14th and 15th January 2022 Hunga Tonga Hunga Ha'apai (HTHH) Volcano Generated Tsunami

'Ofa Fa'anunu

Director of Tonga Meteorological Services

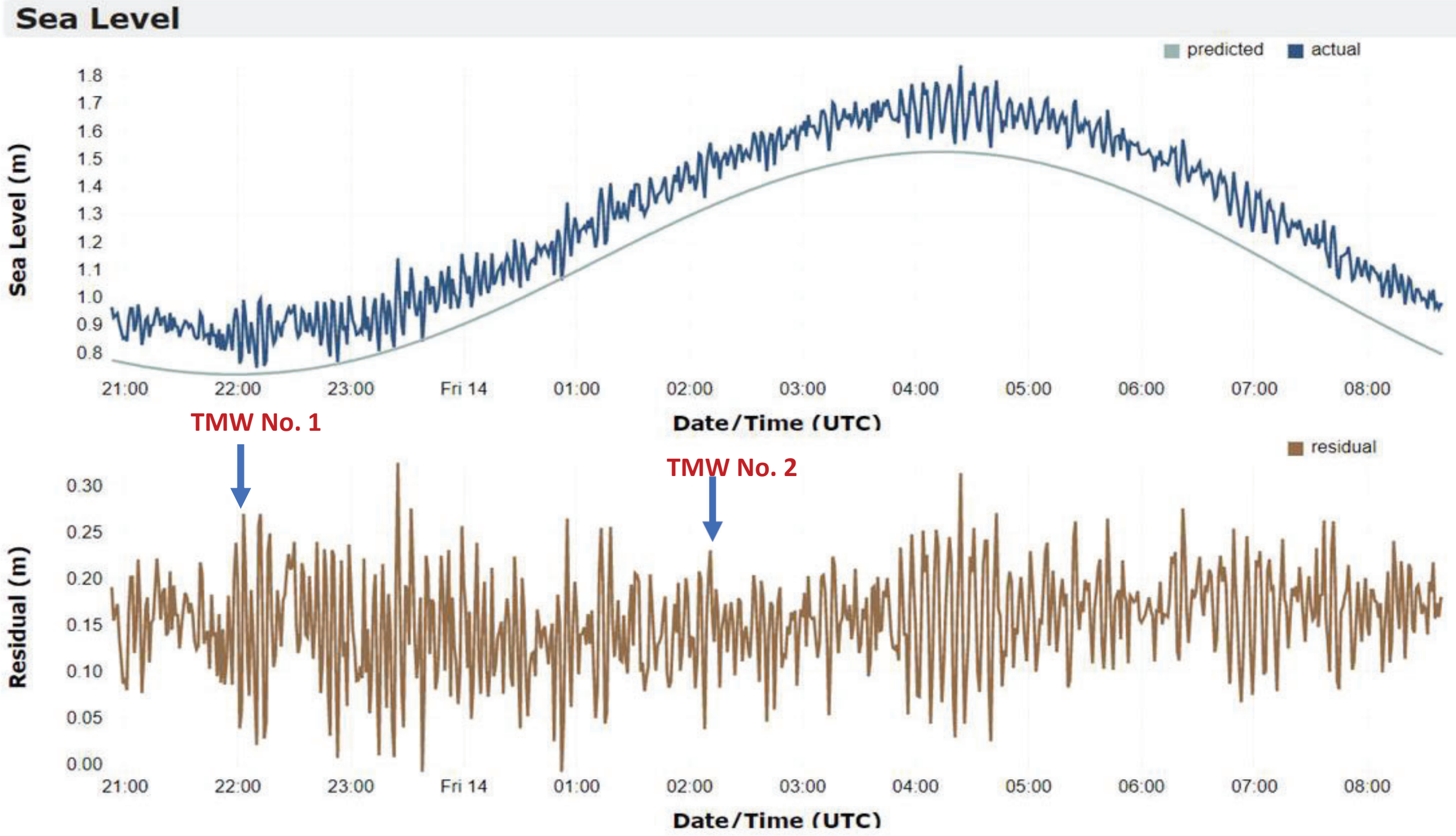
Two warning events based on Eruptions and subsequent Tsunami

