Storm Surge on a Coral Atoll: The Case of Fongafale Islet in Tuvalu

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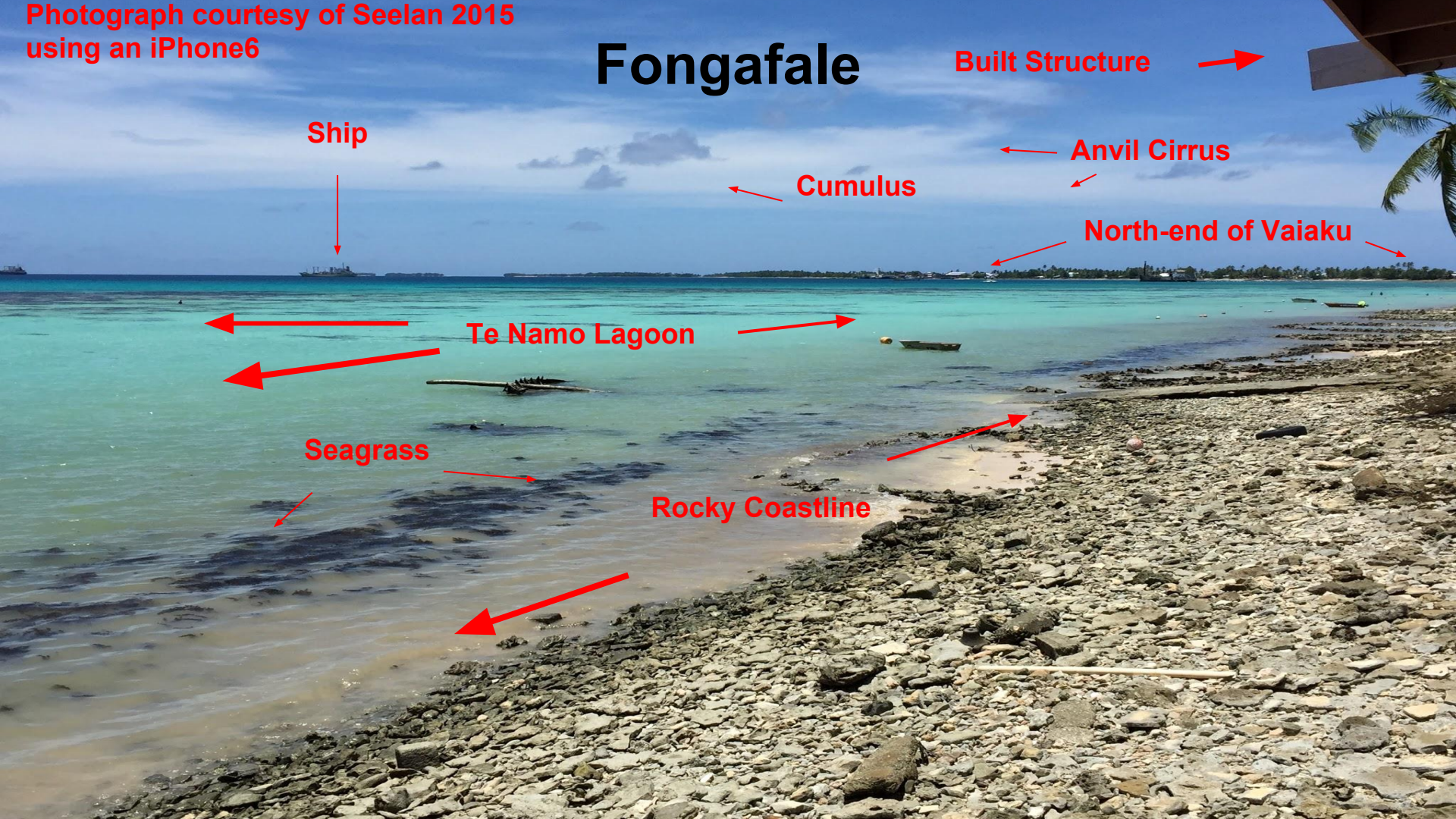
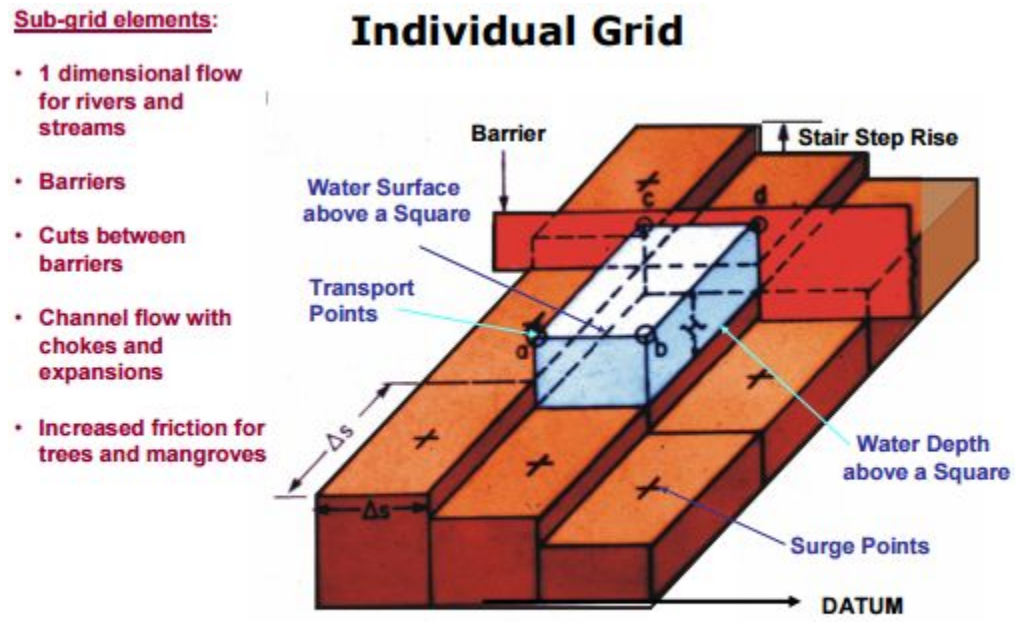
UND
8 April 2016


