



Wind impacts on buildings in Hong Kong due to Mangkhut



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2018 Typhoon Mangkhut window damage
in Hong Kong - some unforgettable
images

Immigration
Tower
in Wan Chai



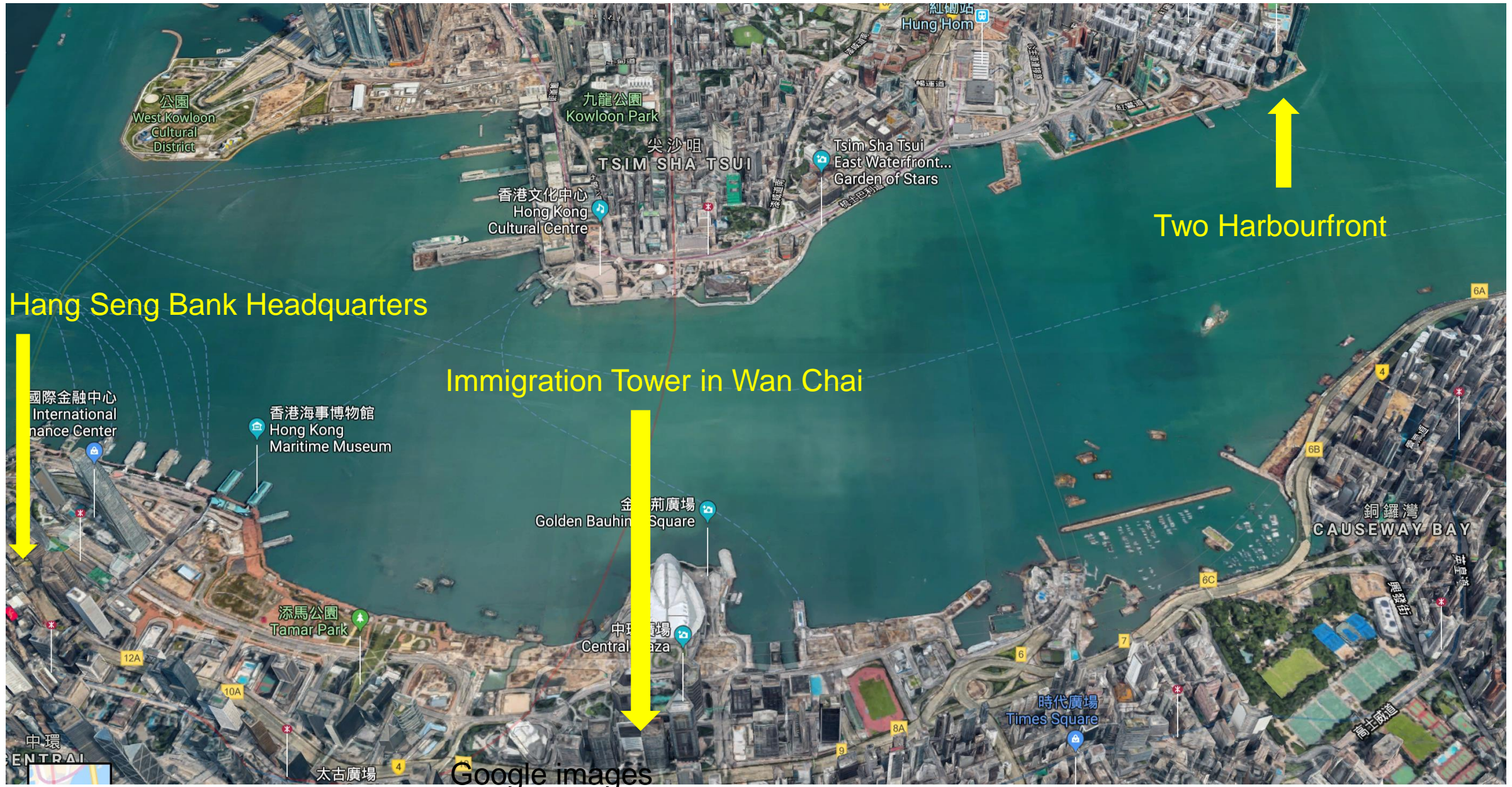
Two Harbourfront



Hang Seng Bank
Headquarters

Internet images

