MIDAS CFD 分析

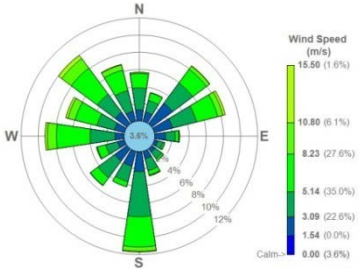
地形對於風場之影響

青山工程顧問

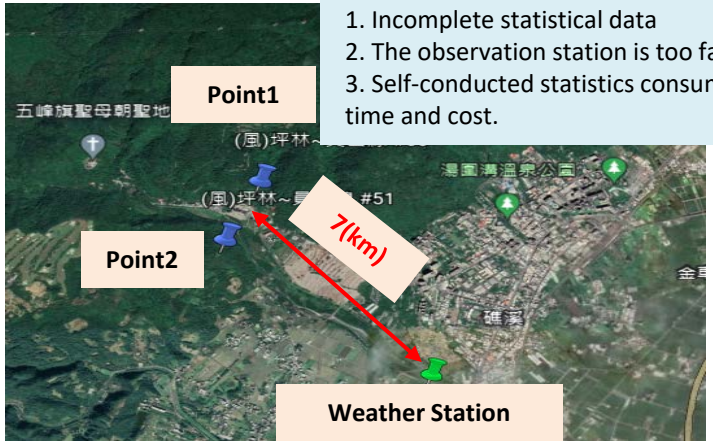
量測&數值分析

Current Method

Anemometer



Wind Rose Diagram

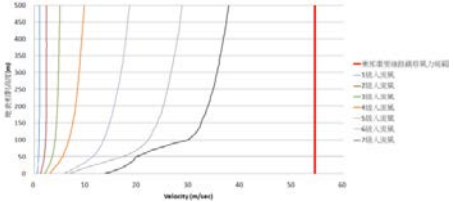


1. Incomplete statistical data
2. The observation station is too far from the site.
3. Self-conducted statistics consume too much time and cost.

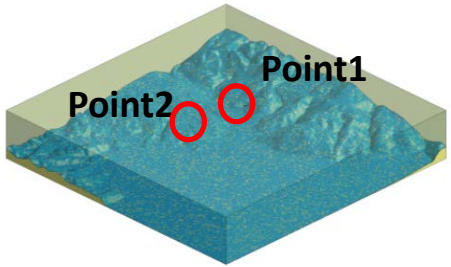
CFD Method

Ground Surface Features

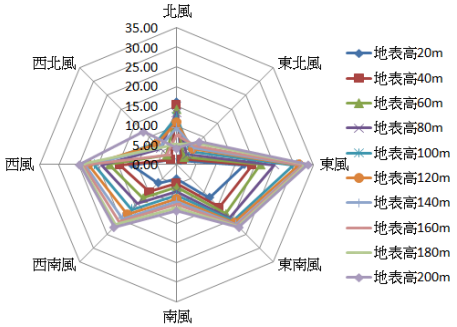
Wind Speed Distribution (Ground Elevation)



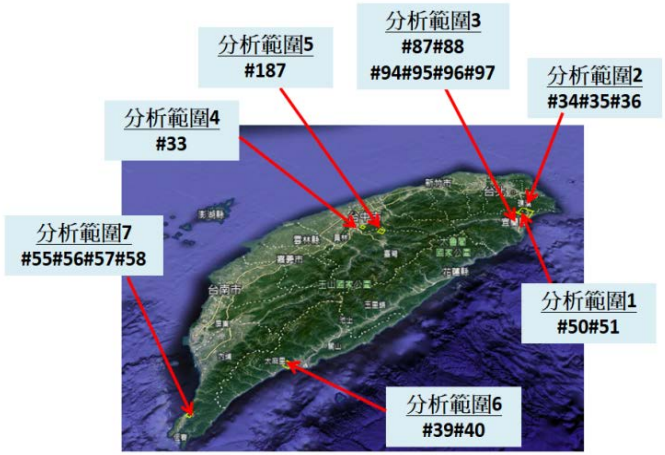
FEA Model



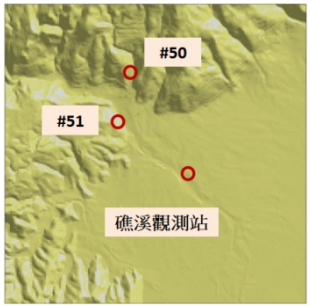
Wind Rose Diagram (Force 7 wind)