Photograph courtesy of Seelan 2015
using an iPhone6
Fongafale
Built Structure
Ship
Anvil Cirrus
Cumulus
North-end of Vaiaku
Te Namo Lagoon
Seagrass
Rocky Coastline

Methods — Key Problem



NOAA (2016)

Elevation

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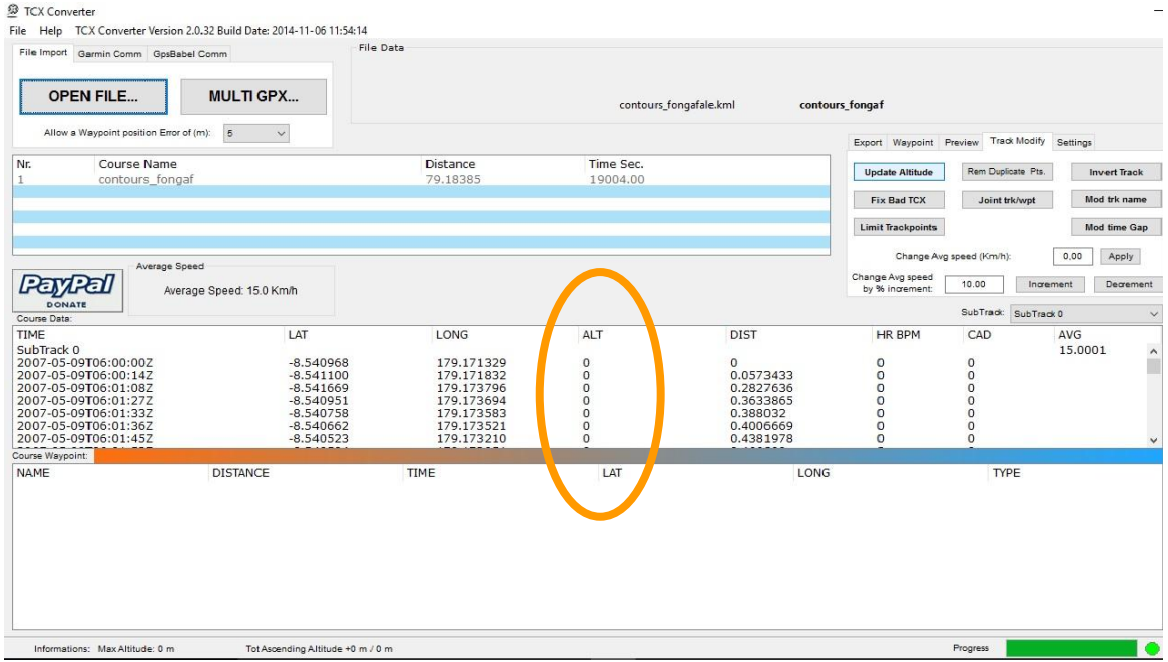
Google's EGM96 Geoid developed for NASA