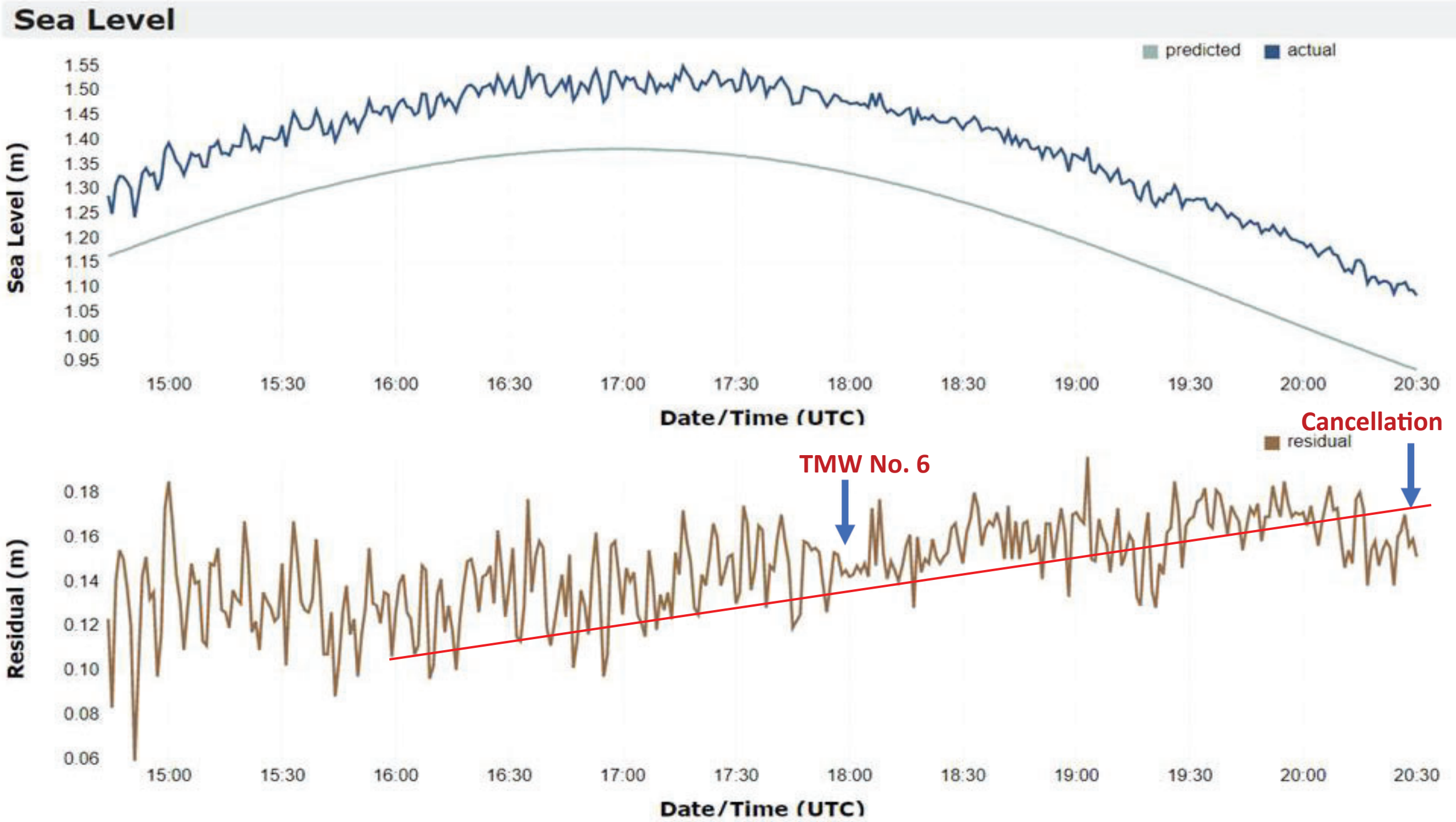
Event #1: 14th January 2022

Event #2: 15th January 2022

Event No 1 on 14th January 2022 timeline

7:00am	Moderate to Strong Sulphur Smell in Nuku'alofa
8:00am	Report of Ash Falls on Fonoi Island in Ha'apai
	Report of Ash Falls from the Inter island Ferry by Meteorological Officer on approach to Tongatapu
11:12am	**Tsunami Marine Warning No. 1** issued based on erratic tide changes from Mango Island in Ha'apai, Nuku'alofa Harbor area, and sea level readings on the Nuku'alofa
3:26pm	**Tsunami Marine Warning No. 2** cancel of warnings for Northern Tongan Islands remain in force for South Ha'apai, Tongatapu and 'Eua
10:00am(15)	**Tsunami Marine Warning No. 7** cancel of warnings for all Tonga


Sea Level
predicted
actual
Sea Level (m)
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
21:00
22:00
23:00
Fri 14
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Date/Time (UTC)
TMW No. 1
TMW No. 2
residual
Residual (m)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
21:00
22:00
23:00
Fri 14
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Date/Time (UTC)