Not everywhere, but a few isolated spots where some window glass shattered

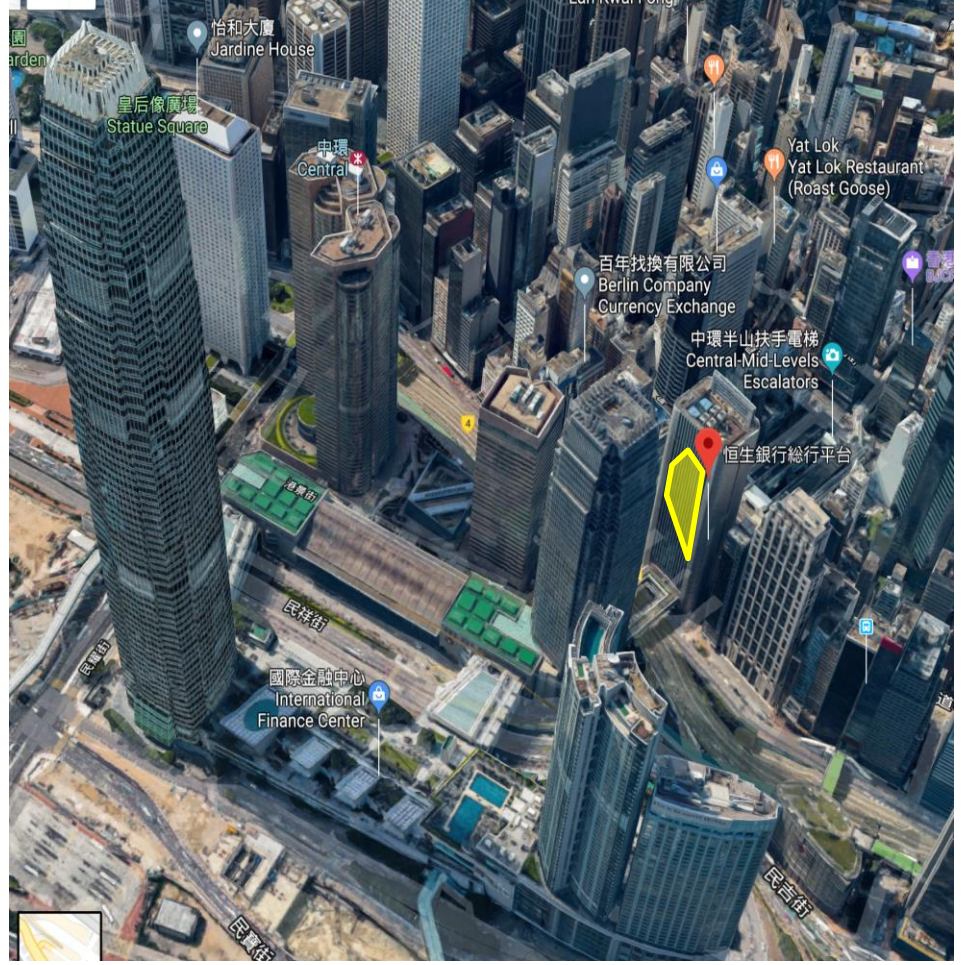
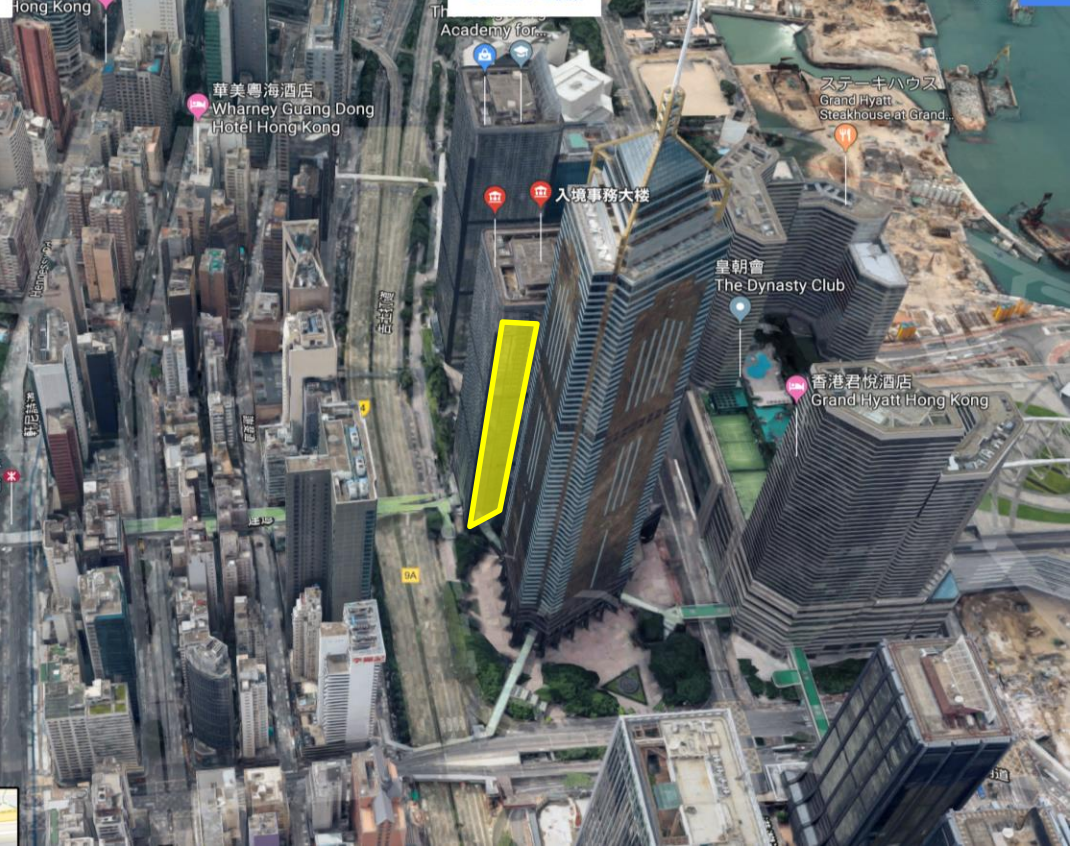