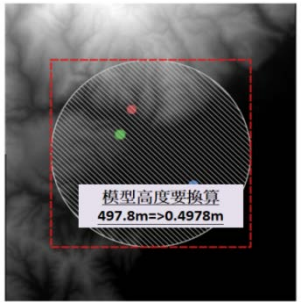
有限元素模型建立



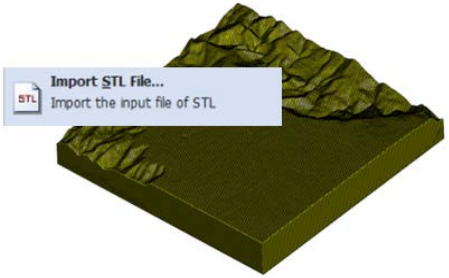
分析範圍_有限元素模型建立



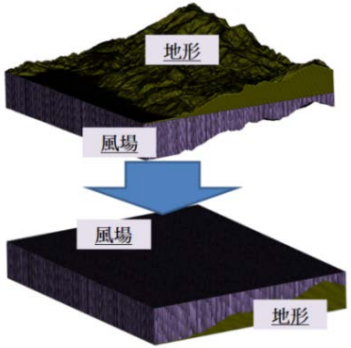
(a)分析範圍



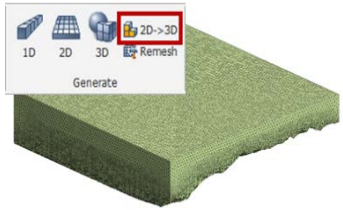
(b) QGIS數值地形編輯



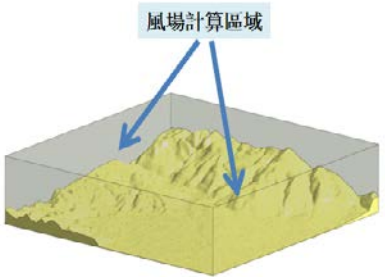
(c) STL格式匯入



(d) 網格編輯



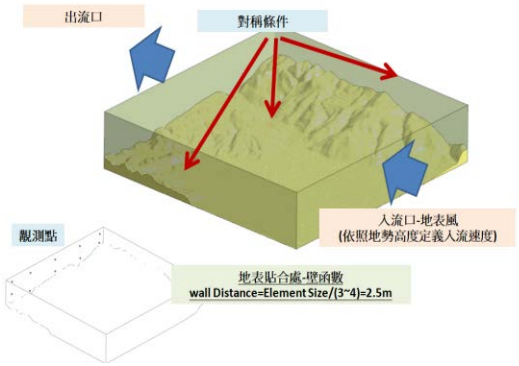
(e) 3D網格生成



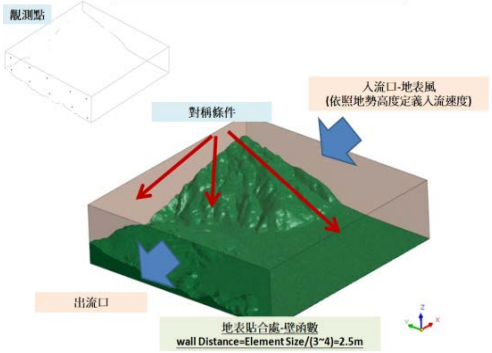
(f)風場計算區域(提高600m)