Google Earth 2014; Lemoine et al. (1998)

Elevation

Extracted elevation data from KML for ArcGIS using TCX Converter



Google Earth 2014; Lemoine et al. (1998)

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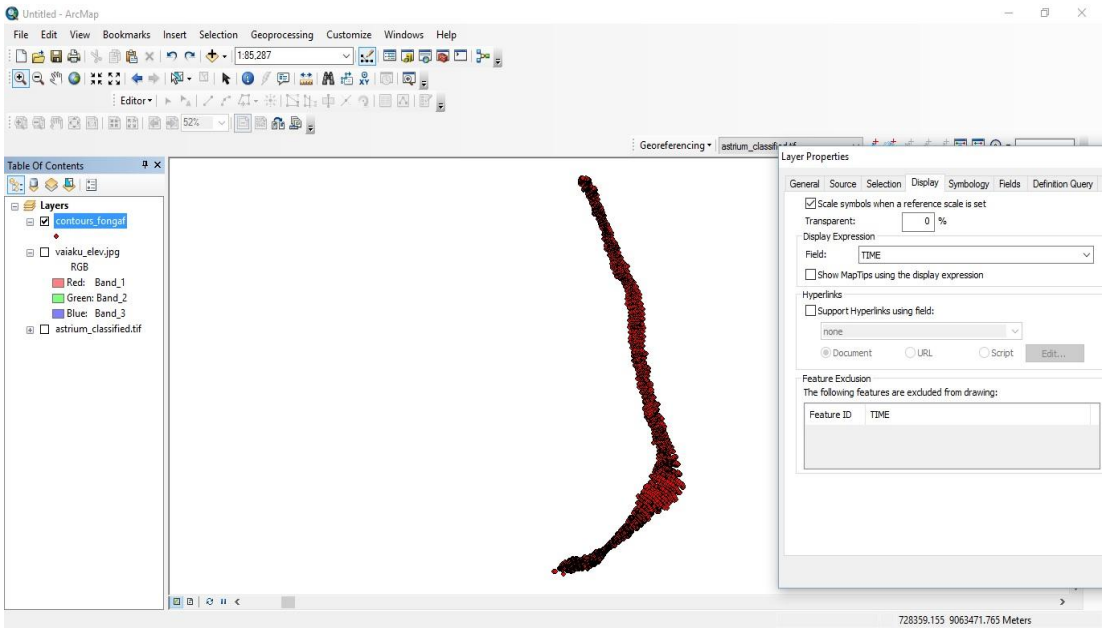
Mapped elevation points in ArcGIS



Google Earth 2014; Lemoine et al. (1998)