Sea Level
predicted
actual
Sea Level (m)
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
Date/Time (UTC)
residual
Cancellation
TMW No. 6
Residual (m)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
Date/Time (UTC)

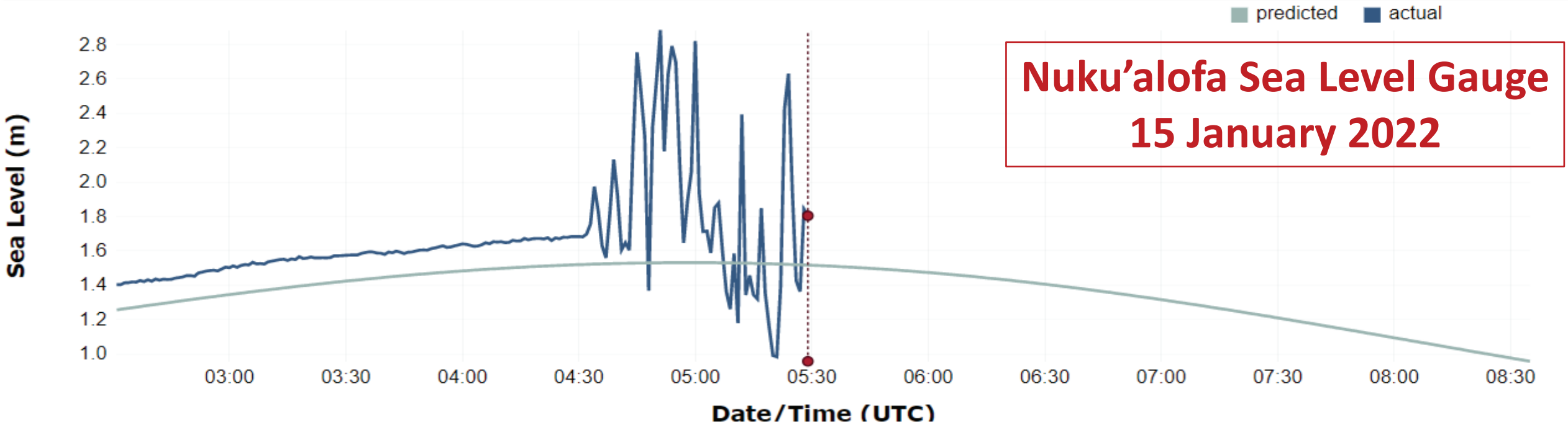
Event No 2 on 15th January 2022 timeline

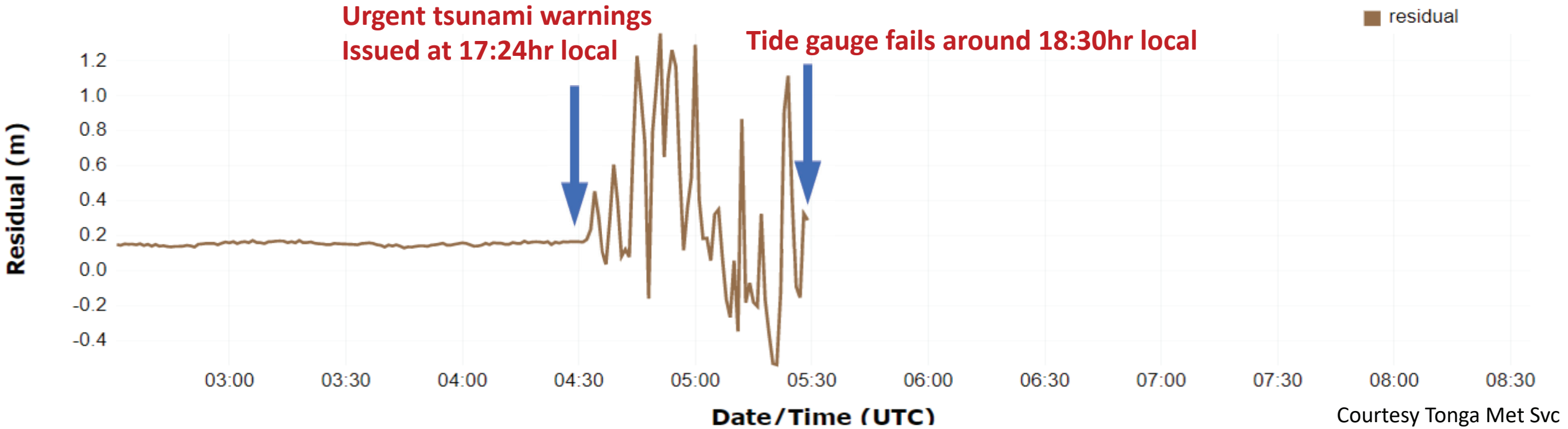
17:13hr	Eruption Observed from the MET Office
	Geological Office informed
17:23hr	Loud blast heard (Est. time) from HTHH. Ears pop.
17:24hr	**Urgent Tsunami Warning for all Tonga** issued on AM Radio with evac advice based on unusually loud volcanic blast by duty officer Sitamipa Paea. Repeatedly played by radio
17:45hr	**Tsunami Warning No. 1 for all Tonga** issued on AM Radio by Director with evac advice based on tide gauge readings
	(Radio briefing every 2hrs based on sat phone calls to VAAC Wellington)
01:48hr (16)	**Tsunami Marine Warning No. 1 for all Tonga** downgrade based on ocean observations by the Director of Geological Office