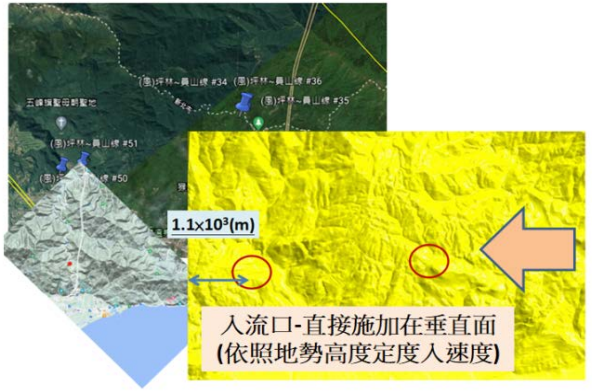
邊界條件說明

邊界條件說明-東風

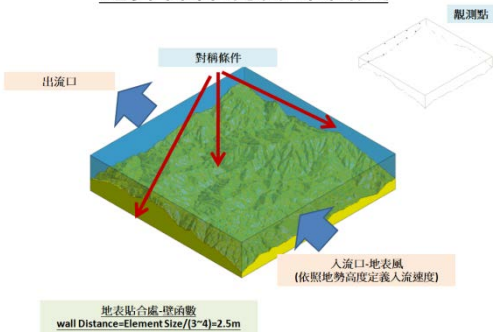


邊界條件說明-東北風

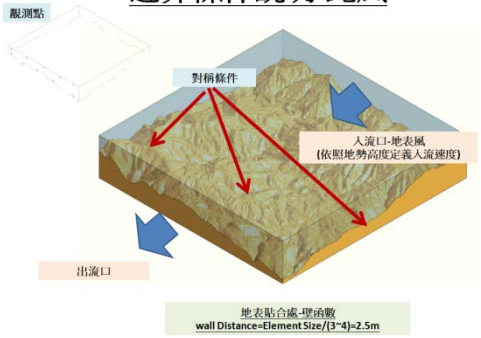




邊界條件說明-東南風



邊界條件說明-北風



風場分析入流/風向/各級風

蒲福氏風級	東	西	南	北	東南	西北	東北	西南
1 級(1.5m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
2 級(3.3m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
3 級(5.4m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
4 級(7.9m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
5 級(10.7m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
6 級(13.8m/sec)	◎	◎	◎	◎	◎	◎	◎	◎
7 級(17.1m/sec)	◎	◎	◎	◎	◎	◎	◎	◎