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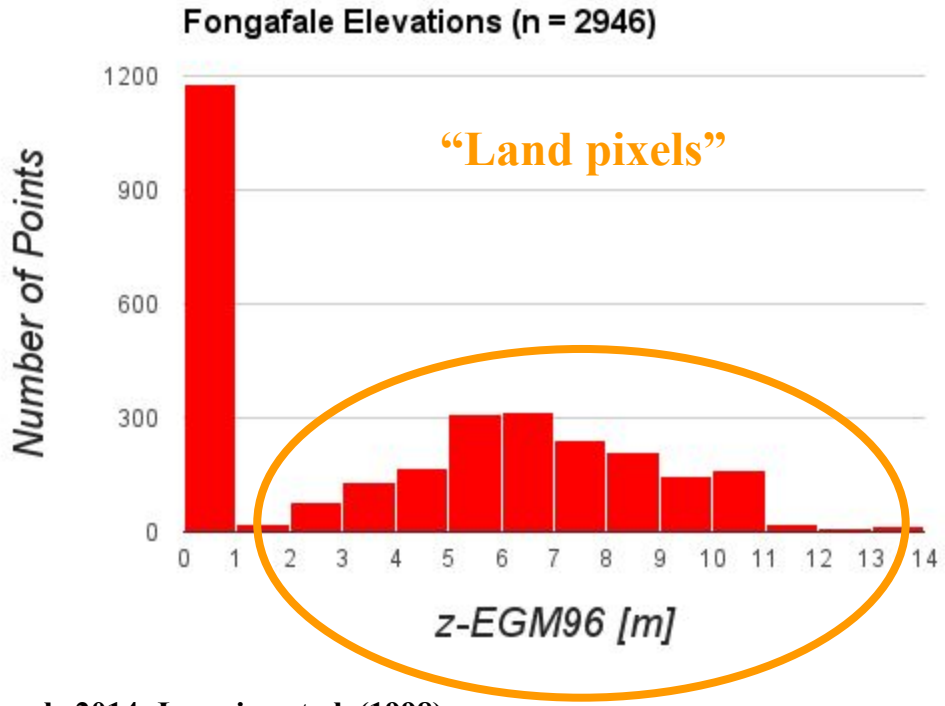

Google 2014; Lemoine et al. (1998)

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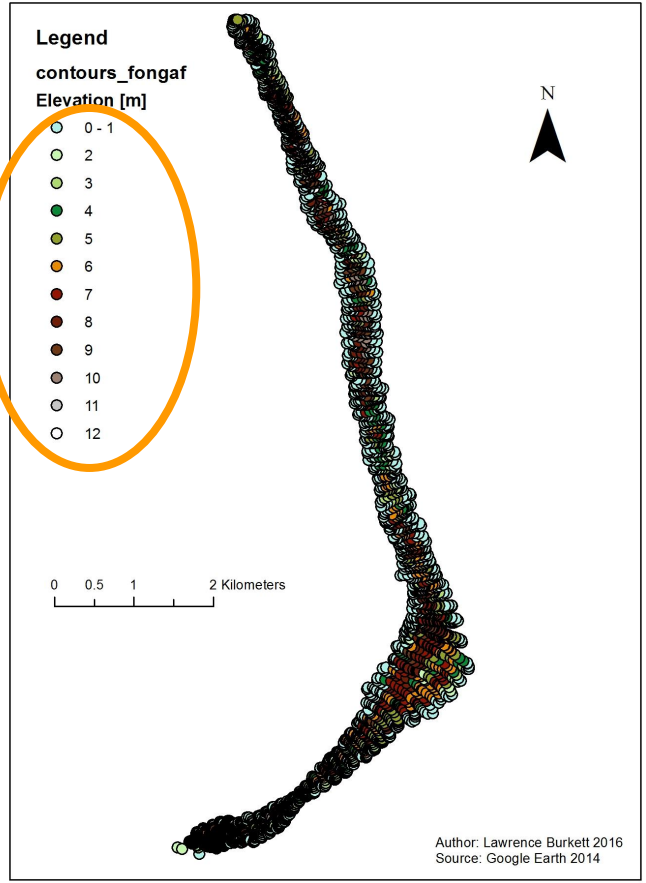
Elevations seem too high!