Event No 2 on 15th January 2022 timeline

01:48hr (16th) to 10am (17th)	**Tsunami Marine Warnings** warnings cancelled for Northern Tonga
13:00hr	**All warnings cancelled** by Deputy Director

Sea Level





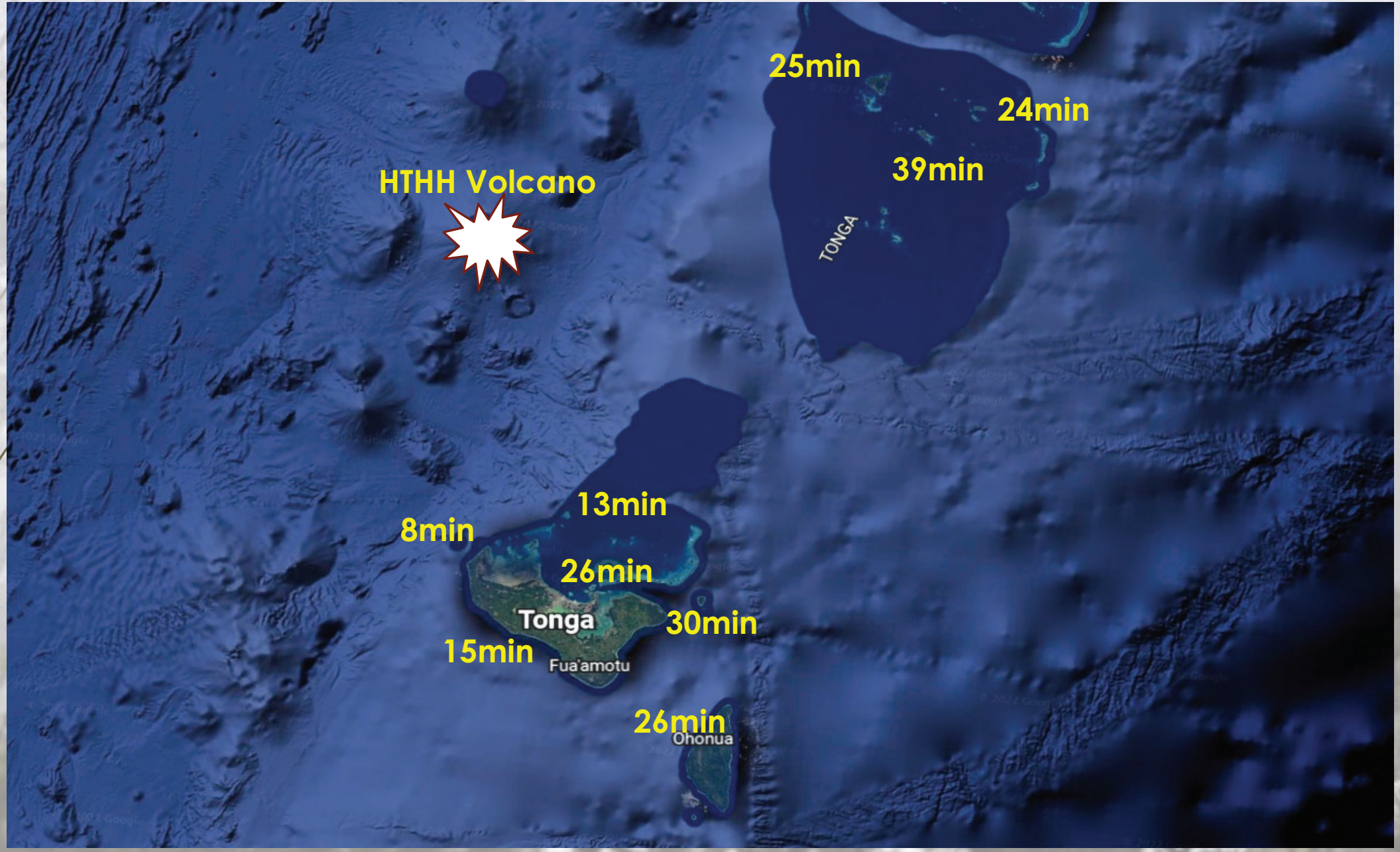
Courtesy Tonga Met Svc

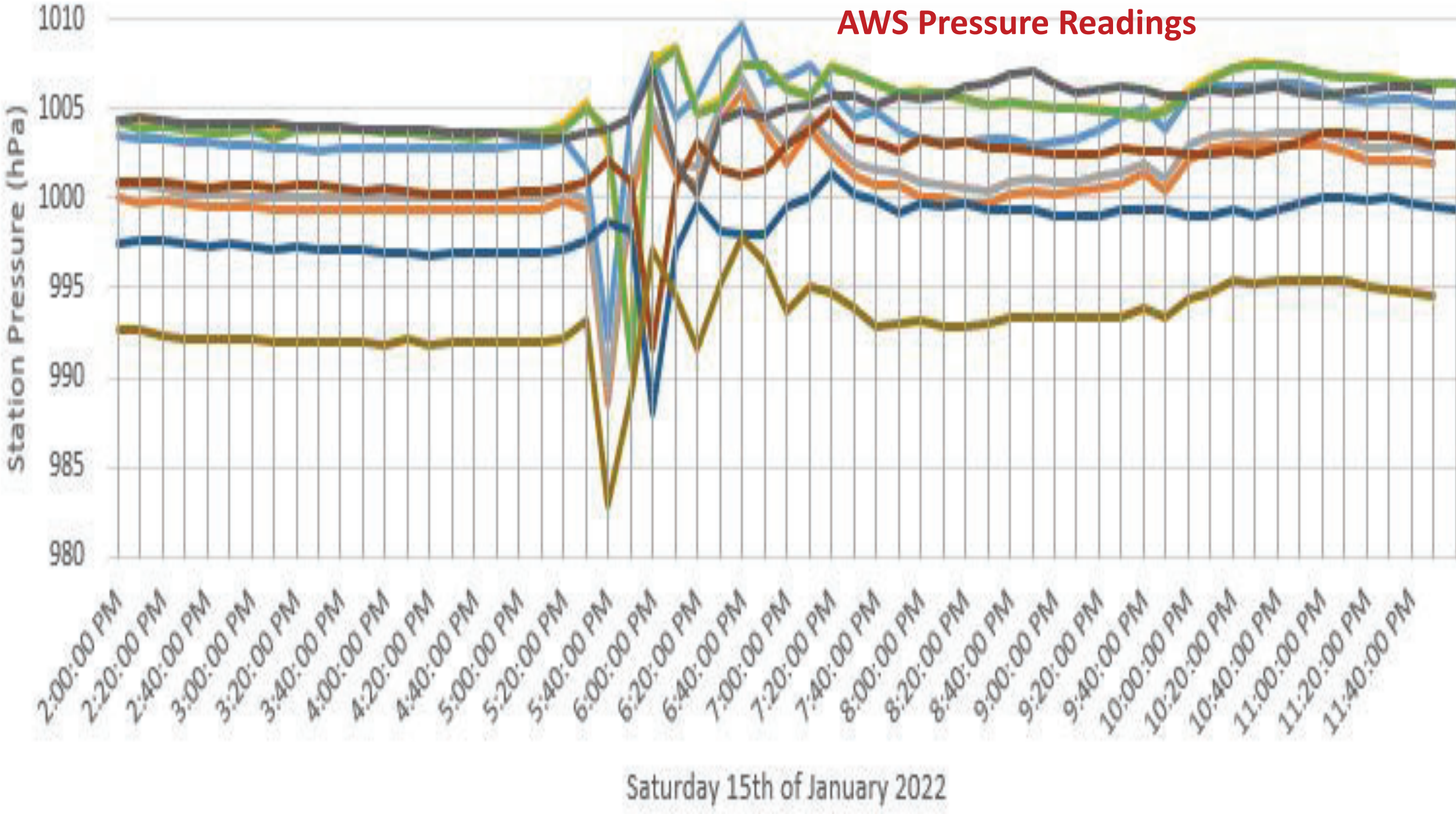
17:13hrs

