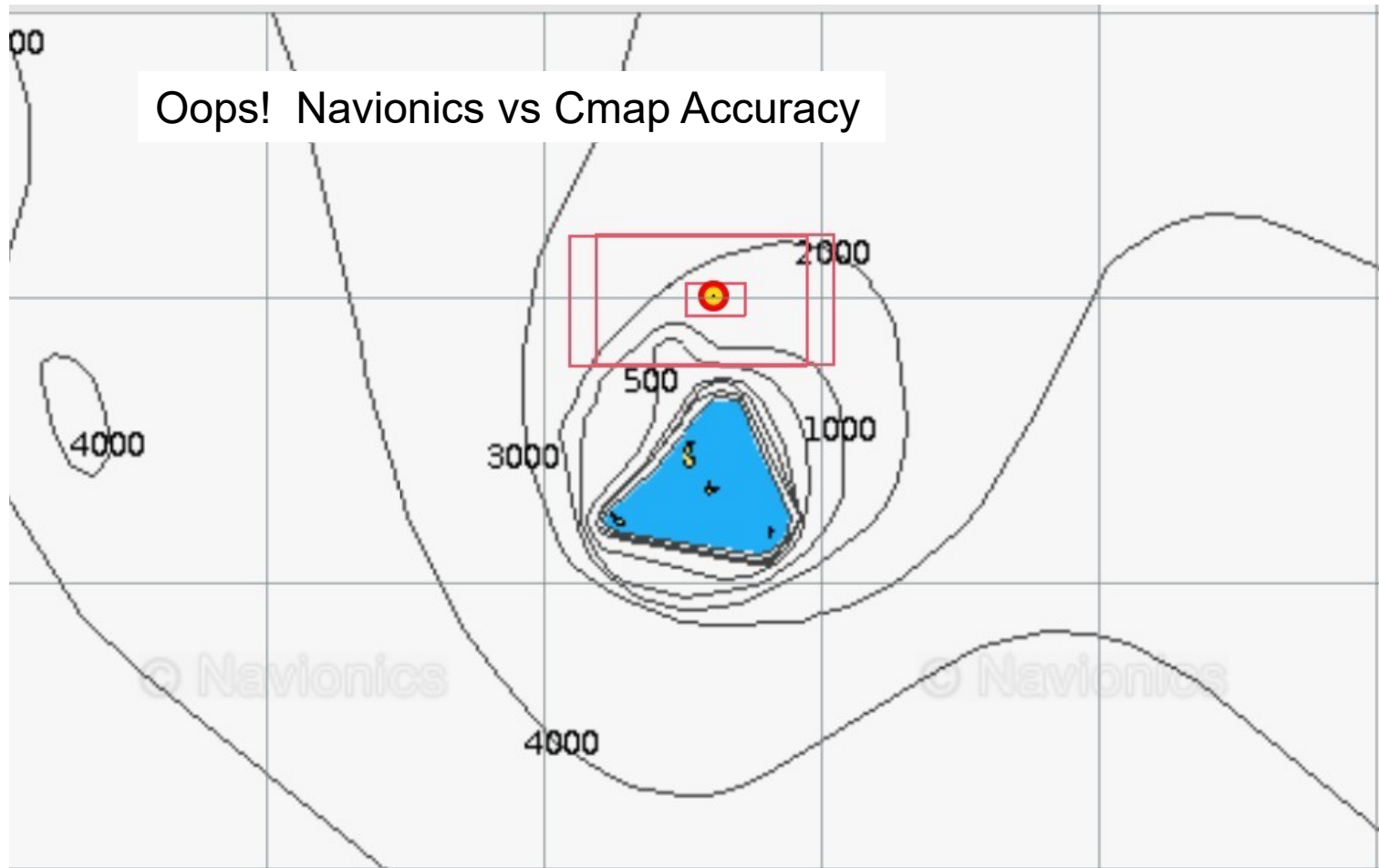
From sv Golden Glow on Noonsite

“Beveridge Reef appears on our Furuno Chart, but only when it’s zoomed in to a map size of 35 nm across the screen (at 40 nm size it’s NOT visible).

Navionics and iNavx apps DO show Beverage Reef, but our Earthmate (Garmin) app, the map for our delorme explorer device, does NOT show the reef.”

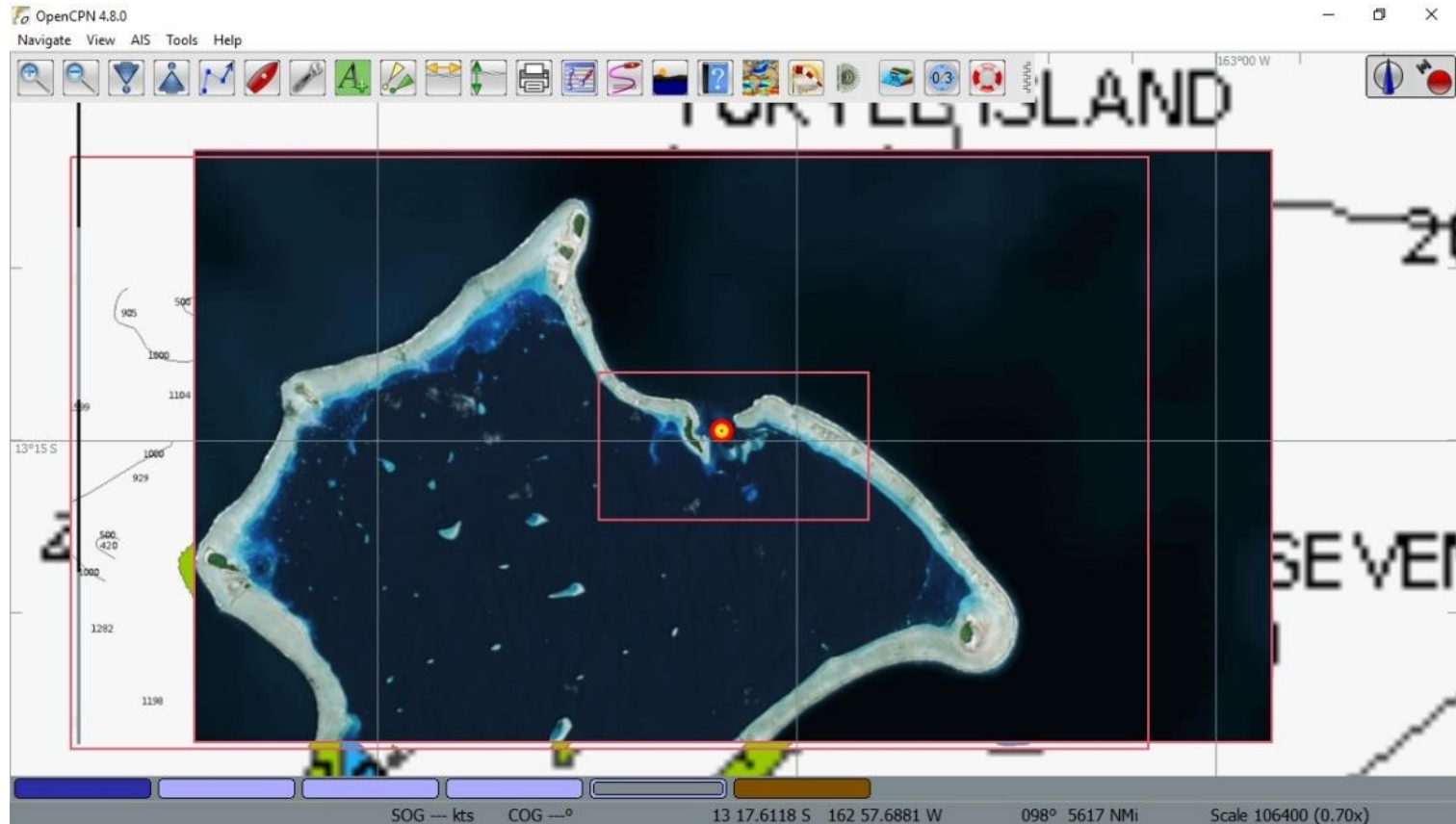
The Disappearing Island

Also Misplaced



Where is Suvarrow Atoll???

The Disappearing Island Misplaced



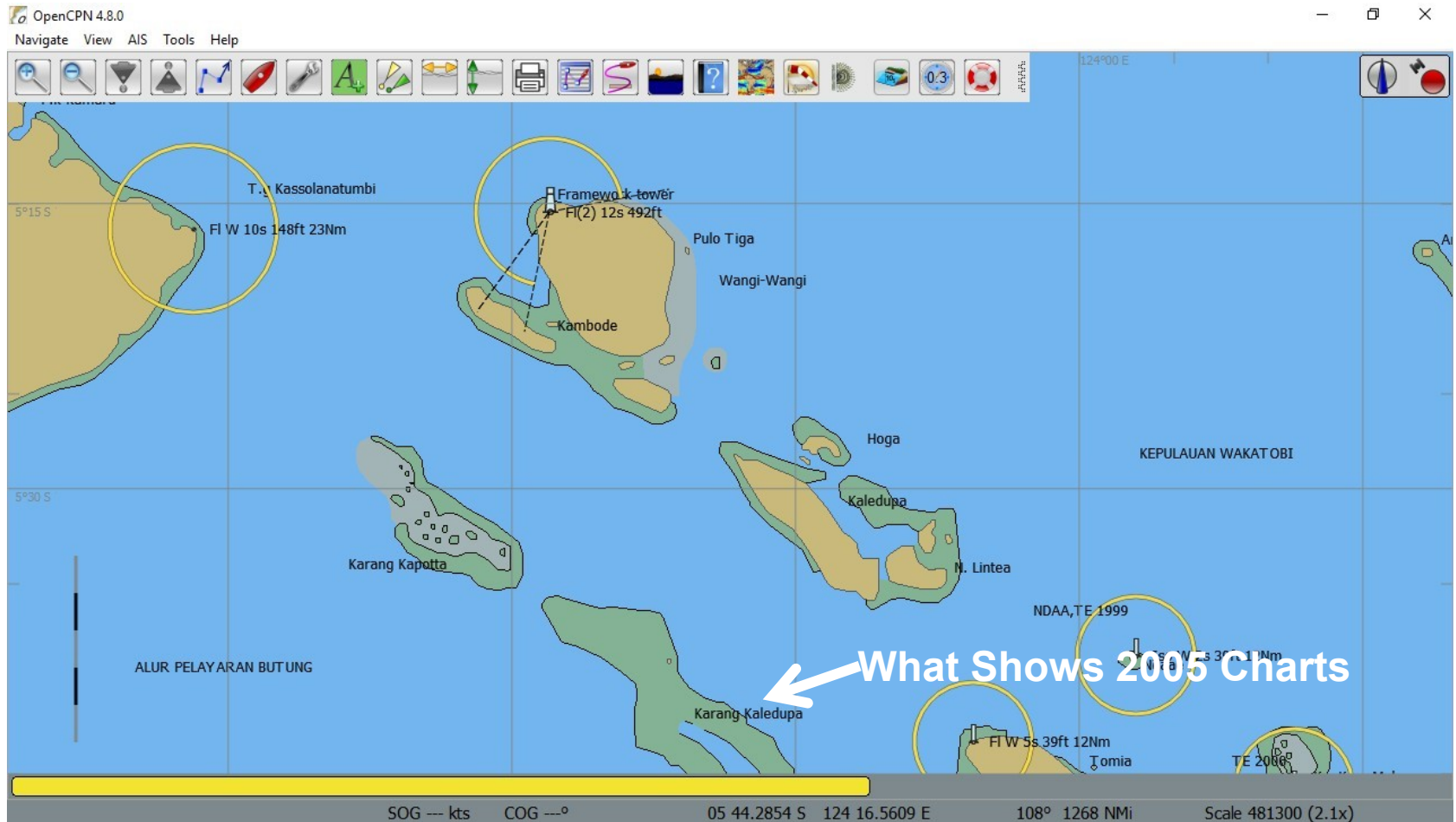
Where is Suvarrow Atoll???