At least reported in two typhoons with Hang Seng Bank Headquarters Building



Internet images

Mostly concentrated on one façade - location of the damaged face not facing the harbour



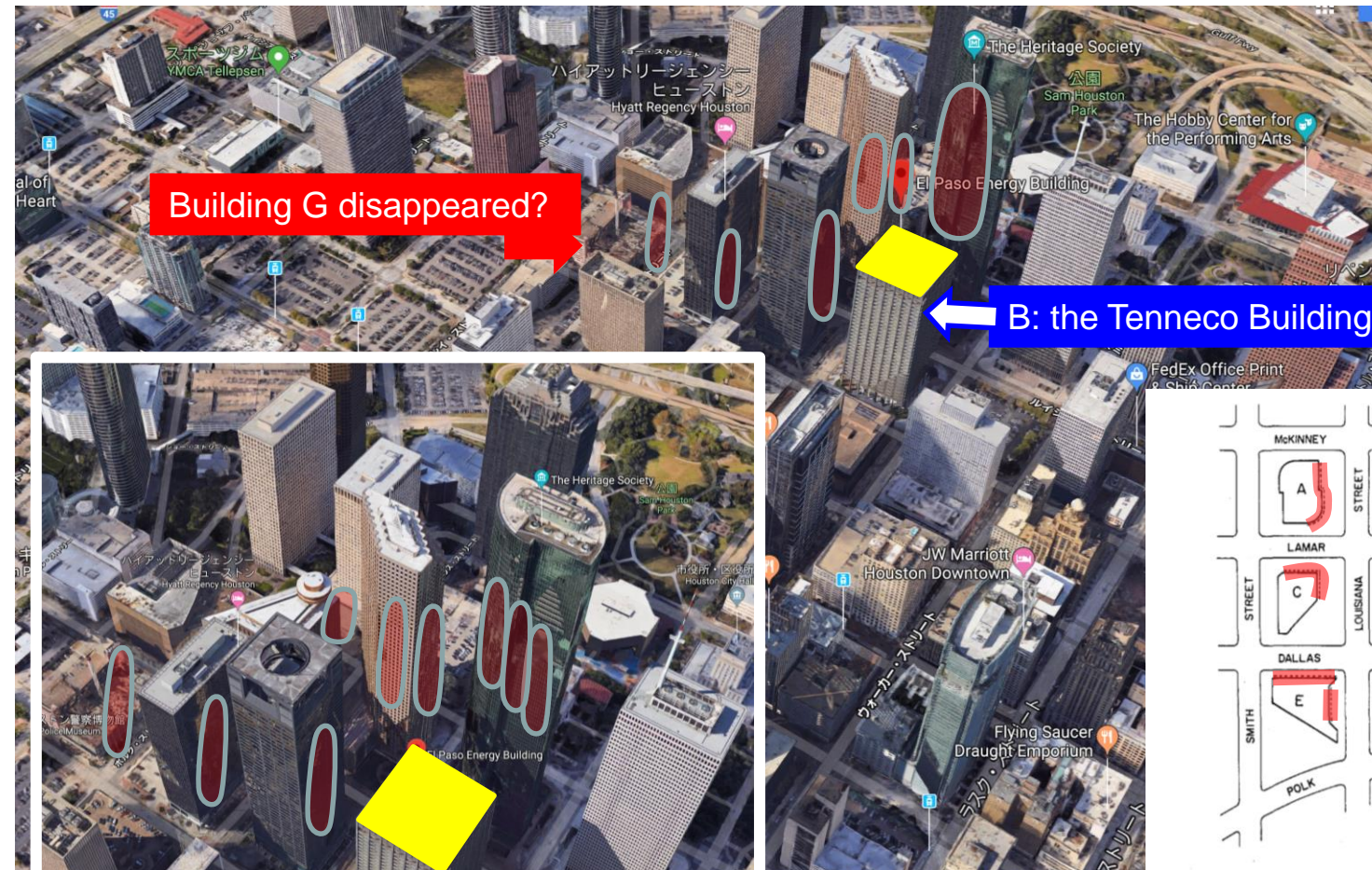
Google images

Three possible mechanisms

- Wind pressure exceeding the design value,
- missile impact from windborne debris, and
- performance of glass under dynamic wind loading

Conclusion:

“Analysis of these mechanisms suggests that impact from windborne debris, e.g., loose sheet metal, roof gravel, broken glass, and parts of the appurtenances from roofs, was the main source of glass damage.”



Kareem, A., 1986. Performance of cladding in Hurricane Alicia. *Journal of Structural Engineering*, 112(12), pp.2679-2693.

FIG. 1.—Plan View of Damaged High Rise Building Towers

The so-called windborne debris has been a popular theory

The Seventh Asia-Pacific Conference on Wind Engineering, November 8-12, 2009, Taipei, Taiwan