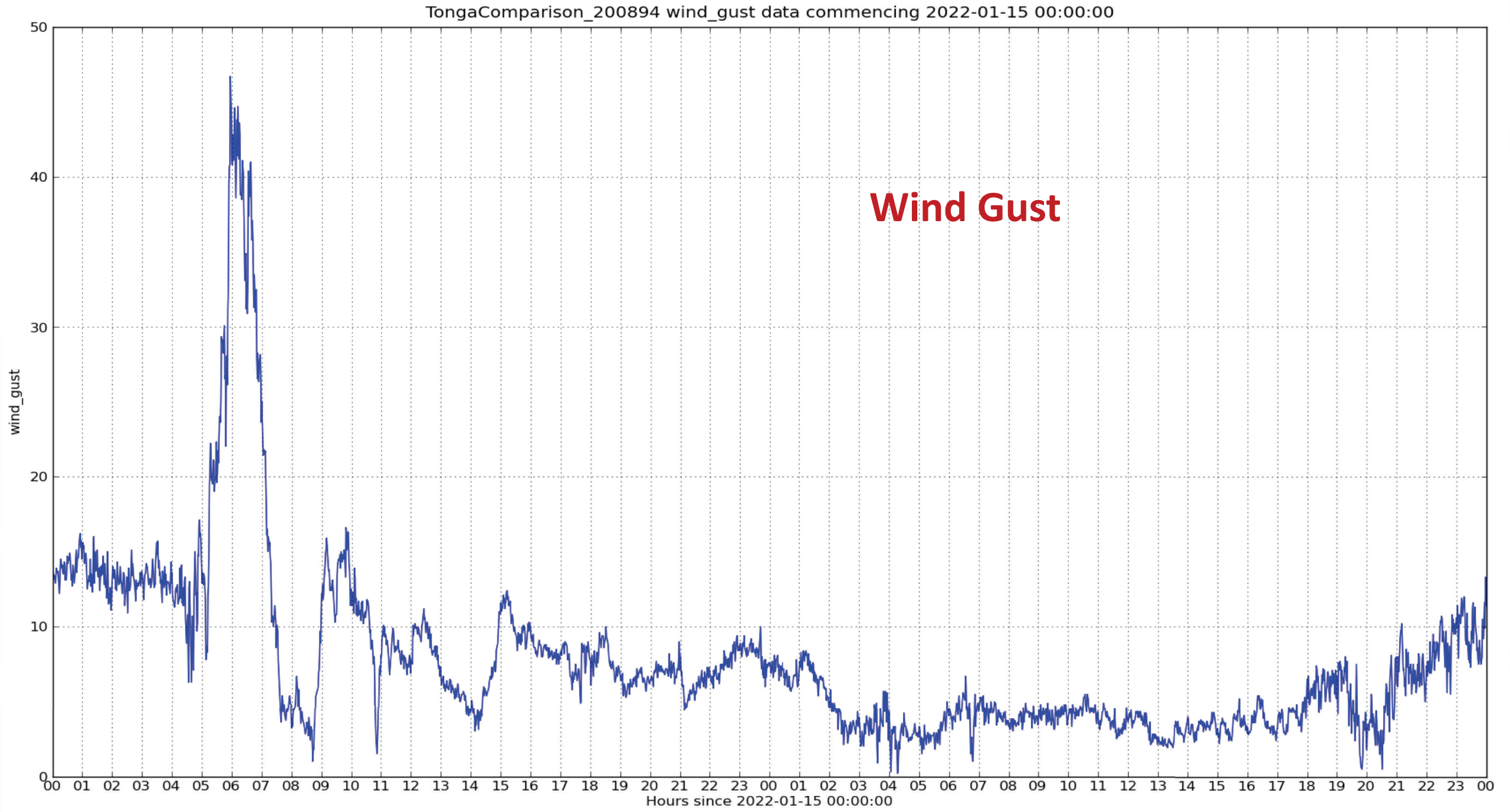
17:21hrs

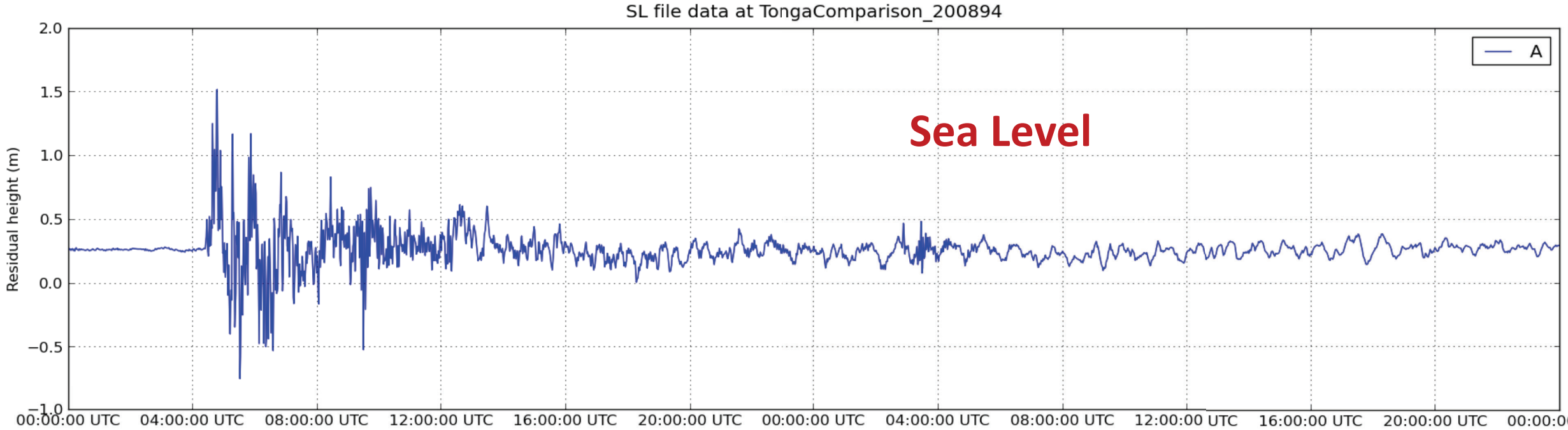
Nuku'alofa, Tongatapu
5:47pm Tonga Local Time
Courtesy Tonga Met Svc