Elevation [m]

- 0 - 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12



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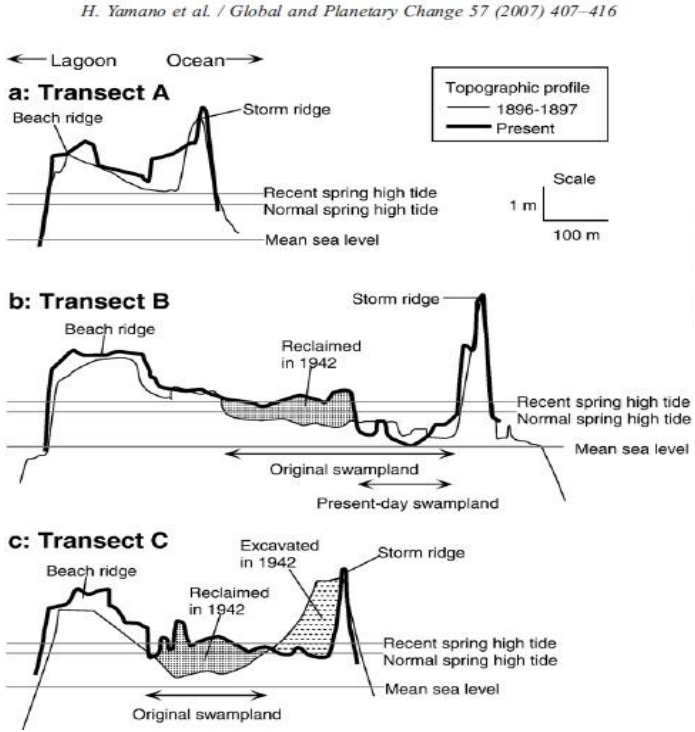
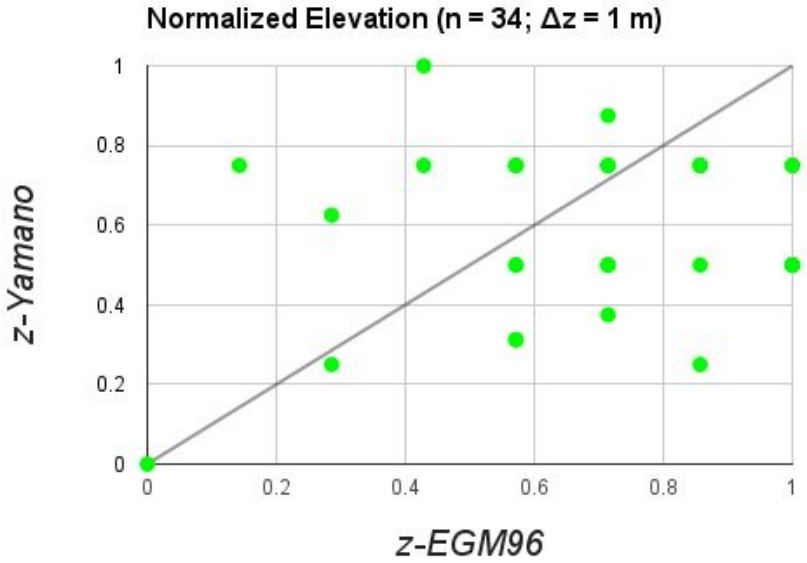
Compared with transects from a prior survey in 2004 that used a two frequency GPS base station and a one frequency GPS device



Yamano et al. (2007)