The Disappearing Reef

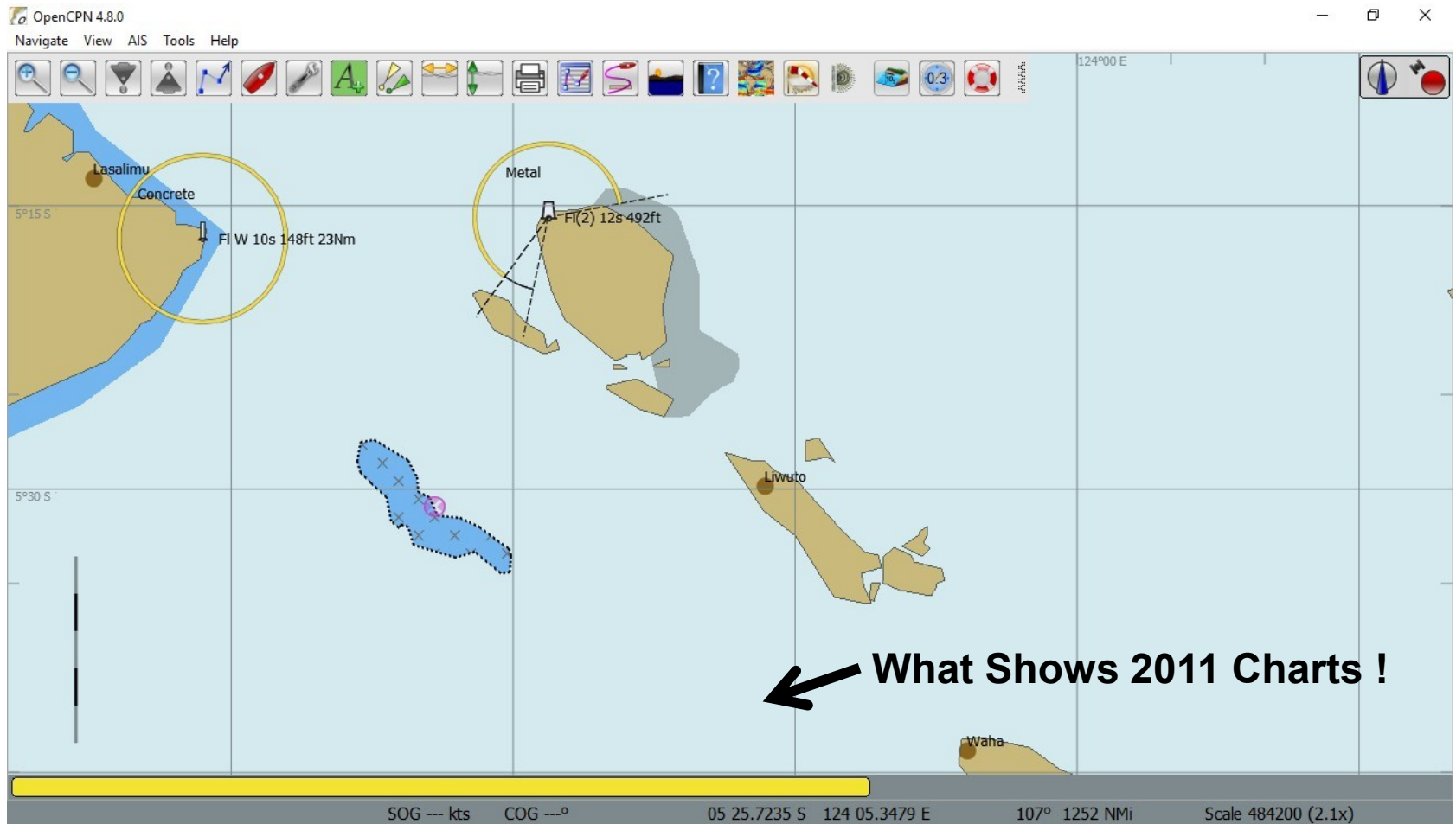
Chart Versions



The Disappearing Reef Chart Versions



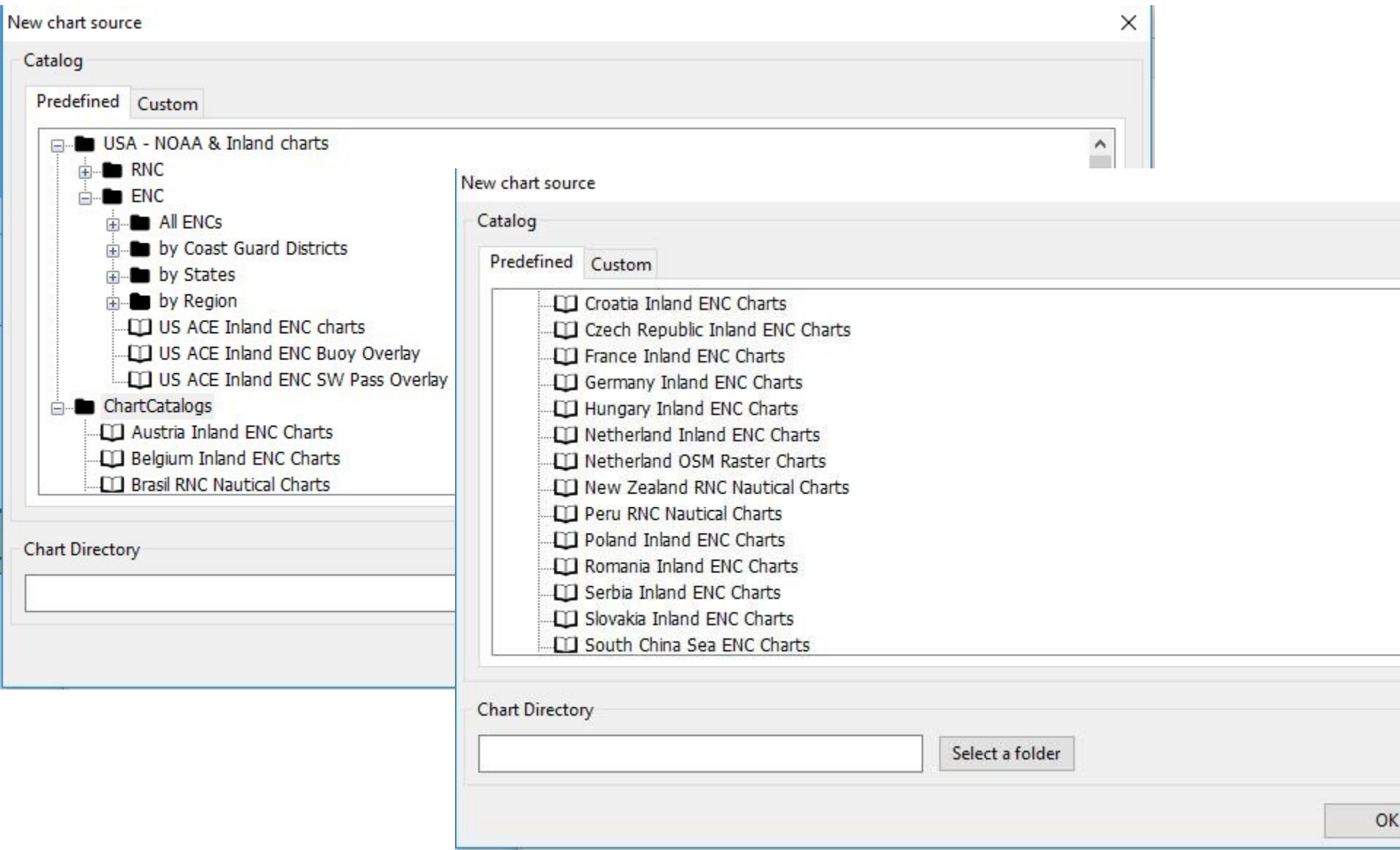
The Disappearing Reef Chart Versions



Some Sources of Vector Charts

- Your local country's chart purveyor
 - Sometimes free, sometimes not
- CM93 v2 (stopped updating in 2010/2011)
- CM93 v3 Cmap / Time Zero (Furuno)
- Garmin (\$250-\$350 per region)
- Navionics
- Raymarine
- Other Cruisers
- The Apple Store!

OpenCPN Chart Downloader



Options



Display



Charts



Connections



Ships



User Interface



Plugins

Chart Files | Vector Chart Display | Chart Groups | Tides & Currents | Chart Downloader

Catalogs

Catalog	Released	Local path
RNC Product Catalog 07 Region	2015-12-03 12:20	C:\Users\sherr\Documents\Charts\RNC\U...
ENC Product Catalog HI	2015-12-03 17:42	C:\Users\sherr\Documents\Charts\ENC\U...
ENC Product Catalog FL	2017-11-02 13:32	C:\Users\sherr\Documents\Charts\ENC\U...

- Add
- Delete
- Edit...
- Update

Charts

Title	Status	Latest
<input checked="" type="checkbox"/> Charleston Light to Cape Canaveral	New	2017-10-24 15:11
<input checked="" type="checkbox"/> Cape St. George to Mississippi Passes	New	2017-11-02 08:31
<input checked="" type="checkbox"/> Tampa Bay to Cape San Blas	New	2017-06-23 09:19
<input checked="" type="checkbox"/> Havana to Tampa Bay	New	2017-08-31 07:12
<input checked="" type="checkbox"/> Perdido Bay and Escambia Bay	New	2017-09-05 10:03

Downloading chart 15 of 99, 0 downloads failed (0 / Unknown)

- Help
- Abort download
- Show local files

- OK
- Cancel
- Apply

Japan Nautical Chart Web Shop



Welcome Guest

[▶ Login](#)

[▶ New Registration](#)

 [Shopping Cart](#)

[HOME](#)

[Search from Maps](#)

[Search from Categories](#)

[User's Guide](#)

[Guide to Charts](#)

[HOME](#) > [Guide to Charts](#) > [Products](#) > [Nautical Charts](#)

→ Products

● [Nautical Charts / Reference Charts](#)

● [Nautical Charts](#)

→ [Electronic Navigational Charts \(ENC\)](#)

→ [Yachting Charts \(Y Chart\)](#)

→ [S Guide Images\(Download\)](#)

→ [Electronic Reference Charts \(new pec\)](#)

→ [Bathymetric Charts](#)

→ [Miscellaneous Charts](#)

→ [Aeronautical Charts](#)

→ [Sailing Directions](#)

Nautical Charts / Reference Charts

Nautical Charts

Nautical Charts are published to cover the Japanese coasts, Pacific and Indian Oceans and their adjacent seas.

They are mainly constructed on Mercator's projection, and most of those charts covering the waters around Japan at a scale smaller than 1:100,000 are compiled at the scale based on the length of the longitude at Lat. 35 degrees.