Estimated tsunami travel times

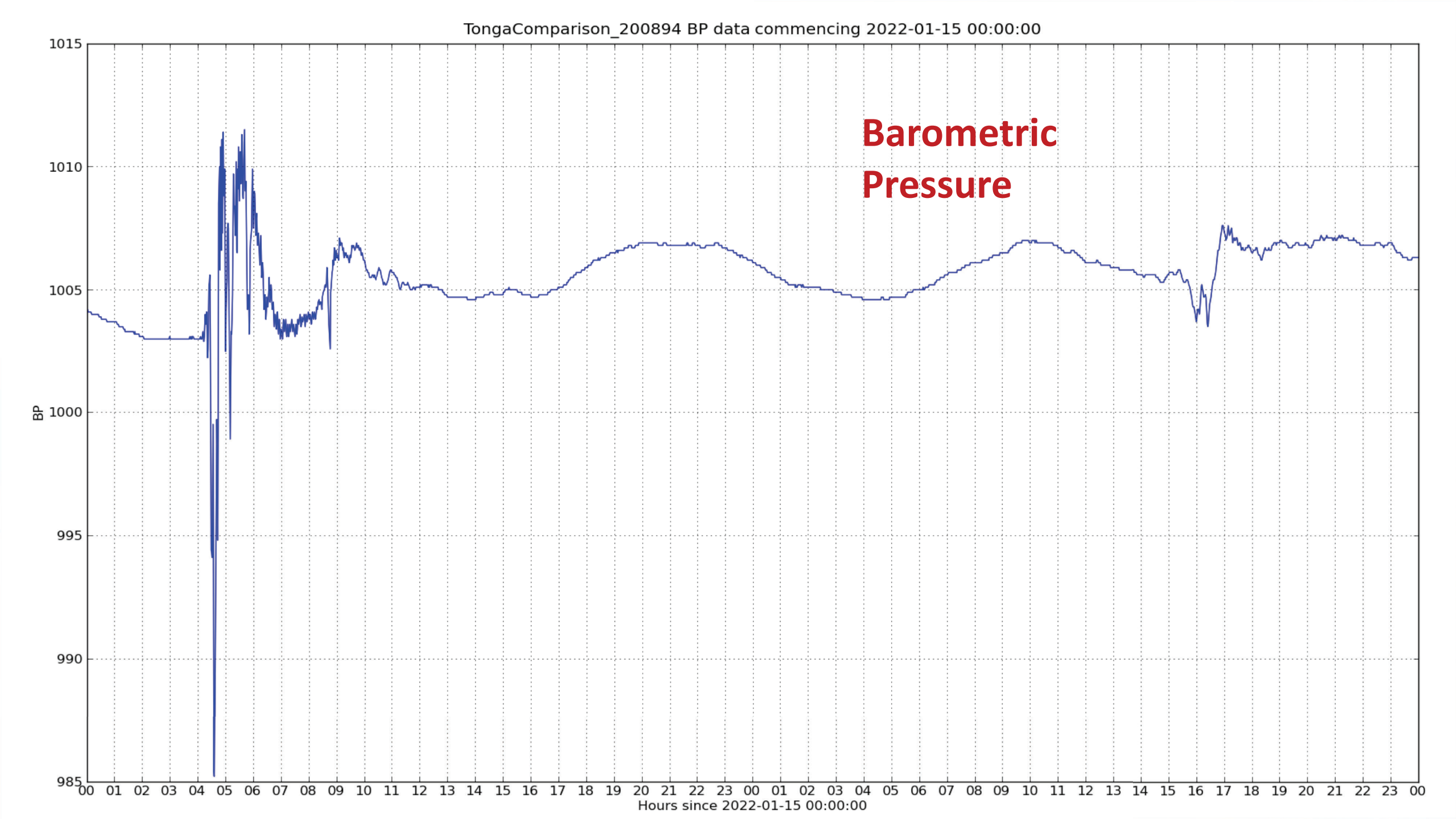



AWS Pressure Readings
Station Pressure (hPa)
1010
1005
1000
995
990
985
980
2:00:00 PM
2:20:00 PM
2:40:00 PM
3:00:00 PM
3:20:00 PM
3:40:00 PM
4:00:00 PM
4:20:00 PM
4:40:00 PM
5:00:00 PM
5:20:00 PM
5:40:00 PM
6:00:00 PM
6:20:00 PM
6:40:00 PM
7:00:00 PM
7:20:00 PM
7:40:00 PM
8:00:00 PM
8:20:00 PM
8:40:00 PM
9:00:00 PM
9:20:00 PM
9:40:00 PM
10:00:00 PM
10:20:00 PM
10:40:00 PM
11:00:00 PM
11:20:00 PM
11:40:00 PM
Saturday 15th of January 2022


TongaComparison_200894 wind_gust data commencing 2022-01-15 00:00:00
Wind Gust
wind_gust
0
10
20
30
40
50
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00
Hours since 2022-01-15 00:00:00


SL file data at TongaComparison_200894
Sea Level
A
Residual height (m)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
00:00:00 UTC
04:00:00 UTC
08:00:00 UTC
12:00:00 UTC
16:00:00 UTC
20:00:00 UTC
00:00:00 UTC
04:00:00 UTC
08:00:00 UTC
12:00:00 UTC
16:00:00 UTC
20:00:00 UTC

Residual
A
SL height (m)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
00:00:00 UTC
04:00:00 UTC
08:00:00 UTC
12:00:00 UTC
16:00:00 UTC
20:00:00 UTC
00:00:00 UTC
04:00:00 UTC
08:00:00 UTC
12:00:00 UTC
16:00:00 UTC
20:00:00 UTC
UTC time


TongaComparison_200894 BP data commencing 2022-01-15 00:00:00
Barometric Pressure
BP
1015
1010
1005
1000
995
990
985
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00
Hours since 2022-01-15 00:00:00

Operational Challenges:

- Internet disconnections (undersea cable cut) and No back up internet options (VSAT)