Elevation

$R^2 = +0.17$

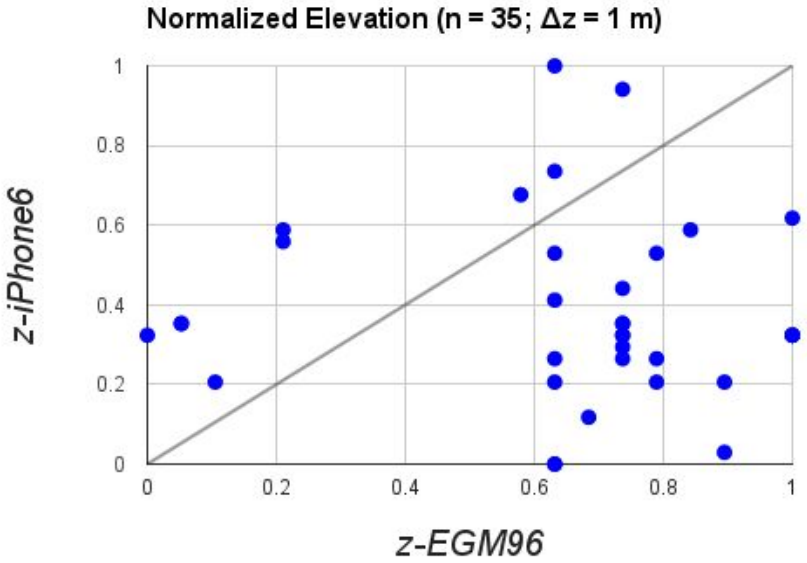


Google Earth 2014; Lemoine et al. (1998); Yamano et al. (2007)

Elevation

iPhone6 reports elevation but this is from a pressure sensor

$R^2 = -0.05$



Google Earth 2014; Lemoine et al. (1998); iPhone6 2015

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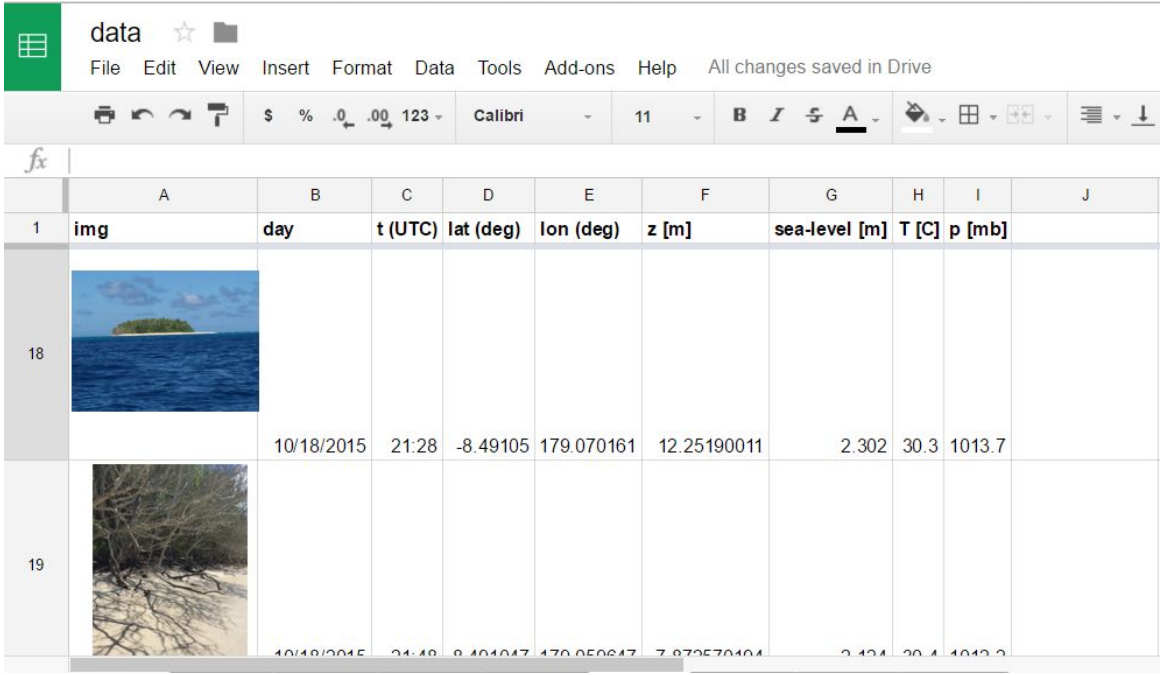
Attempting to correct elevations using altimetry