Example of Japan's Chart Purchase Page

Enter search term



nv charts

your account checkout login



Pay-for Charts from 3rd Party Vendors

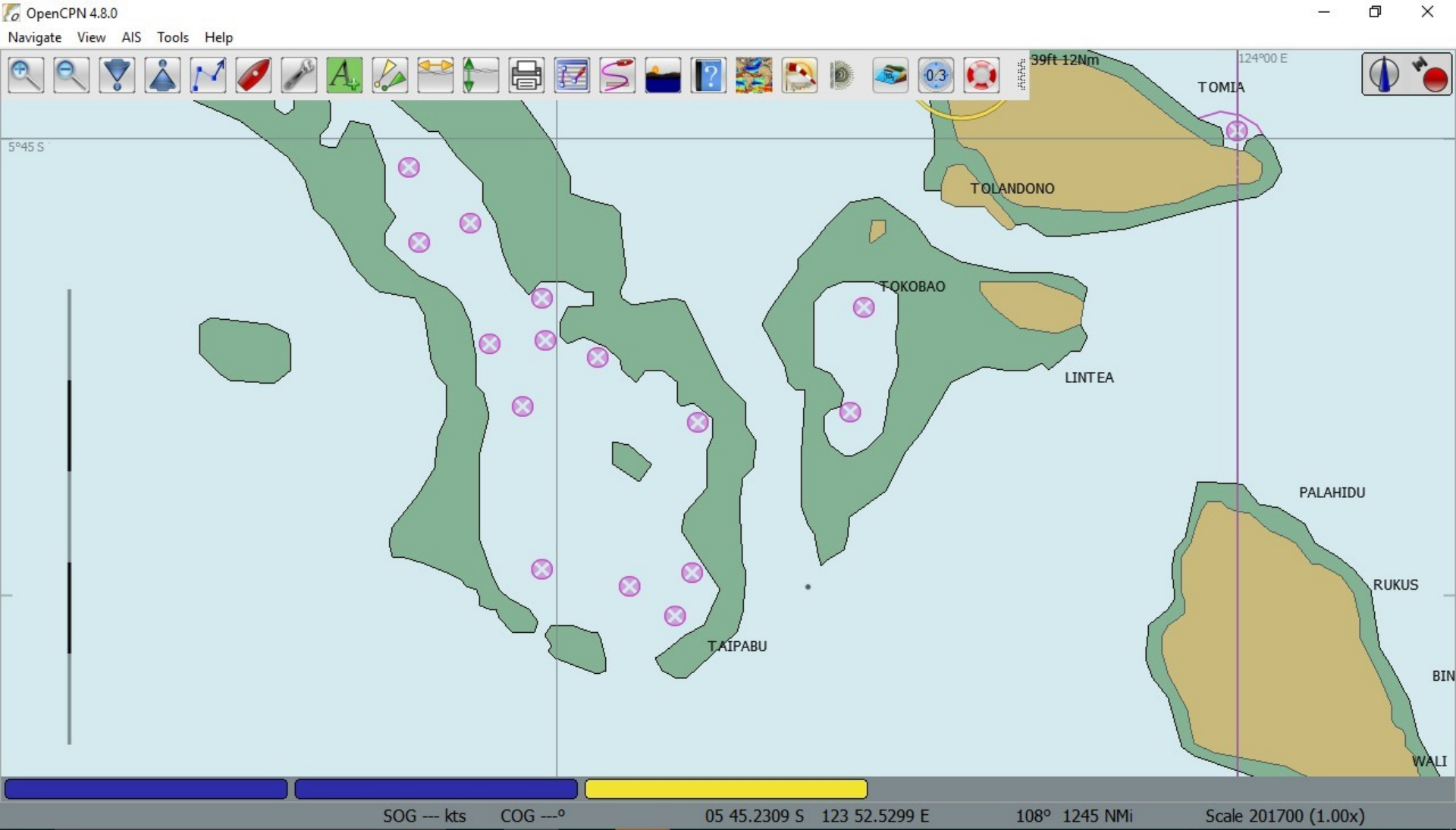
nv charts

- Home
- Shop
 - » NV. charts
 - > All charts
 - > Caribbean
 - > US East Coast
 - > Atlantic
 - > Baltic
 - > North Sea
 - > Mediterranean Sea
 - > NV. plotter charts

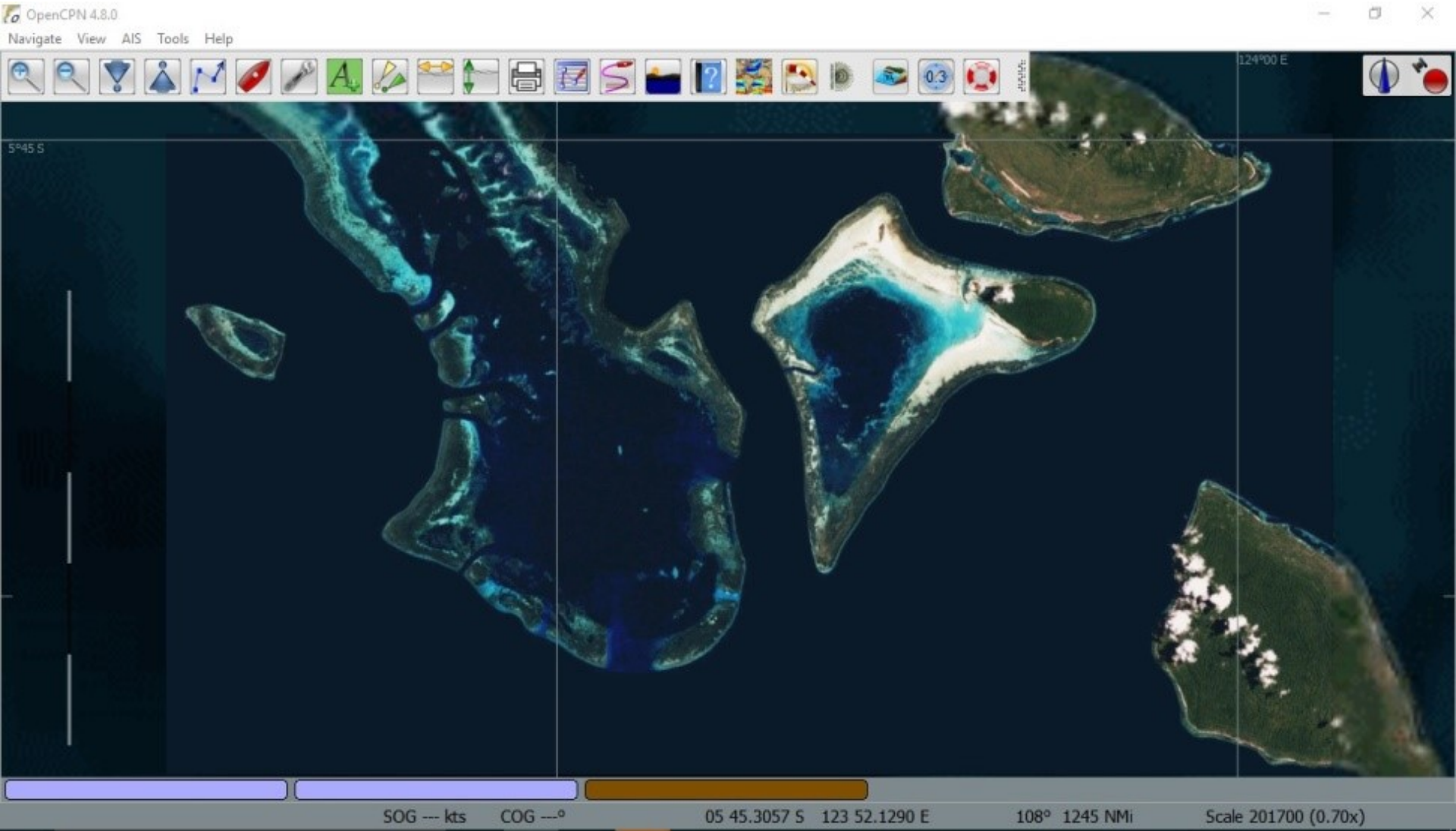
Using Satellite “Charts”

- GoogleEarth (Windows only)
- SAS Planet (Windows only)
- Guru Maps (Tablet only)
- OpenCPN & Satellite Charts (Windows, Linux, Apple Mac, Android (tablet & phone), sorry, not iPad or iPhone)
- Some chartplotter chart sets
 - Garmin G2 Vision (poor resolution)

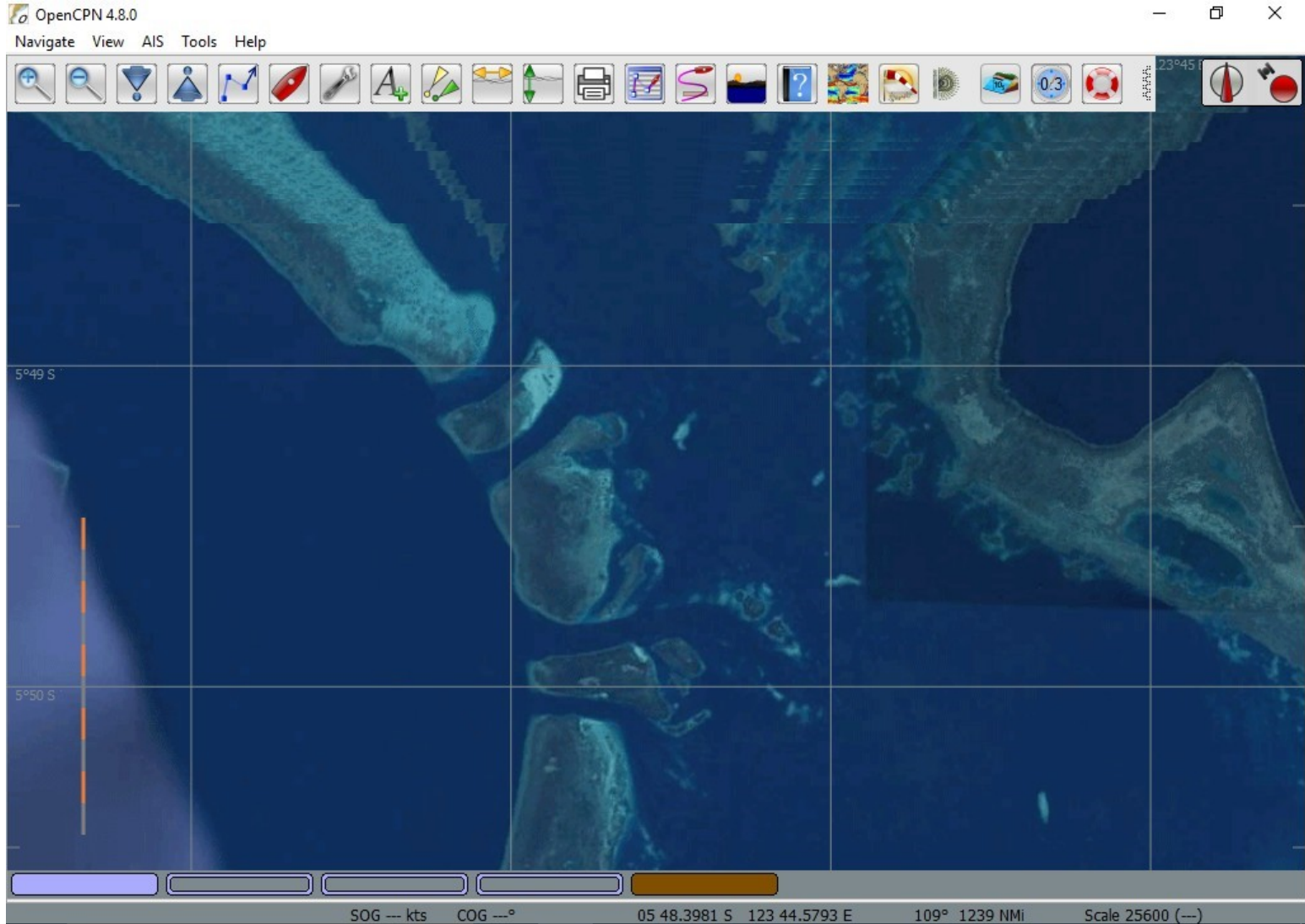
Which Would You Choose?