- Local communication break-downs/busy lines/difficulties to outer islands
- Difficult to pick up Satellite phone signal due to volcanic ash
- Disconnections to Himawari-cast Satellite Receive at MET Office (7:20pm)
- Inadequate staff protective gears/uniforms
- Volcanic Ash affecting communication systems
- Disruption to Earthquake and Tsunami monitoring systems

Impacts

- 4 deaths (1 Foreign National in Tbu and 3 locals from Ha'apai)
- 9 major Resorts totally destroyed
- Est. 200 homes seriously damaged or destroyed
- Certain crops like yams, sweet potato, vegetables and fruit trees almost totally destroyed
- Wave runup between 15-20m in some areas
- 500m inundation inland in Nomuka, Haapai
- 600m inundation inland at Mango, Haapai
- 2 islands (Mango, Atataa) and 1 village to the west of TBU (Kanokupolu) no go zones

Recommendations for warning center

- Review SOPs to address operational lessons learnt in volcano generated tsunami
- Volcanology training for warning personnel
- **Establish a study group under the PTWS to research into exactly what happened (e.g. resulting in loss of life in Peru) and for PTWC to finalize regional procedures for quick advisory services for near source volcano generated tsunami**
- Awareness on natural warning signs (e.g. the Sulphur smell)
- Establish better communication redundancies
- Establish better communication protocols to address congested lines
- Improve seismic network and volcano monitoring
- **Reconsider working arrangements with national response agencies e.g. to be under one roof and to eliminate inconsistencies in information going out to the public**