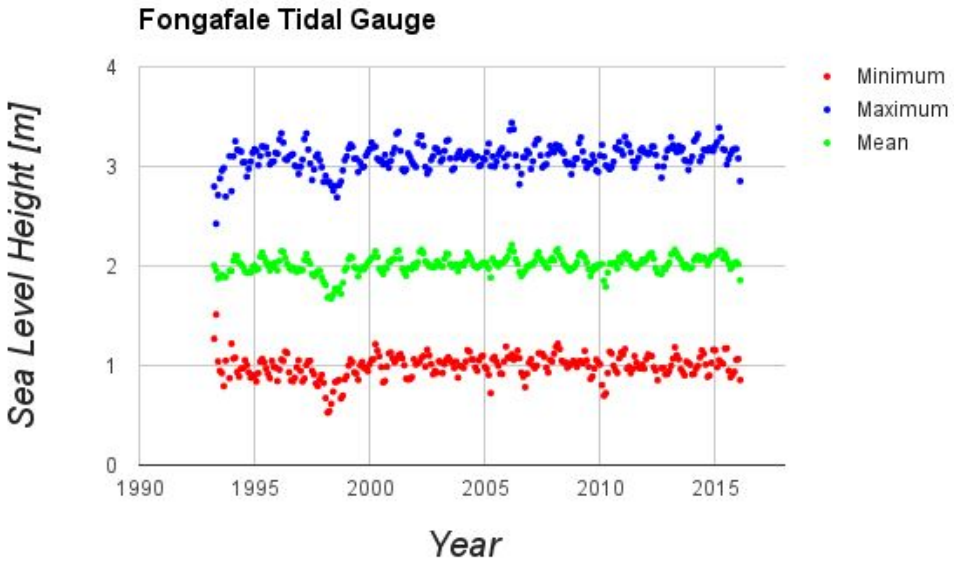
	A	B	C	D	E	F	G	H	I	J
1	img	day	t (UTC)	lat (deg)	lon (deg)	z [m]	sea-level [m]	T [C]	p [mb]	
18		10/18/2015	21:28	-8.49105	179.070161	12.25190011	2.302	30.3	1013.7	
19										

iPhone6 2015; Bureau of Meteorology (Australia) 2015

Ideally, an "away team" should be sent to GPS elevations — *goal*!

Elevation

Ultimately, tidal data mined will be "added" to storm surge



Bureau of Meteorology (Australia) 2016

Land Cover

Manually digitized polygons around buildings and the runway — infrastructure!

Google Earth 2014

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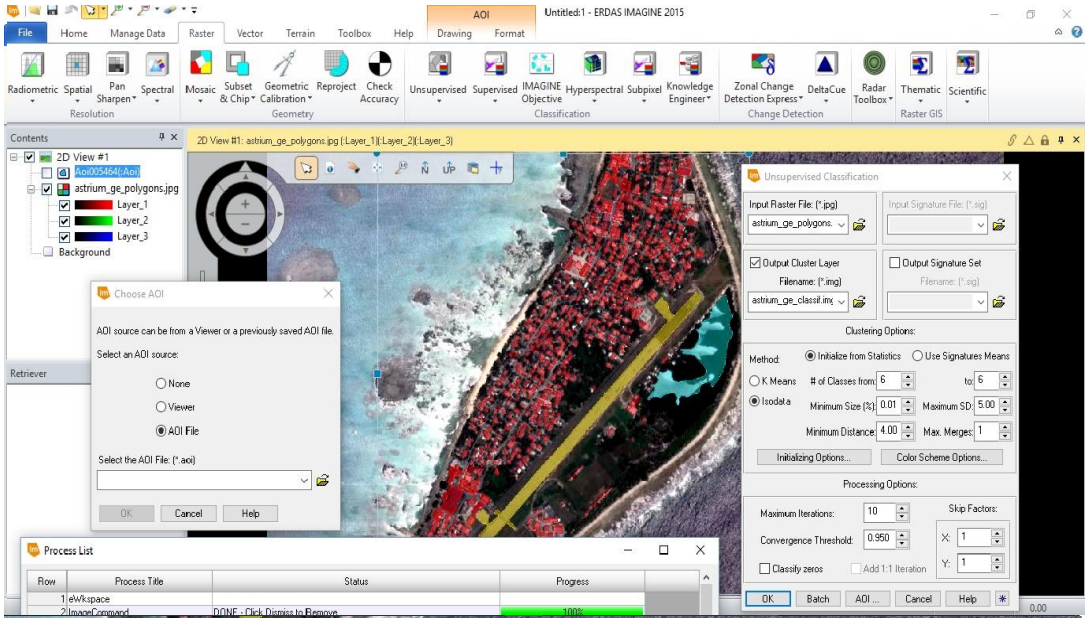
Used ERDAS Imagine to do image classification