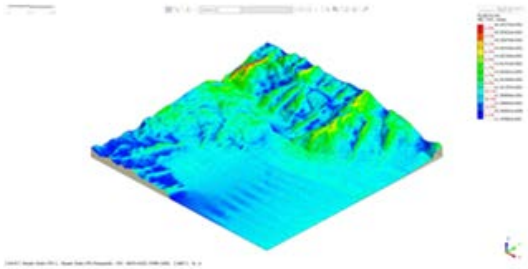
地表相對高度風速

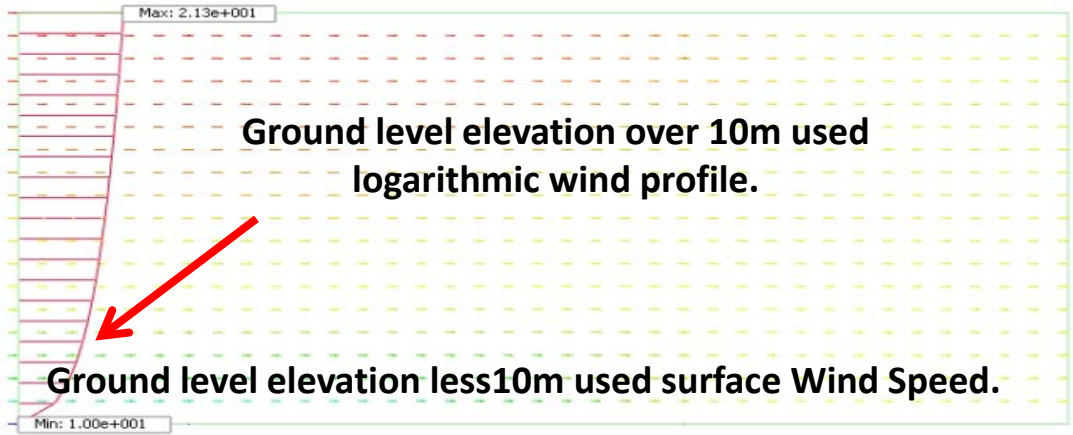
Logarithmic wind profile

$$u = u_r \left(\frac{z}{z_r} \right)^{\alpha}$$

u: Relative altitude wind speed(m/s)
Z_γ:Ground level elevation(10m)
u_γ:Ground level elevation Z_γWind Velocity
α :0.143

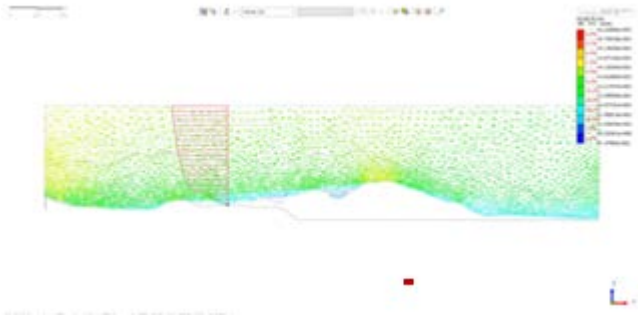
Surface wind speed
Force 1 wind(1.5m/sec)
Force 2 wind(3.3m/sec)
Force 3 wind(5.4m/sec)
Force 4 wind(7.9m/sec)
Force 5 wind(10.7m/sec)
Force 6 wind(13.8m/sec)
Force 7 wind(17.1m/sec)



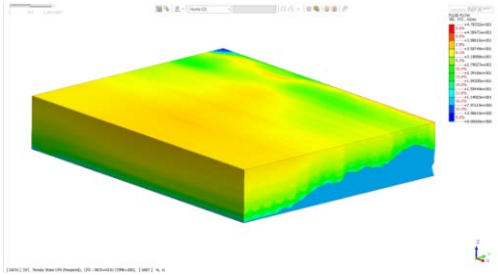


Ground level elevation over 10m used logarithmic wind profile.

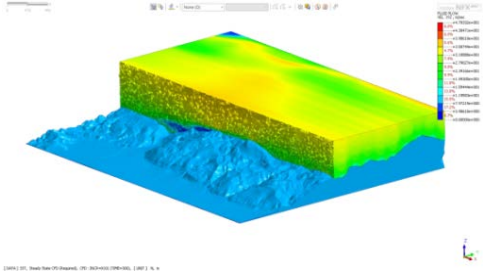
Ground level elevation less10m used surface Wind Speed.



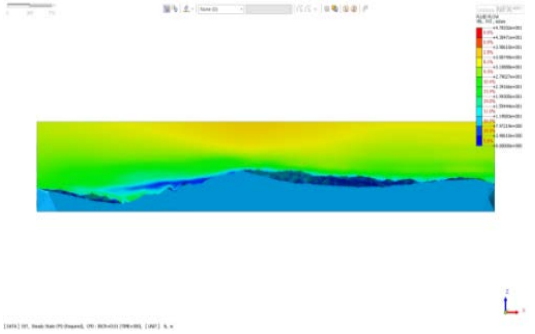
CFD圖形化結果



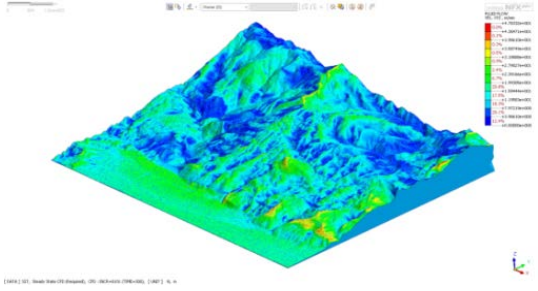
輪廓圖(全模型)