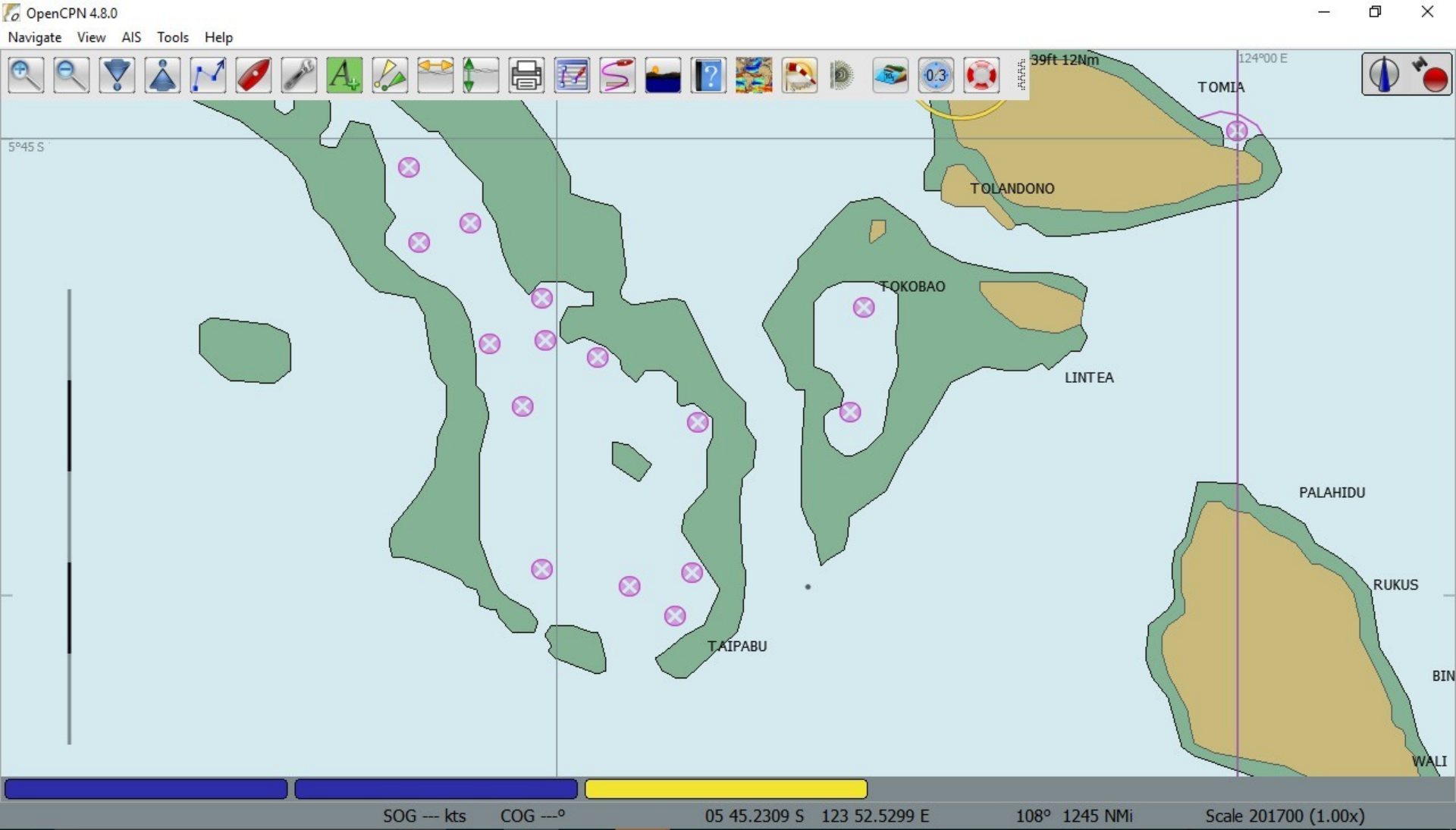
Which Would You Choose?



Which Would You Choose?



Which Would You Choose?



Problems Using Satellite Programs Directly

- GoogleEarth
 - ~~No direct GPS connection~~
 - You are not in control of the chart-saving
 - Not made for navigation
 - Integrating other navigation information
 - You MUST download
- SASPlanet
 - Can control what is saved
 - Possible to populate from other's saved data
 - Not as user friendly
- Is chart there or not???

Benefits of Using Pre-Made Satellite KAP Charts

- You know absolutely what you have charted
- You can share your charts with others
- You know who made it and how well it is done

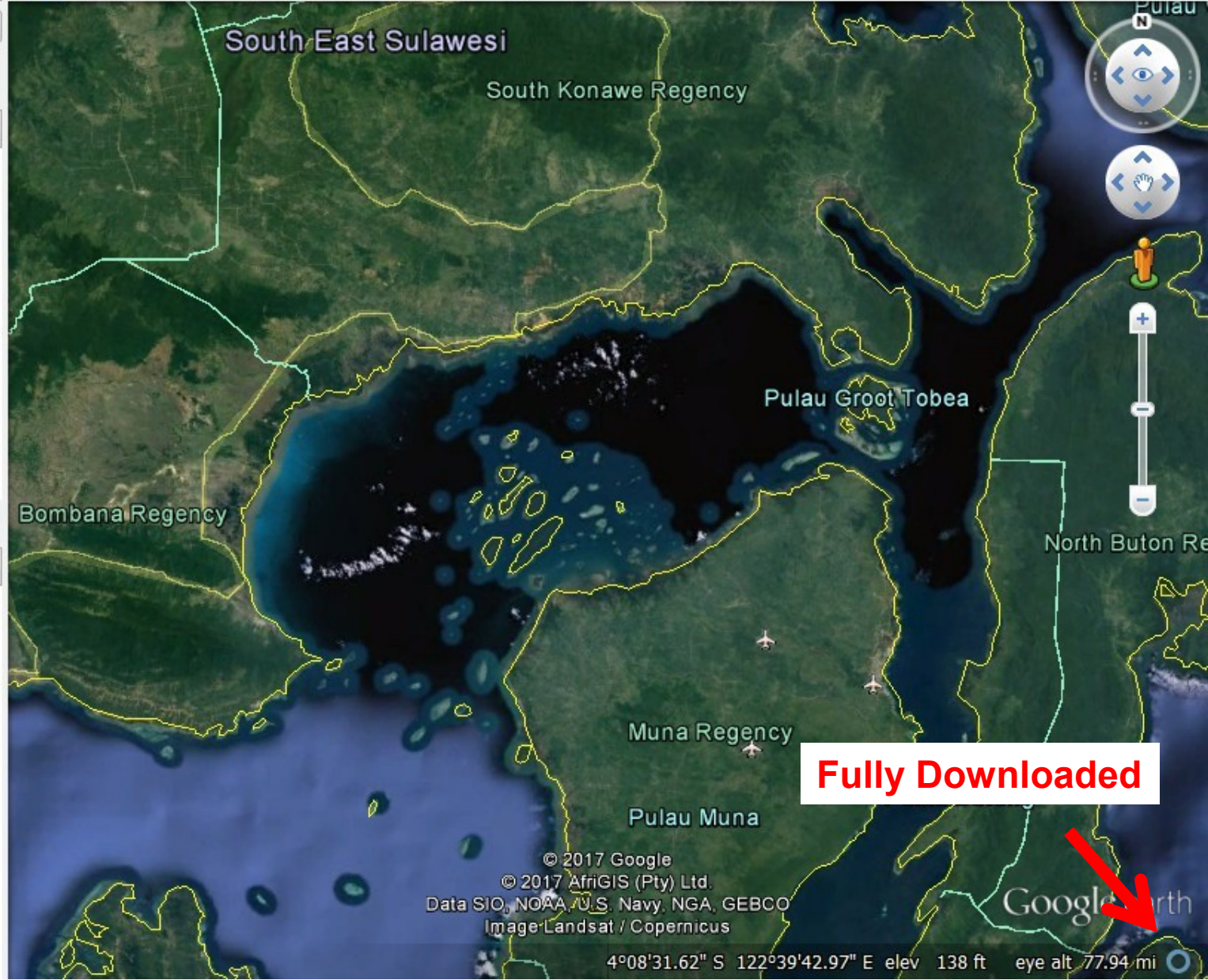
Steps to make a Chart from GoogleEarth

- Install Sat2Chart & GoogleEarth
(and/or SASPlanet)
- Locate area you want to chart
 - Zoom in, position
 - Make sure it is fully downloaded
 - Turn Layers On and Off
 - Get rid of toolbars (View /

Places

- My Places
 - Starting Location
 - Sightseeing Tour
Make sure 3D Buildings layer is checked
- IndonesianAnchorageV12
- Screensavers Planned Ro...
- Model
- HomePort
- screensaver2017-data (7)...
- screensaver2017-data (8)...
- Temporary Places

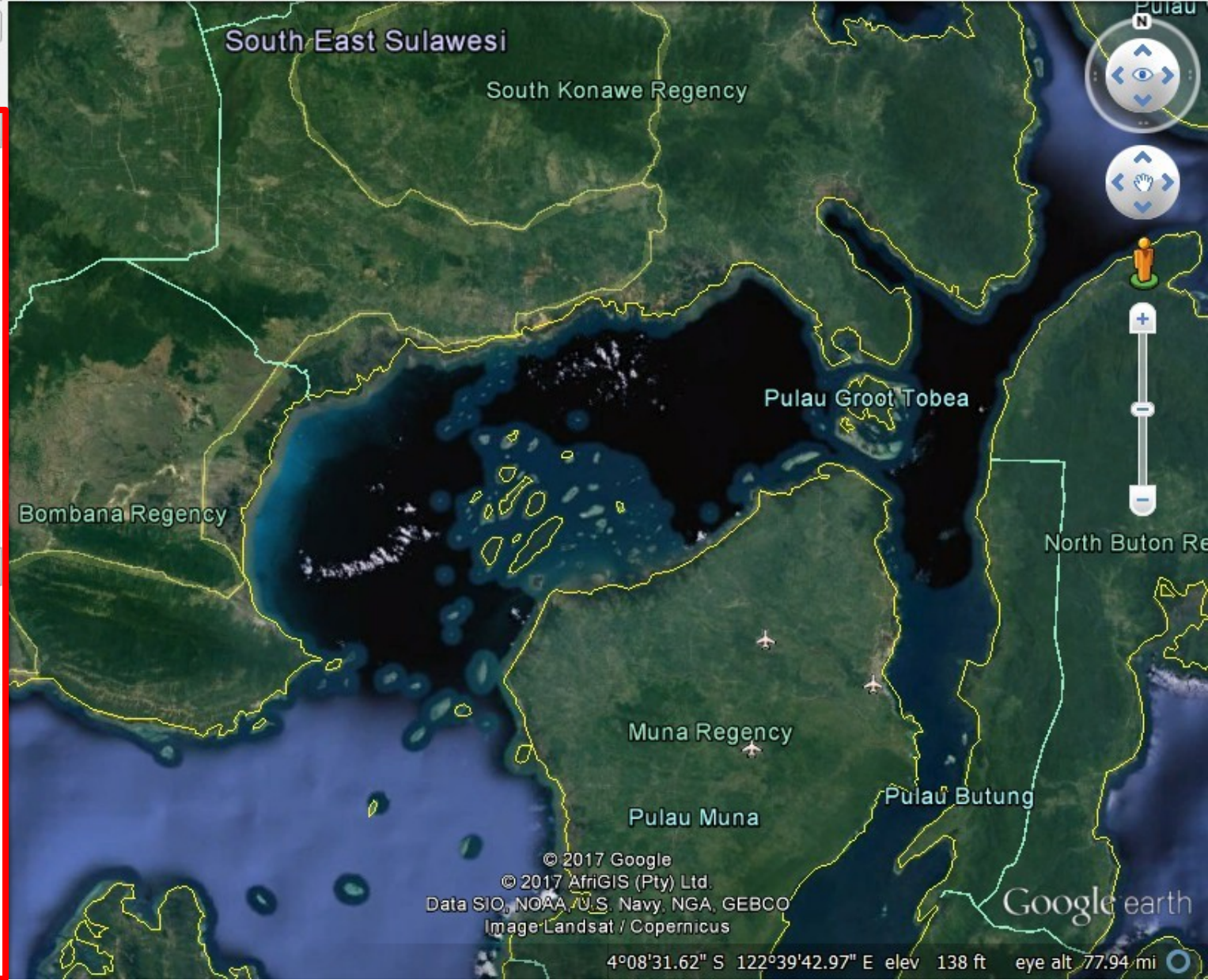
- Primary Database
- The new Google Earth
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More
- Terrain



Places

- My Places
 - Starting Location
 - Sightseeing Tour
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- IndonesianAnchorageV12
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- HomePort
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- Terrain



