

Supplement of *Clim. Past*, 16, 51–64, 2020  
<https://doi.org/10.5194/cp-16-51-2020-supplement>  
© Author(s) 2020. This work is distributed under  
the Creative Commons Attribution 4.0 License.



*Supplement of*

**Reconstruction of the track and a simulation of the storm surge  
associated with the calamitous typhoon affecting the  
Pearl River Estuary in September 1874**

**Hing Yim Mok et al.**

*Correspondence to:* Dick Shum Lau (dslau@hko.gov.hk)

The copyright of individual parts of the supplement might differ from the CC BY 4.0 License.

**Section S1: Extract from The Selga Chronology (Part I: 1348-1900) with information on the 1874 typhoon (R. García-Herrera, P. Ribera, E. Hernández, L. Gimeno:'Typhoons in the Philippine Islands 1566-1900'. Submitted to Journal of Climate.)**

The dawn of the 21st in Vigan was cloudy and rainy. The barometer registered 745.5 mm with calm. At four o'clock in the afternoon, it began to rain aplenty. The barometer registered 741.5 mm with a slight wind from the SW which continued until midnight, when it veered to the W and reached hurricane force. The barometer remained at 745 mm until 8 in the morning when the wind backed to SSW and to the S with much rain; the barometer at 747.7 mm. At midday perfect calm; and the barometer began to rise; in the afternoon it cleared up with a slight wind from the S. Jose Serra described in this guise the effects of the storm which burst over Batan Islands on the 22nd of September, 1874: "At twilight on the 21st of September, the barometer began to descend in a conspicuous manner. At 8 at night, a strong NNE wind began to blow, while the barometer continued its rapid fall. At 10, a hurricane of extraordinary intensity was present. The aneroid barometers registered 737.0 mm ay 11, the wind veered to the NNE with frightful violence, while the barometer continued its descent. From this hour until 1, the wind blew with such a terrifying violence that the aneroides dropped 0.20, until they registered 724.0 mm. At the said hour, the wind veered to the E, where it acquired its maximum intensity, and produced the greatest havoc. From this hour, the barometer began to rise as fast as it had fallen. At 4, the SE wind began to blow, and at 5, I was able to go out and visit the town. The typhoon was over, but it left in its trails desolation and death. This island, being very small, and very near to Sabtang and Isbat the typhoon was experienced in all these places with the same intensity as in the capital. The churches and mission houses received damages, especially on the roofs. The church of the town of San Carlos was completely destroyed. The tribunals and schools were left in pitiable state. Seven houses made of lime and stone in the capital collapsed. One hundred sixty-four houses of wood and cogon were destroyed. It should not escape notice that while in Luzon houses were made earthquake proof, the natives in these isles make their cottages baguio proof, so that the devastating effects of the typhoons in these islands will ever be as great as in any town of Luzon. The winds of this storm were from the 1st and 2nd quadrant.

**Table S1. Reports of pressure observations in Hong Kong and Macao during the passage of Typhoon 1874**

Date/Time	Hong Kong Police Central Station barometer readings <sup>(1)</sup>	Hong Kong Harbour Master office barometer readings reduced to sea level <sup>(2)</sup>	Messrs. Geo Falconer & Co.'s, Hong Kong aneroid barometer readings <sup>(3)</sup>	Messrs Geo Falconer & Co.'s, Hong Kong mercurial barometer readings <sup>(3)</sup>	HMS Princess Charlotte, mooring off Kowloon <sup>(4)</sup>	Gunboat Tejo at inner harbor of Macao <sup>(5)</sup>	Macao pressure readings <sup>(6)</sup>
Local time	inches Hg (hPa)	inches Hg (hPa)	inches Hg (hPa)	inches Hg (hPa)	inches Hg (hPa)	mm Hg (hPa)	inches Hg (hPa)
22/0900				29.852(1010.9)			
22/morning		29.85 (1010.8)					
22/1100							29.59 (1002.0)
22/1200					29.78 (1008.5)	755.382 (1007.1)	
22/1300				29.770 (1008.1)			
22/1400							
22/1500						753.604 (1004.7)	
22/1600		29.74 (1007.1)					29.55 (1000.7)
22/1700				29.704 (1005.9)			29.54 (1000.3)
22/1800						751.826 (1002.4)	29.53 (1000.0)
22/1900				29.634 (1003.5)		751.318 (1001.7)	29.50 (999.0)
22/1930	29.50 (999.0)						
22/1945		29.63 (1003.4)					
22/2000				29.602 (1002.4)		750.810 (1001.0)	29.48 (998.3)
22/2100	29.40 (995.6)		29.500 (999.0)		29.55 (1000.7)	750.302 (1000.3)	29.44 (997.0)