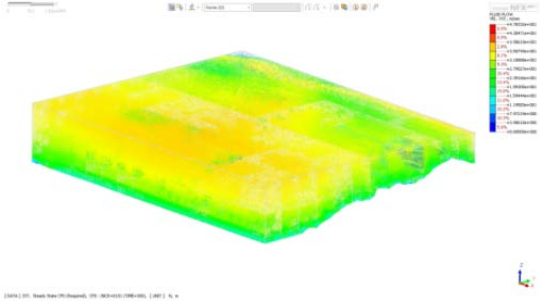
輪廓圖(局部元素隱藏)



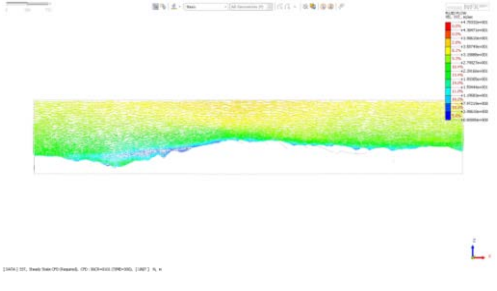
輪廓圖(剖面)



輪廓圖(地表)



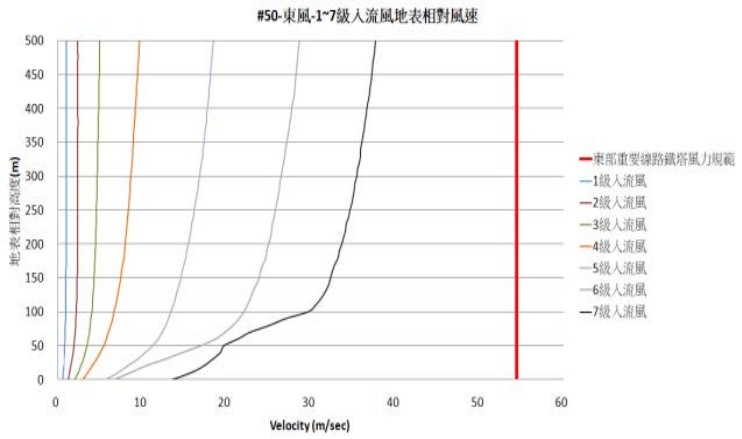
向量圖(全模型)



向量圖(剖面)

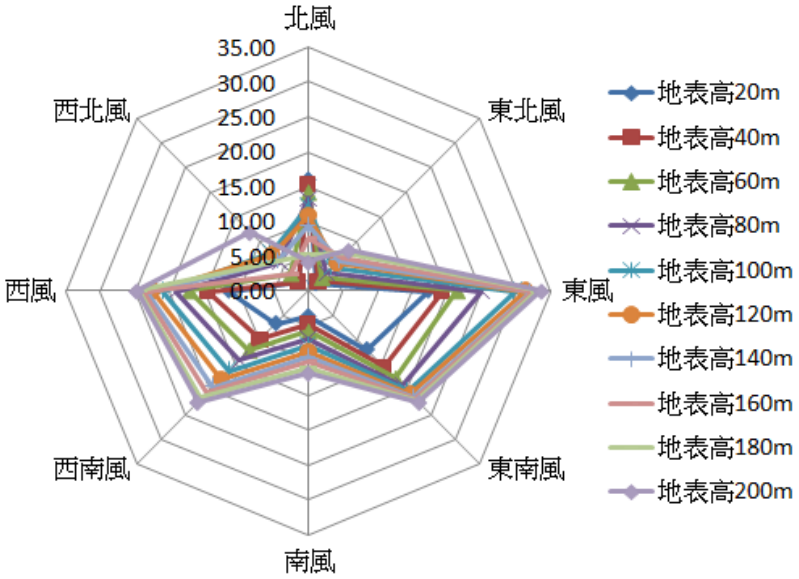
綜合數據整理

地表相對高度風速



地表單一風向各級風之影響力。

氣象玫瑰圖



地表各風向各級風之影響力。