Search

ex: NYC

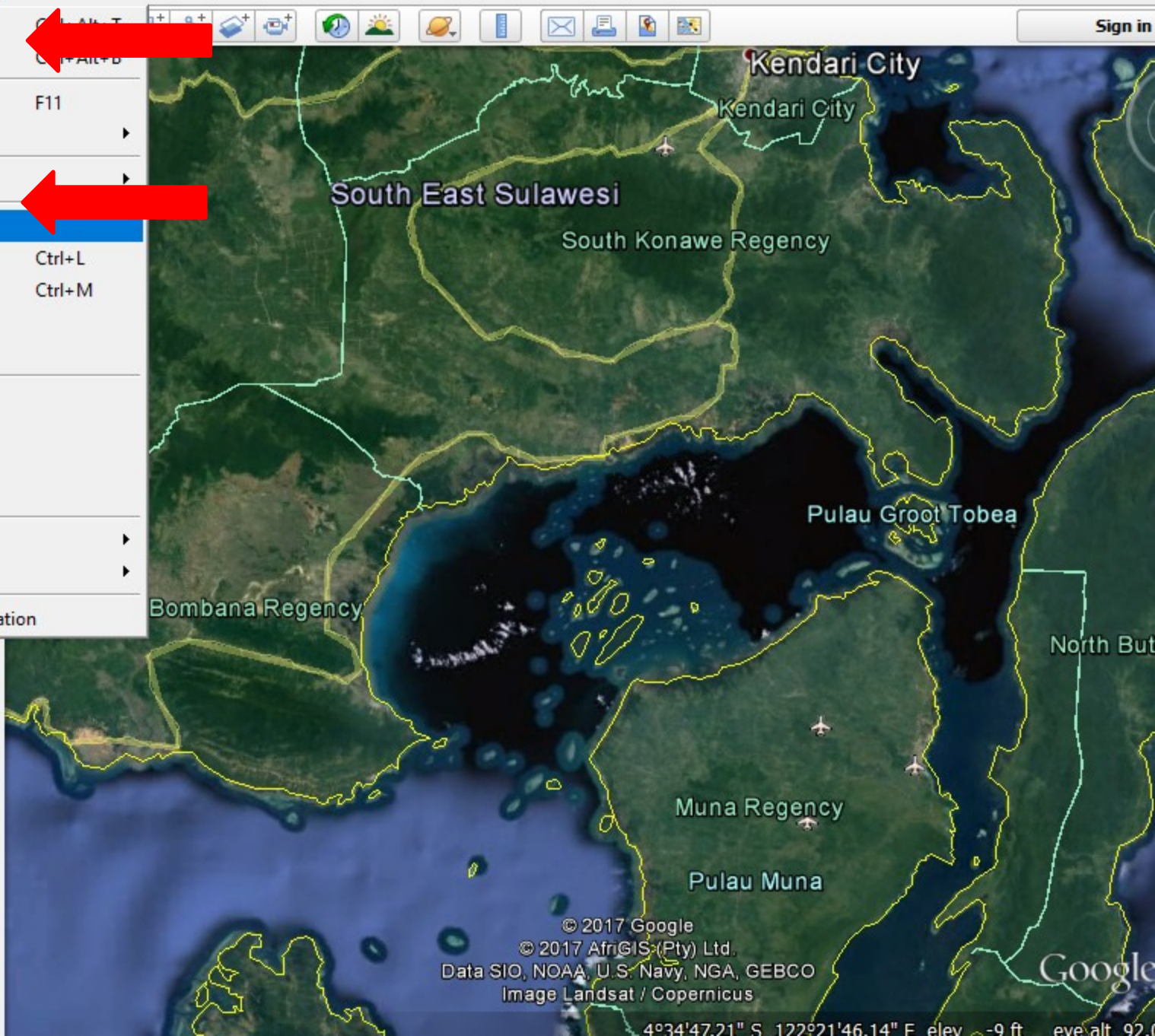
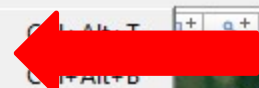
Places

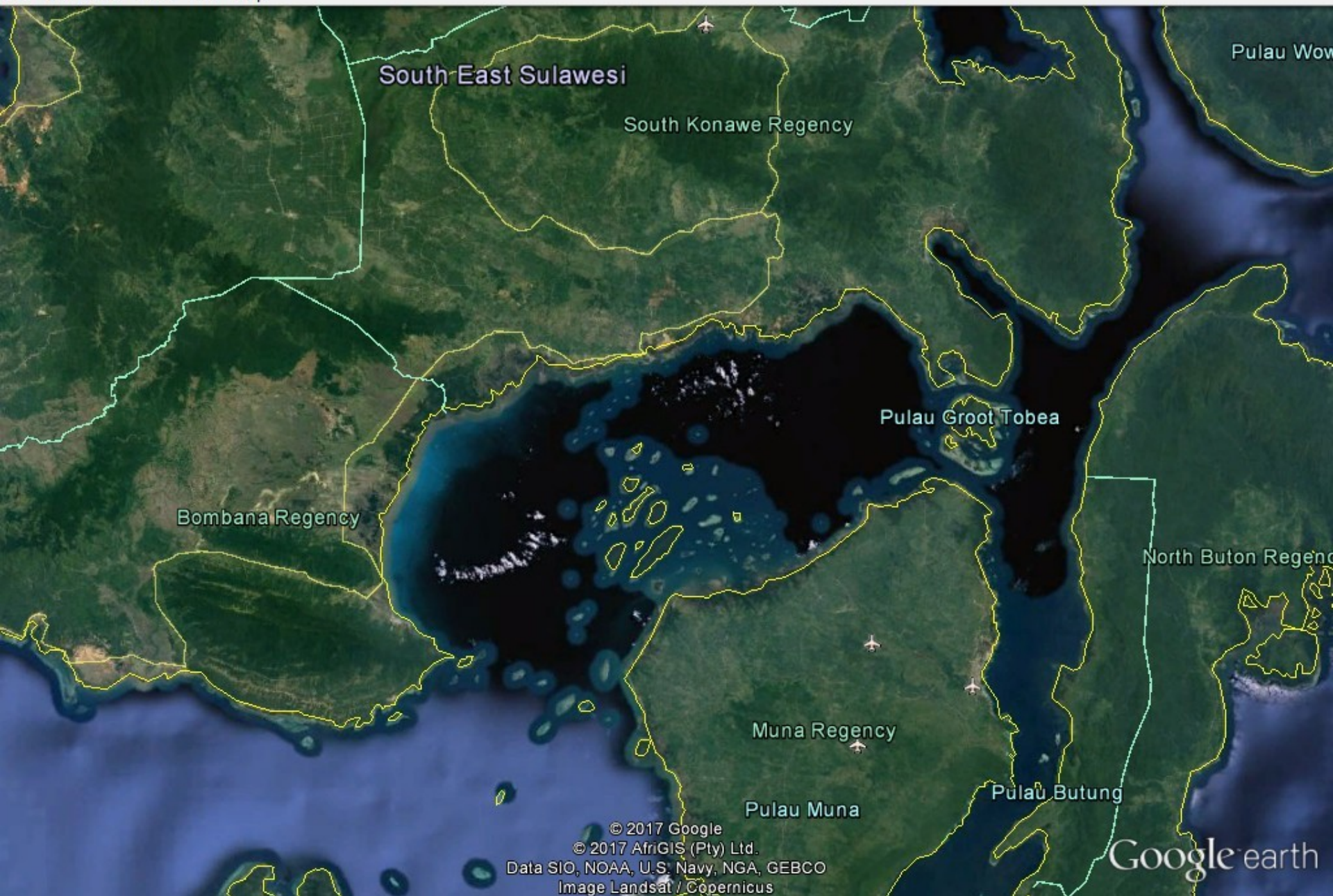
Layers

- Primary Database
- [The new Google Earth](#)
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More
- Terrain

View

- Toolbar
- Sidebar
- Full Screen F11
- View Size
- Show Navigation
- Status Bar**
- Grid Ctrl+L
- Overview Map Ctrl+M
- Scale Legend
- Tour Guide
- Atmosphere
- Sun
- Historical Imagery
- Water Surface
- Explore
- Reset
- Make this my start location