22/2115		29.57 (1001.4)					
22/2125							
22/2200	29.30 (992.2)		29.408 (995.9)	29.500 (999.0)	29.46 (997.6)	748.779 (998.3)	29.38 (994.9)
22/2215		29.45 (997.3)					
22/2230		29.40 (995.6)					
22/2300			29.325 (993.1)	29.345 (993.7)	29.27 (991.2)	746.493 (995.2)	29.33 (993.2)
22/2330	29.20 (988.8)						29.25 (990.5)
22/2400	29.15 (987.1)		29.100 (985.4)	29.200 (988.8)	29.18 (988.1)	743.699 (991.5)	29.21 (989.2)
23/0005	29.10 (985.4)						
23/0015	29.06 (984.1)						
23/0025	29.02 (982.7)						
23/0030		29.12 (986.1)					29.18 (988.2)
23/0040	28.95 (980.4)						
23/0045	28.95 (980.4)						
23/0056	28.94 (980.0)						
23/0100		29.05 (983.7)	28.897 (978.6)	28.950 (980.4)	28.87 (977.7)	738.619 (984.7)	29.05 (983.7)
23/0103	28.91 (979.0)						
23/0107	28.90 (978.7)						
23/0110	28.90 (978.7)						
23/0112		29.00 (982.1)					
23/0120	28.88 (978.0)						
23/0123	28.85 (977.0)						

23/0127	28.84 (976.6)						
23/0130		28.95 (980.4)					28.89 (978.3)
23/0134	28.82 (976.0)						
23/0135	28.81 (975.6)						
23/0137	28.80 (975.3)						
23/0143	28.78 (974.6)						
23/0148	28.76 (973.9)						
23/0155	28.75 (973.6)						
23/0200		28.88 (978.0)	28.760 (973.9)	28.870 (977.7)	28.83 (976.3)	731.761 (975.6)	28.8 (975.3)
23/0203	28.73 (972.9)						
23/0215	28.77 (974.3)		28.727 (972.8)	28.752 (973.7)			
23/0220	28.80 (975.3)						
23/0230			28.785 (974.8)	28.810 (975.6)			28.61 (968.8)
23/0240	28.85 (977.0)						
23/0245	28.90 (978.7)						
23/0250	28.90 (978.7)						
23/0255	28.95 (980.4)						
23/0300	28.97 (981.0)	29.04 (983.4)	28.990 (981.7)	29.235 (990.0)	29.12 (986.1)	715.759 (954.3)	28.22 (955.6)
23/0305	29.00 (982.1)						
23/0310	29.05 (983.7)						
23/0320	29.10 (985.4)						
23/0330	29.15 (987.1)		29.184 (988.3)	29.286 (991.7)			28.11 (951.9)