Google Earth 2014

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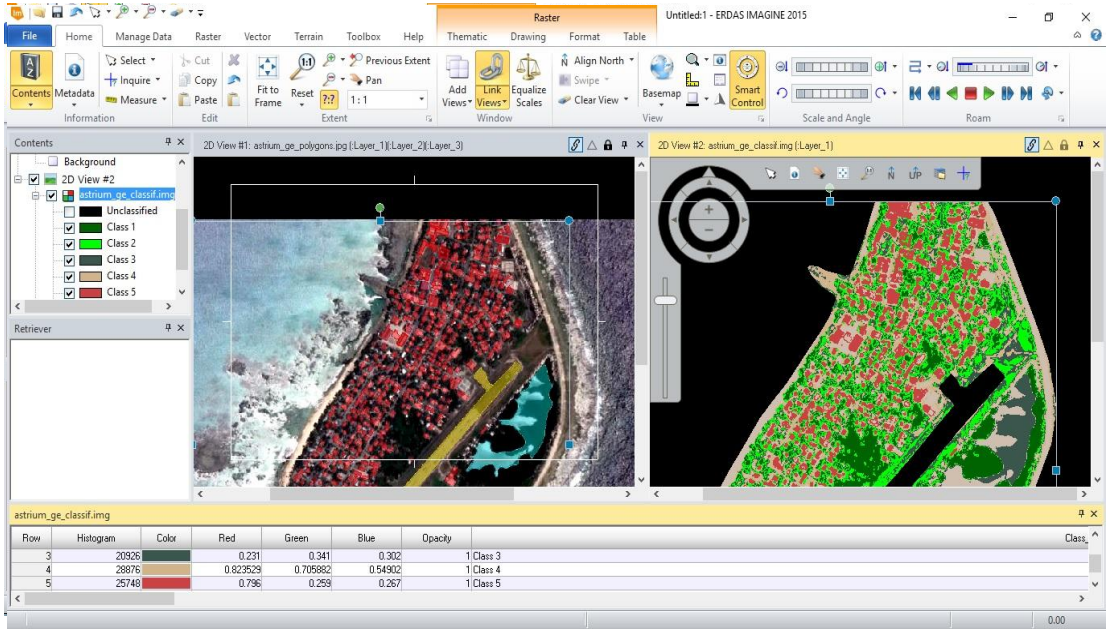
Ran an unsupervised isodata classification algorithm for remaining pixels



Google Earth 2014

Land Cover

Preliminary result — features ... need characterized in terms of importance and roughness

Google Earth 2014

Bibliography

“Abbreviated” listing

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Google Docs / Google Sheets / Google Slides, Google. Mountain View, California. https://www.google.com/docs/about/

TCX Converter, http://www.tcxconverter.com/TCX_Converter/TCX_Converter_ENG.html

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