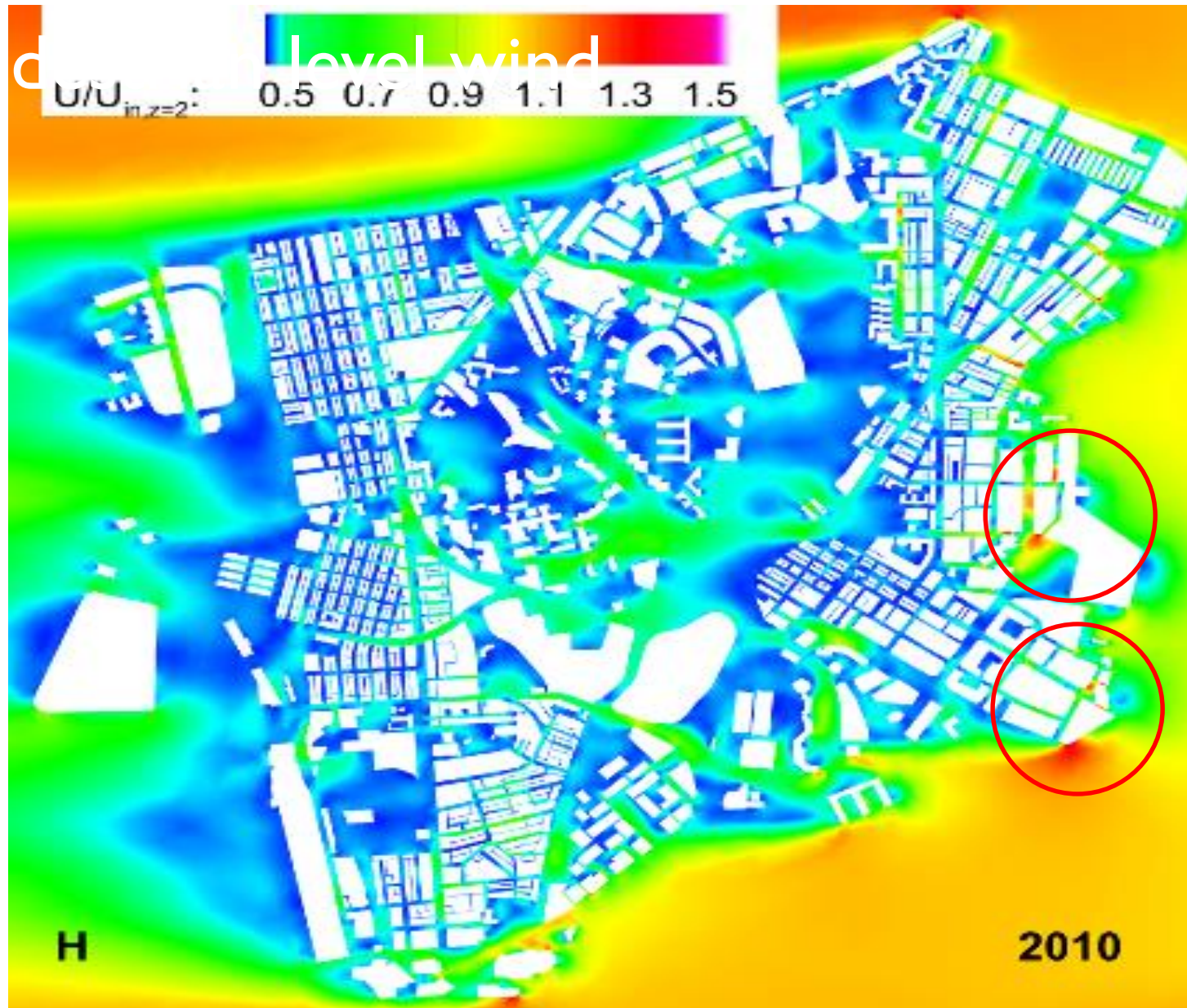
(a) September 17th, 2006, Nobeoka-city



(b) September 5, 2005, Miyazaki-city
(courtesy of Miyazaki Meteorological Station)

Figure 12: Damage Marks by Wind-borne Debris due to Tornadoes (Tamura, 2007)

Have we seen any damage marks on the facades of these damaged window buildings in our cases?

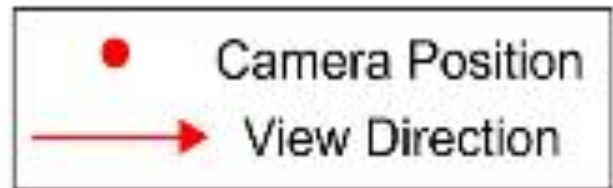


A few wind speed-up spots?