South East Sulawesi

South Konawe Regency

Pulau Wowa

Pulau Groot Tobe

Bombana Regency

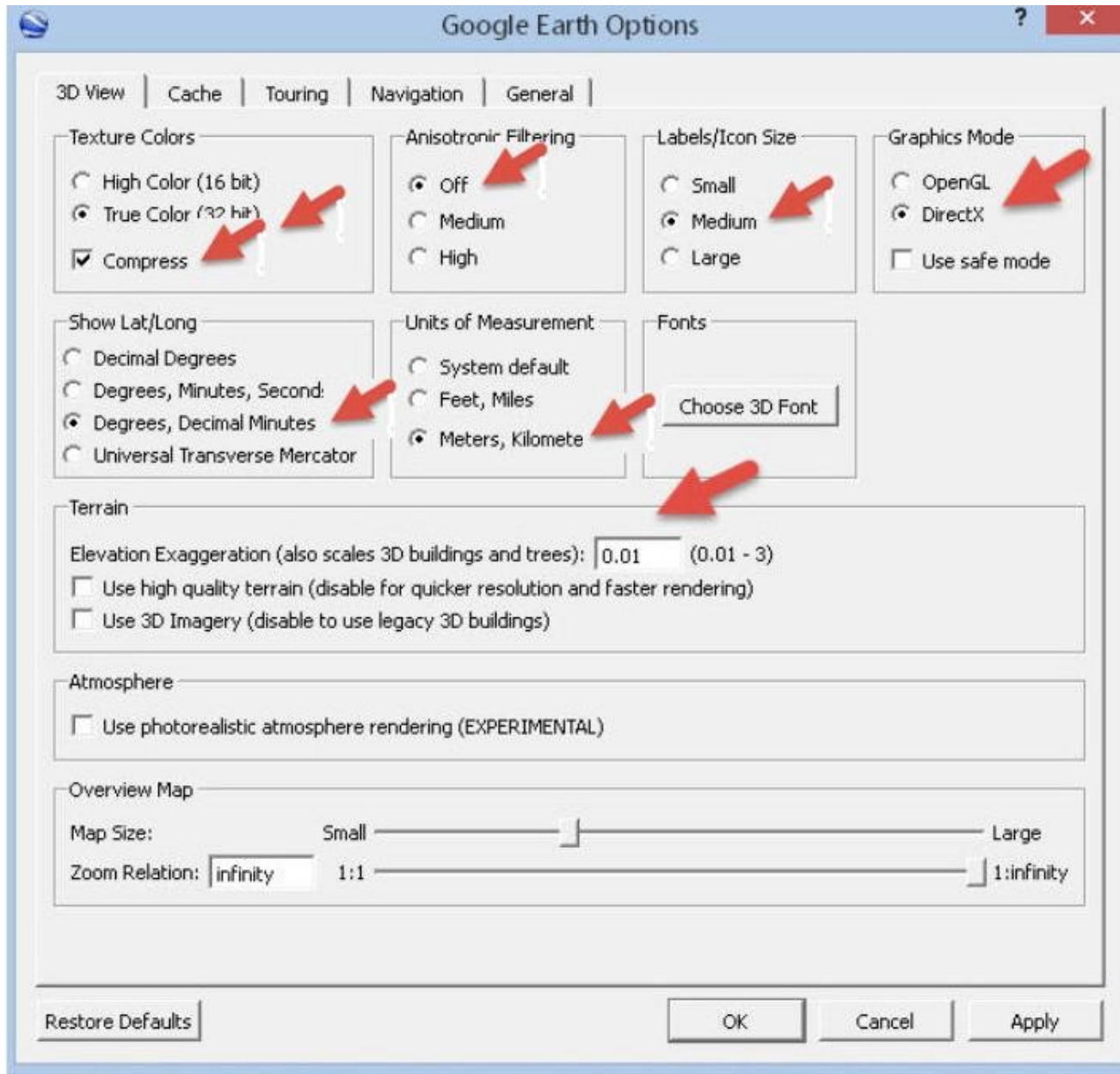
North Buton Regency

Muna Regency

Pulau Muna

Pulau Butung

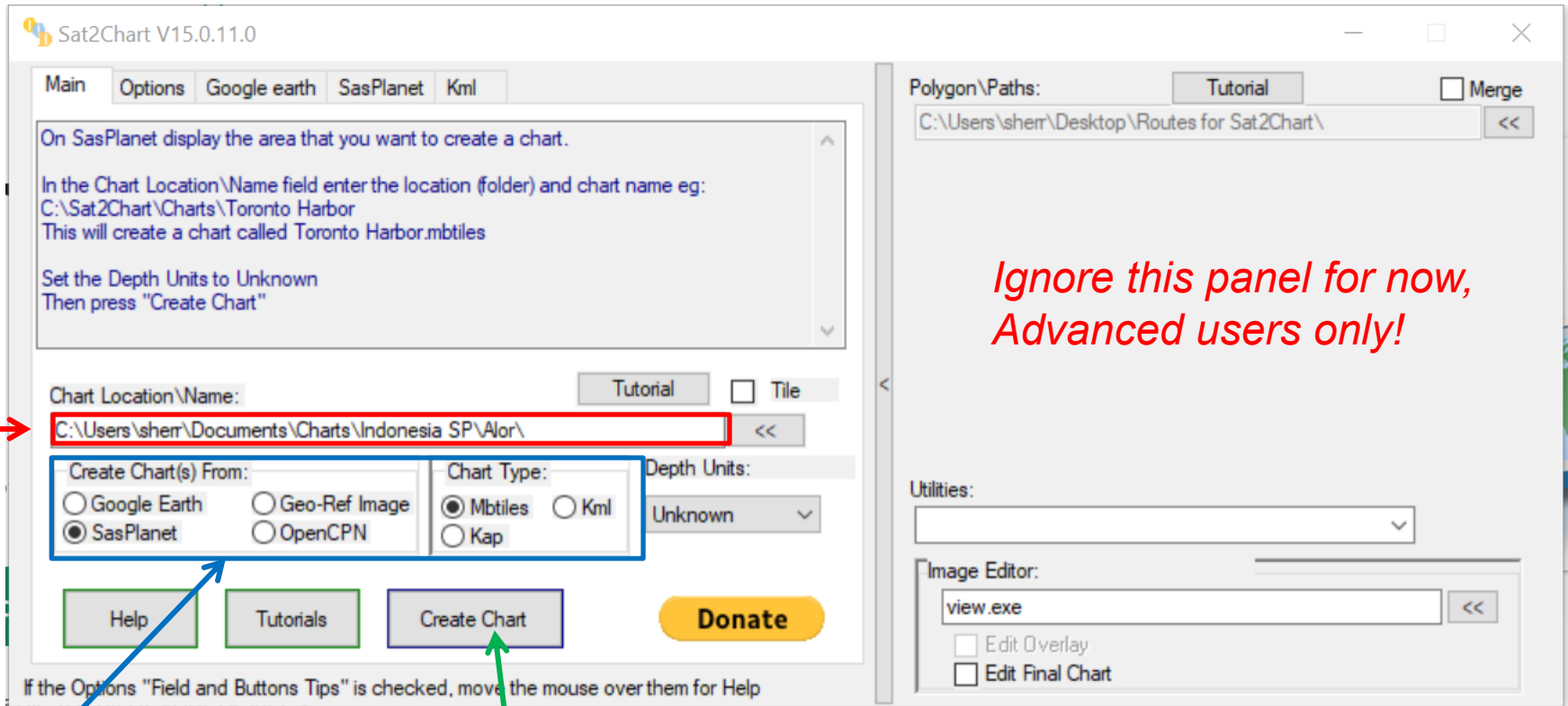
A Few Quick Settings Changes



Steps to make a Chart from GoogleEarth/SAS Planet

- Open Sat2Chart
- Select folder to save chart
- Name chart-to-be
- Check mbtiles vs KAP setting
- Click a button -> Creates an mbtile or KAP file (satellite chart file)
- Tell your chart program to load it

Sat2Chart is Simple!



*Ignore this panel for now,
Advanced users only!*

Specify Path (to save chart) & filename
Select options
Click "Create Chart"

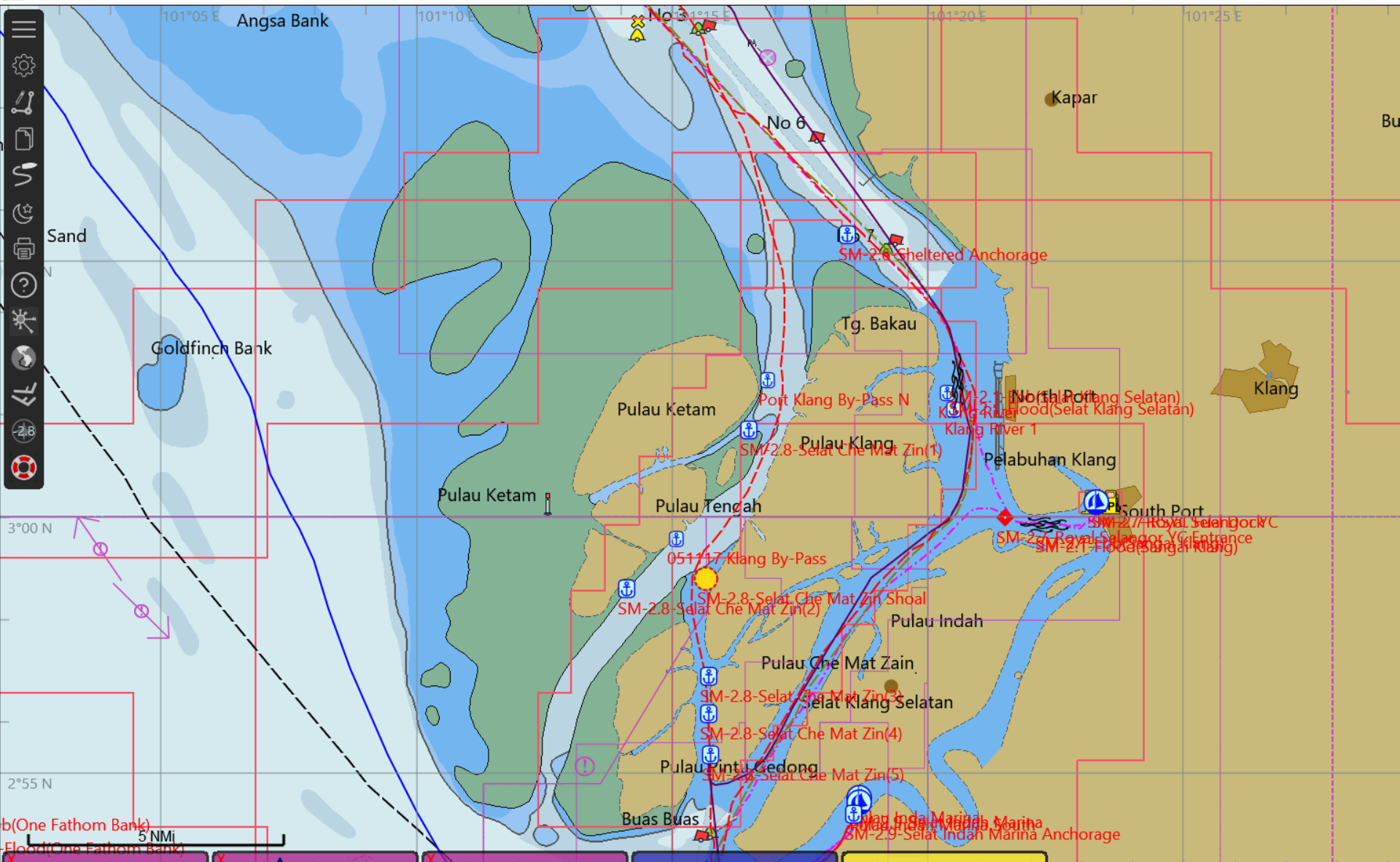
Advanced Sat2Chart Features

- Make multiple charts along a course, or within a circle--great for coastlines or rivers
- Merge multiple small charts into one big chart
- Overlay chart on OpenCPN (blended chart)

- Alternative to Sat2Chart:
www.venturefarther.com

KAP vs mbtiles format

- KAP format
 - Charting standard, works with several computer navigation programs
 - Limited to 256 colors
- mbtiles
 - Only supported in OpenCPN 5.0 and above
 - Significantly better for high quality imagery
 - Must “turn on” each chart in OpenCPN



Available mbtiles charts

Available KAP charts

Cmap "base" chart

GoogleEarth vs SAS Planet

- GoogleEarth
 - Easier to use (less flexibility)
 - Updates to GE cause problems
 - Limited to JUST Google imagery
 - Infinite / specific altitude settings
 - Many layers and overlay capabilities

Note: GoogleEarth is no longer the preferred mechanism for making satellite charts!

GoogleEarth vs SAS Planet

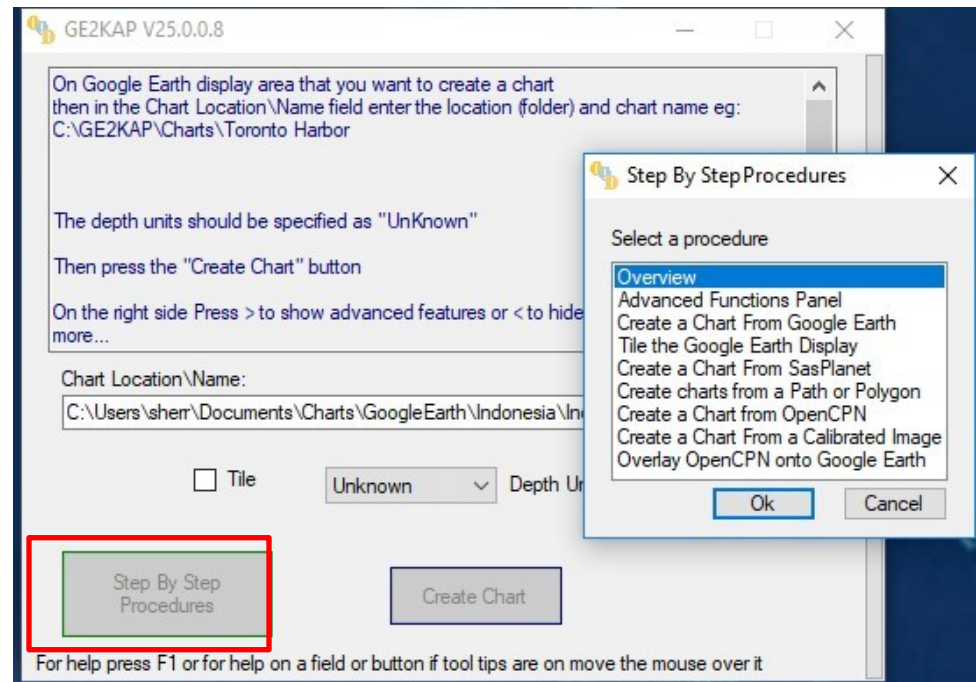
- SAS Planet
 - High flexibility
 - Multiple imagery sources
 - YOU decide when to delete imagery saved on your hard drive
 - User interface is a little quirky, but easy to use once you get the hang of it.

Downloading & Installing GoogleEarth & SASPlanet

- Use only the GoogleEarth Pro version from Sat2Chart site (newer GE version blocks Sat2Chart interface)
- Use SASPlanet version from Sat2Chart site (pre-configured for Sat2Chart settings)

Sat2Chart & OpenCPN Tutorials

- Terry (Valhalla)
- Sherry (Soggy Paws)
- Ocelot's excellent tutorial
- Embedded in Sat2Chart, and downloadable from Sat2Chart site for offline viewing.