23/0335	29.20 (988.8)	29.22 (989.5)					
23/0345	29.25 (990.5)						
23/0400	29.28 (991.5)		29.320 (992.9)	29.315 (992.7)	29.40 (995.6)	709.155 (945.5)	27.94 (946.2)
23/0405	29.30 (992.2)						
23/0410		29.32 (992.9)					
23/0415							28.06 (950.2)
23/0420	29.34 (993.6)						
23/0430							28.23 (956.0)
23/0445							28.40 (961.7)
23/0500		29.49 (998.6)			29.53 (1000.0)	724.809 (966.3)	28.59 (968.2)
23/0515							28.77 (974.3)
23/0530							28.98 (981.4)
23/0540		29.58 (1001.7)					
23/0545							29.08 (984.8)
23/0600					29.65 (1004.1)	744.461 (992.5)	29.16 (987.5)
23/0615							29.25 (990.5)
23/0630							29.28 (991.5)
23/0700					29.72 (1006.4)	749.540 (999.3)	29.33 (993.2)
23/0730							29.42 (996.3)
23/0800					29.79 (1008.8)	753.604 (1004.7)	29.47 (998.0)
23/0815		29.80 (1009.1)					
23/0830							29.52 (999.7)

23/0900					29.82 (1009.8)	755.382 (1007.1)	29.55 (1000.7)
23/0930		29.84 (1010.5)					
23/1000					29.87 (1011.5)		29.58 (1001.7)
23/1200						756.144 (1008.1)	

1 Published in the Hong Kong Government Gazette of 17 Oct 1874.

2 Published in the Hong Kong Government Gazette of 17 Oct 1874 (readings for 22/morning, 22/1600, 22/2230 and 23/0200) and The China Mail of 23 Sep 1874 (others).

3 Published in the China Mail of 23 Sep 1874.

4 Logbook of HMS Princess Charlotte.

5 Observations of Gunboat Tejo published in the Bulletin of the Macao Province and Timor Anno, 1874-Vol. XX- No. 41 Saturday 10 October.

6 Report of Port Captain of Macao published in the Bulletin of the Macao Province and Timor Anno, 1874-Vol. XX- No. 44 Saturday 31 October.

Note: the following conversion factors have been adopted:

(i) 1 inches of mercury = 33.86395 hPa

(ii) 1 mm mercury = 1.33322387 hPa

Reference: Smithsonian Meteorological Tables, 4<sup>th</sup> revised edition, 1918

**Table S2. Reports of winds in Hong Kong and Macao during the passage of Typhoon of 1874**

Date/Time	Wind reports in Hong Kong Police Central Station <sup>(1)</sup>		Wind reports in Hong Kong Harbour <sup>(1)</sup>		Wind reports by HMS Princess Charlotte <sup>(2)*</sup>		Wind reports in Macao <sup>(3)</sup>	
	Direction	Beaufort Force	Direction	Beaufort Force	Direction	Beaufort Force	Direction	Beaufort Force
22/morning			NW					
22/1200					N	4	N / NNE	4
22/1500							N	3
22/1600			NNW	Fitful gusts	N	6 to 7		
22/1800							NW	5
22/1900							NW	5
22/2000					N	4 to 6		
22/2100							NNW	6
22/2200	Gusts heavy and frequent.						NNW	7
22/2230			N					
22/2300							NNW	8
22/2330	Shifting to 70.							
22/2400					NNE	8 to 10	NNW	10



23/0045	Gusts lighter and long							
23/0100					NE	8 to 11	NNW, N	10
23/0107	Gusts heavier and continuous.							
23/0123	Gusts heavy but longer intervals.							
23/0200			Suddenly shifted to NE and then to ENE	Terrible violence	ENE	9 to 12	N	11
23/0300					ESE	10 to 12	N	12
23/0400					ESE	10 to 12	NE, ENE, NW, E, SE	12
23/0405	Gradually veered to SE							
23/0500					SE	7 to 9	SE	12
23/0600					SE	7 to 9	SSE	11
23/0700					SSE	7 to 8	SSE	11
23/0800					SSE	7 to 8	S	9
23/0900					SSE	7 to 8	S	6
23/1200					SSE	3 to 6	S	4

\* There were uncertainties in reading some of the hand-written characters.

1 Published in the Hong Kong Government Gazette of 17 Oct 1874.

2 Logbook of HMS Princess Charlotte.

3 Observations of Gunboat Tejo published in the Bulletin of the Macao Province and Timor Anno, 1874-Vol. XX- No. 41 Saturday 10 October