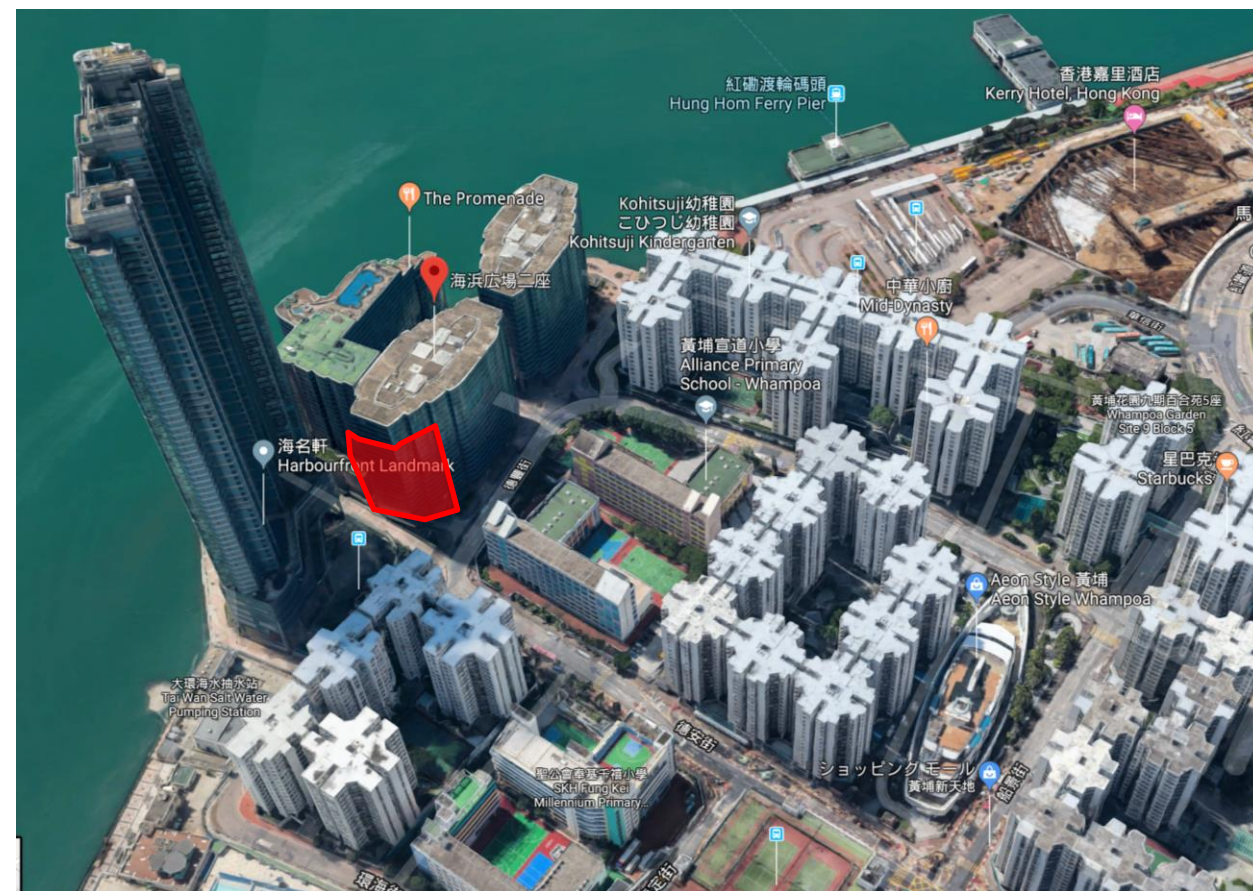
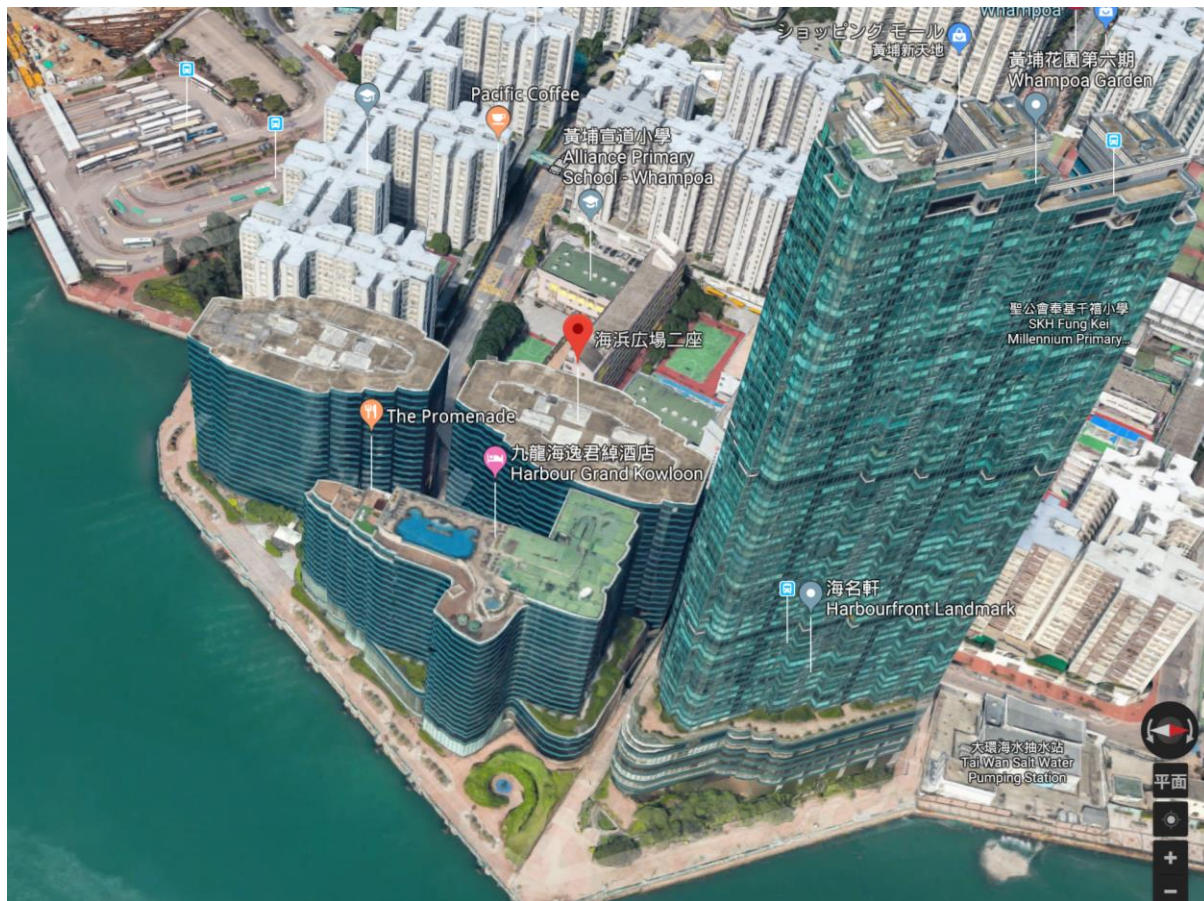
Distributions of normalized pedestrian wind speed at $Z = 2$ m in 2010.