Sources of Pre-Made Satellite Charts

- Bruce Balan's Chart Locker (mbtiles)
- Terry on Valhalla (SE Asia & W Pac)
- Sherry on Soggy Paws (Fr Poly to SE Asia)
- Jon on Ocelot (SE Asia) (bring hard drive)
- Mike on Zen Again
- Rally Groups (Puddle Jumpers)
- Other Cruisers' hard drive swap
(links to sites provided at the end)

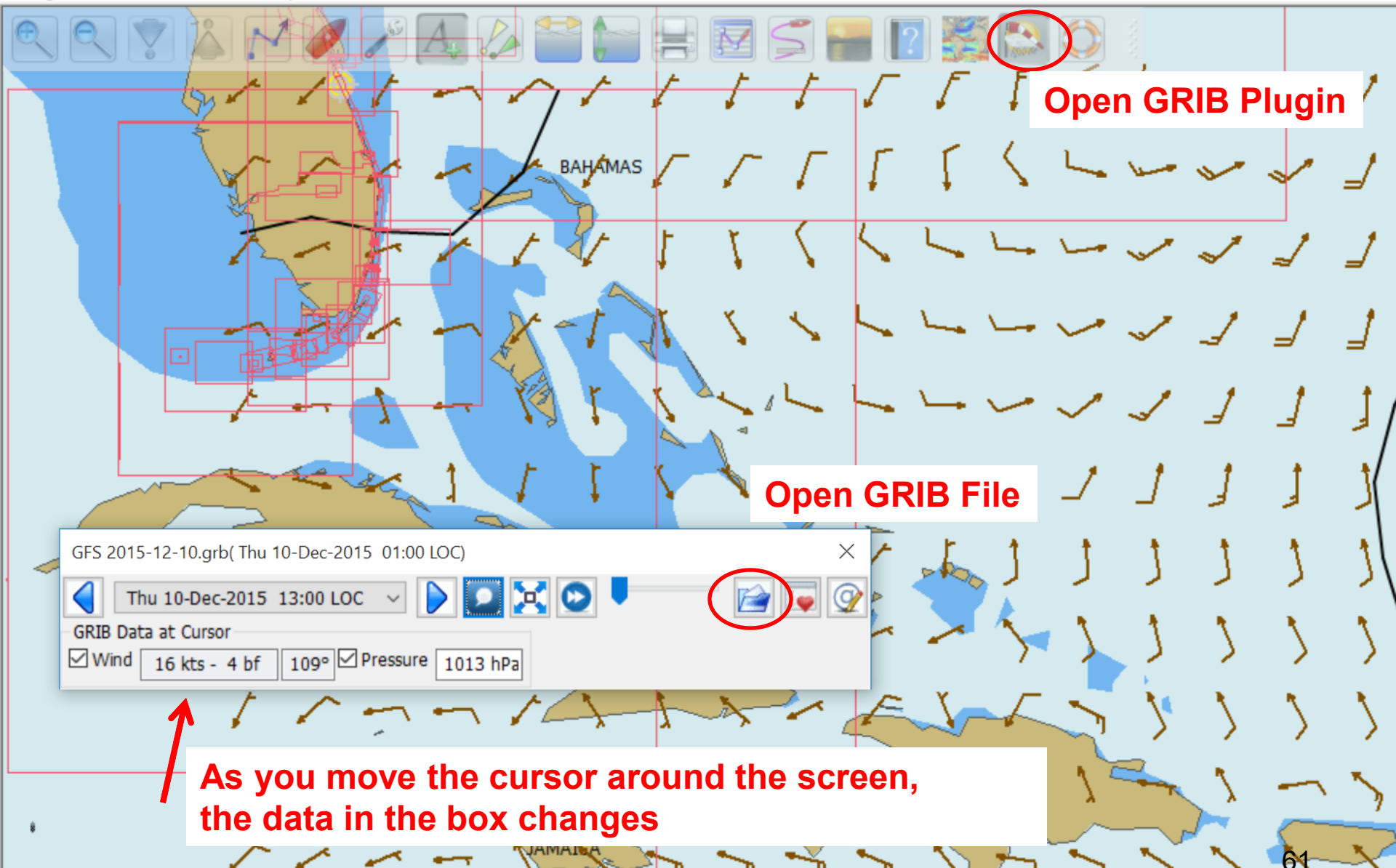
Choosing a Charting Program

- Are you held captive??
- Chartplotters = captive, expensive, ruggedized
- Time Zero (ex Nobeltec) = captive, expensive
- Most tablet apps = captive, cheap
- OpenCPN = OPEN!, free!

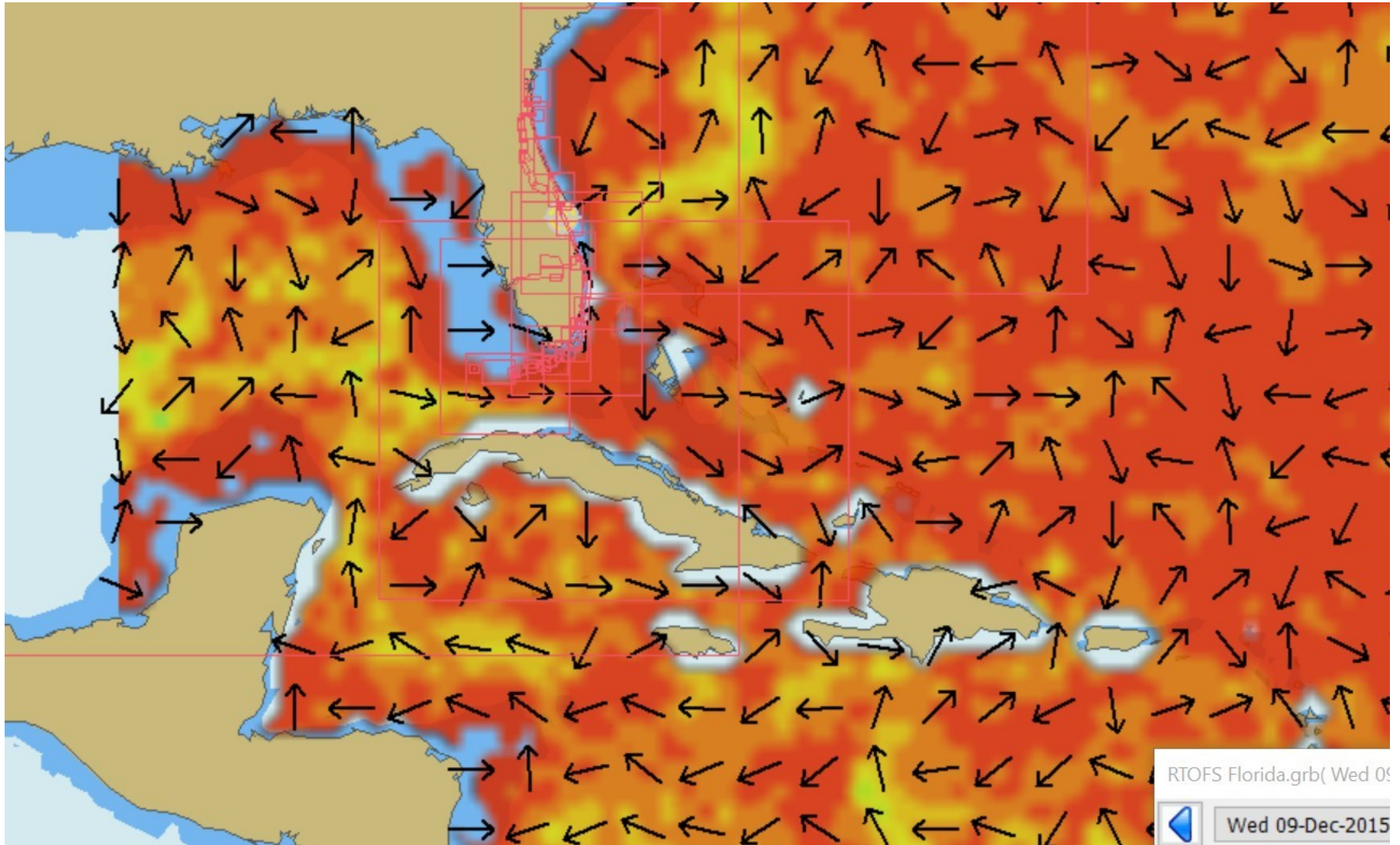
Benefits of OpenCPN

- Free, free, free
- Runs on almost everything (exc iPad ☹)
- Supports many chart formats
- Great for sharing tracks and waypoints (gpx)
- Permits adjustment to CM93 v2 Charts
- Good website and extensive help
- Many, many plug-ins to add functionality

Open GRIB Plugin



RTOFS (Grib File) Display



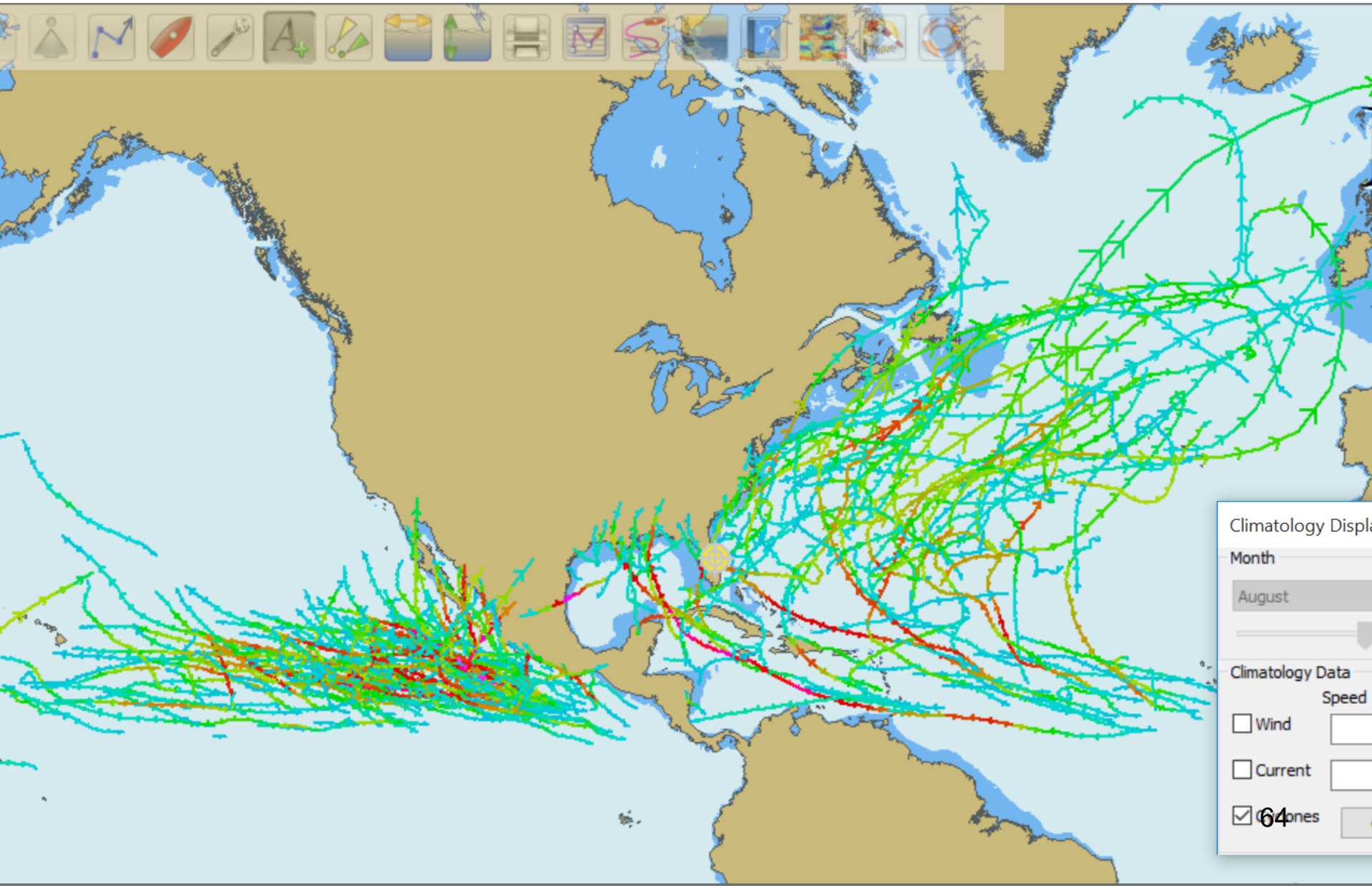
RTOFS = Grib file for current data

Climatology Plugin

- Pilot charts overlaid on your chart
- Updated with fairly recent data
- Wind, currents, and tropical storm tracks
- Traditional wind rose display, or wind barbs

“Climatology data is generally averaged since the 1980's depending on data type and sources available (for example, Wind data is averaged 6 hr data since 1987)”

Where is a Safe Place to Be In August?



More OpenCPN Plugins

- Radar overlay (Garmin & Navico)
- Weather Routing
- Create your Polar file
- Voyage Data Recorder
- Stowage Manager
- Logbook Function
- NMEA Instrument Display
- Squidio – Alternative to Active Captain

Rugged Laptops for OpenCPN



10 inch screen, \$425
13 inch screen, \$450
Free shipping

1.2 ghz processor

80 gb HDD

2 gb RAM

External GPS antenna

12 volt power supply

Linux OS

Pre-loaded w/ OpenCPN & some charts

Accuracy of the GPS

- Does your tablet **HAVE** a GPS?
(older wifi-only, maybe not)
 - Recommended: Bad Elf Bluetooth GPS
- Backup/easy USB GPS for laptops
 - GlobalSat BU-353-**S4** USB GPS Receiver
 - Windows 7, 8, 10
 - Linux
 - Raspberry Pi
 - \$27 on Amazon, with Prime

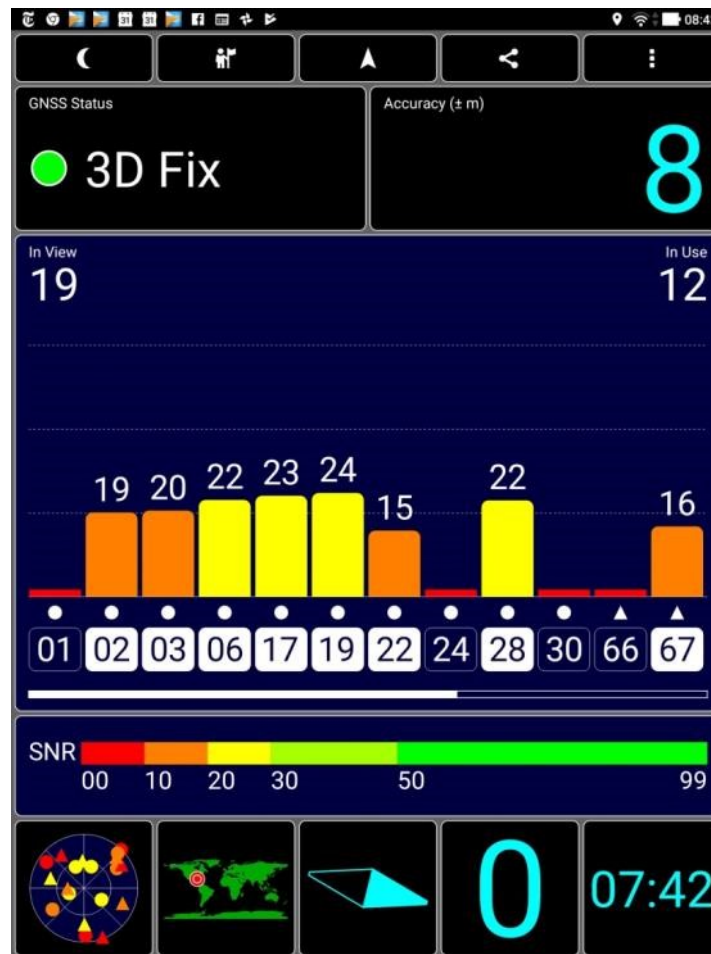


Accuracy of the GPS

- Understand the limitation of your GPS
- Time to acquire fix varies widely
 - How many receivers it has (8,12,48 channels)
 - How long since last use
 - How far away from last use
 - Signals blocked (cabin, trees, buildings)
 - Newer devices can perform significantly better

Android program “GPS Test”

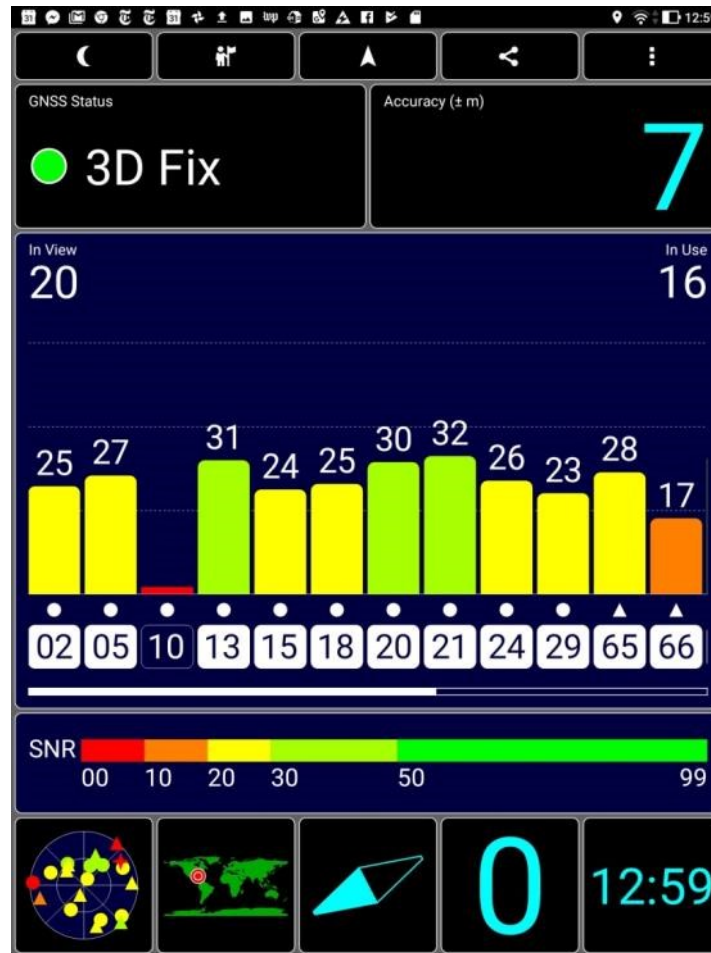
Inside building
Marginal SNR
Not many sats



METERS!

Android program “GPS Test”

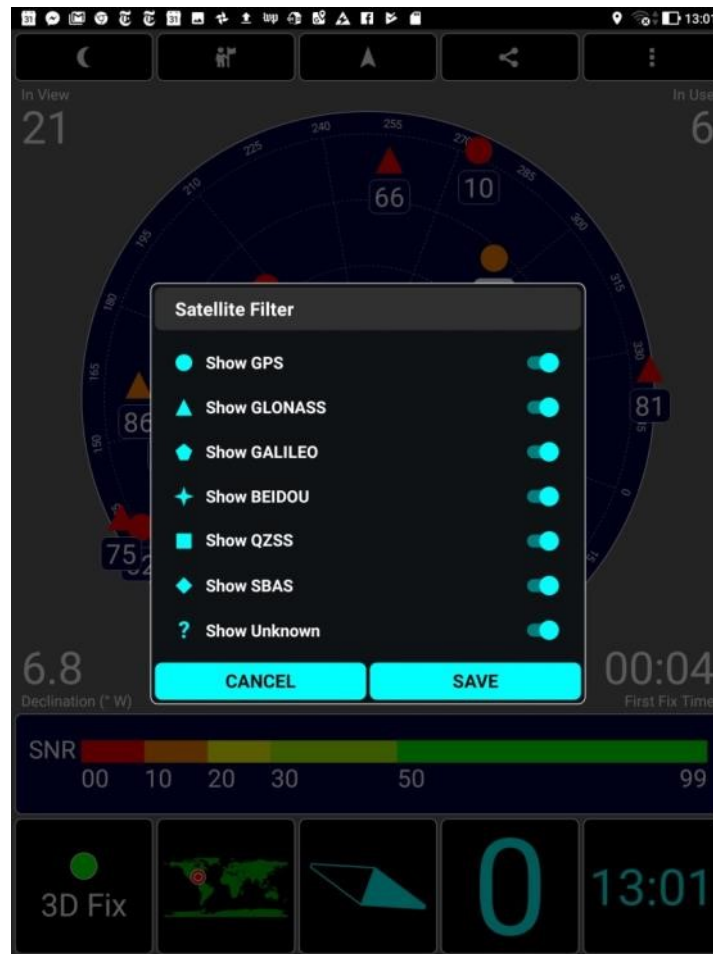
Outside buildings
OK SNR
More sats



METERS!

Android program “GPS Test”

What Satellites
to Display



Entering a new Area?

How to Check Your Chart

- Accuracy
 - Plot a known set of waypoints
 - GPX / Friend you trust / Satellite / Guidebook
- Detail
 - Check vs other sources
- Plot route and check at low level
- If you change your route, check your **NEW** route at low level

Entering a new Area?

What Charts to Use?

- ASK “what are the best charts for...”
- Make sure you validate
 - Chartplotter, tablet, or computer
 - What “generation” of chart
- Ask people who “go places”
- Harbor charts for busy ports are almost always accurate everywhere
- The further off the beaten path, the more likely the charts will be inaccurate

If You're Stuck Navigating Unfamiliar areas at Night

- Consider: Heave to and enter in daylight
- If you must go in...
 - Prior prep makes this option much safer
 - Satellite (GE) charts
 - Trusted tracks and waypoints
 - Check and double-check
 - Charts, waypoints, routes, depths
 - Use other validation methods
(radar, depth sounder)
 - Mark I eyeballs! Spotlight at night

The Bottom Line

- Know the true accuracy of your GPS device
- Plot a detailed route and examine for anomalies
- If your route changes, examine it again
- Don't sail around reefs at night!
- Use all the tools available
 - Paper charts
 - Electronic charts from several sources
 - GoogleEarth & other satellite charts
 - Other cruiser's tracks and waypoints
 - Cruising guides

The Bottom Line

- Double check your waypoints
- One caution about “Electronic charts from several sources (make sure they are different sources)”
 - The Grib File / Weather Forecast analogy



The End
www.SVSoggyPaws.com

Questions?

Sources of Charting Tools/Info

- Paul's Sat2ChartProgram
<http://www.gdayii.ca/>
<https://www.gdayii.ca/Downloads/>
- OpenCPN
<https://opencpn.org/>
- Guru Maps (Satellite imagery for iDevices only)
<https://gurumaps.app/>
- All-In-One Offline Maps (Android Only)
<https://play.google.com/store/apps/details?id=net.psyberia.offlinemaps>

Sources of Charting Tools/Info

- Terry (Valhalla) Charts, Waypoints, Guides, etc
<http://svsoggypaws.com/terrystopics.htm>
- Soggy Paws' Website
<http://svsoggypaws.com/satcharts/> Charts
(be sure to also click the link "Other chart sources")
<http://svsoggypaws.com/Presentations.htm> OpenCPN
- Ocelot's Website
How To: http://svocelot.com/Cruise_Info/Equipment/mbTiles.htm
Chart Downloads:
http://svocelot.com/Cruise_Info/Equipment/Chart_Downloads.htm
- Migration/Bruce Balan's Chart Locker:
<https://chartlocker.brucebalan.com/>

Sources of Charting Tools/Info

- Garmin's iPad Product (BlueChart)
 - Apple Store (Not currently available on Android ☹)
- Navionics Apps (iPad & Android)
 - Apple Store & Google Play
- Navigating with SAS Planet Directly
<http://outchasingstars.com/2017/07/15/using-sas-planet-navigate-uncharted-reefs/>
- USB GPS for Laptops [Amazon Link](#)
- <https://www.thoughtco.com/raster-vs-vector-charts-2915534>
- <https://www.nauticalcharts.noaa.gov/csdl/seamlessraster.html>