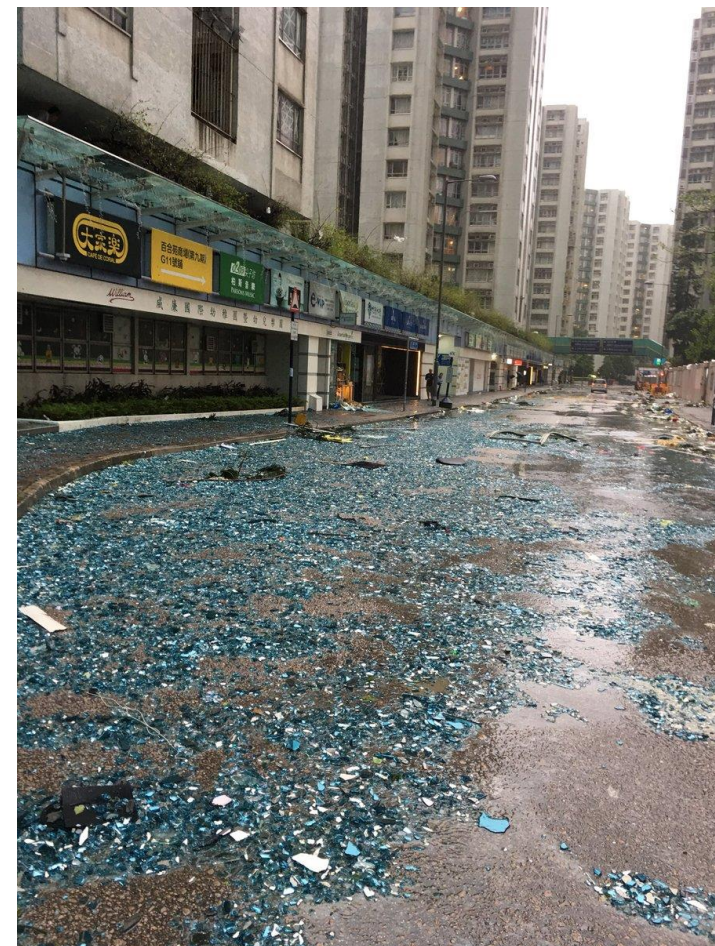
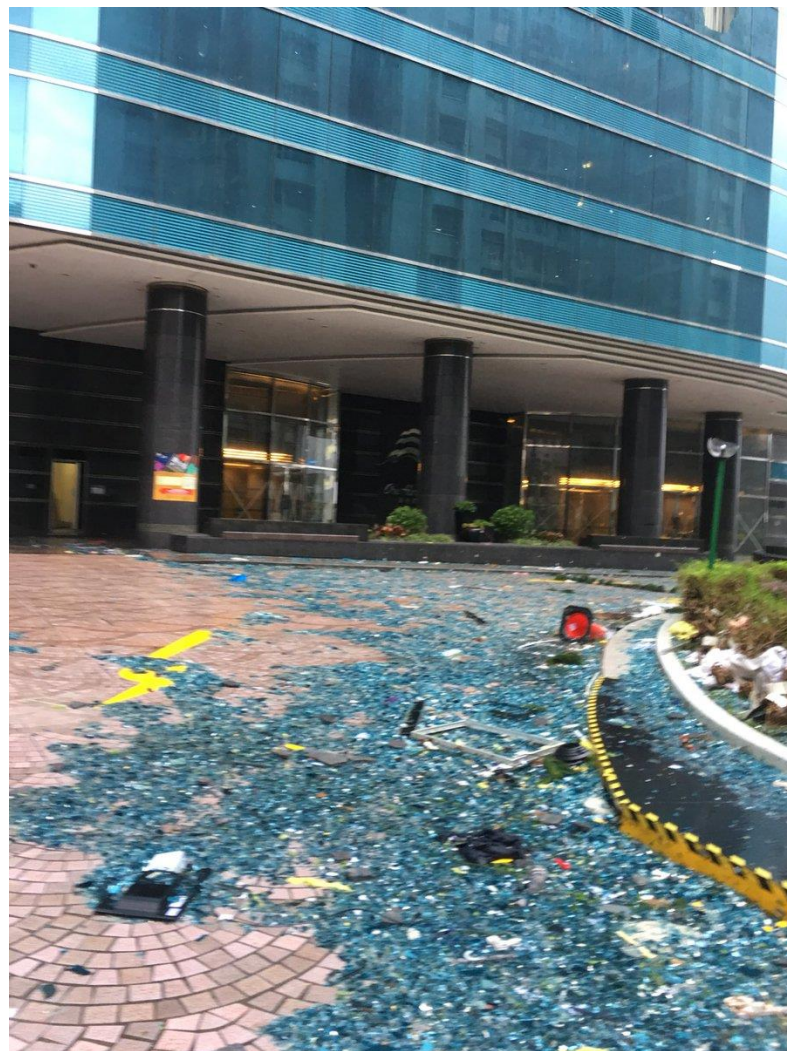
Two Harbourfront



*Most damaged positions not facing the wind,
but somehow behind the first row of
buildings facing the wind*



*Glass
fragments or
debris on the
ground,
mostly not in
the rooms*



https://twitter.com/phila_siu/status/1041220887633027075

<https://twitter.com/jamesplloyd/status/1041479352829894656>

*2018 Typhoon Mangkhut window
damage in Hong Kong*



Immigration Tower in Wan Chai



Wikipedia images

Two Harbourfront

澳門寰宇天下

2012 July Typhoon Vicente
2017 August Typhoon Hato
2018 September Typhoon Mangkhut



Internet images



海天居建成後，建築群與寰宇天下形成如漏斗形的隧道，強風經收窄後的管道，風壓更高，寰宇天下第一座成「食風位」，多個單位的玻璃窗分別在2012年及2017年颱風吹襲下被吹毀。