



110-2 地圖與地理資訊系統

LAB 06 網格資料處理

Raster Data Processing

QGIS部分

授課教師：郭巧伶博士

助教：倪煒傑、楊宇翔、張旻菁

今日實習

網格資料處理

1

網格資料讀取與呈現

2

網格資料分析

3

向量資料網格化

網格資料操作實習使用圖資

1. 臺灣縣市地圖 : taiwan.shp
 2. 臺北市分區地圖 : taipei.shp
 3. 臺北市藥局資料 : pharmacy.shp
 4. 臺灣島20公尺數值地形圖（ DEM ） :
dem_20m.tif
 5. 2021/06/01 24小時累積雨量 :
rain_20210601.csv
 6. 臺灣自動雨量站點位 : rain_station.csv
- 檔案連結：<https://drive.google.com/drive/folders/1FsXnYaQn-ZXtg5Af0NGRclS6osU4ZaAy?usp=sharing>
(NTU COOL 上面也有了)

資料來源：
臺灣中央氣象局的open data;
臺北市政府的open data

TWD 97 TM2

EPSG: 3826

WGS84

EPSG: 4326

網格資料讀取與呈現

第一部分

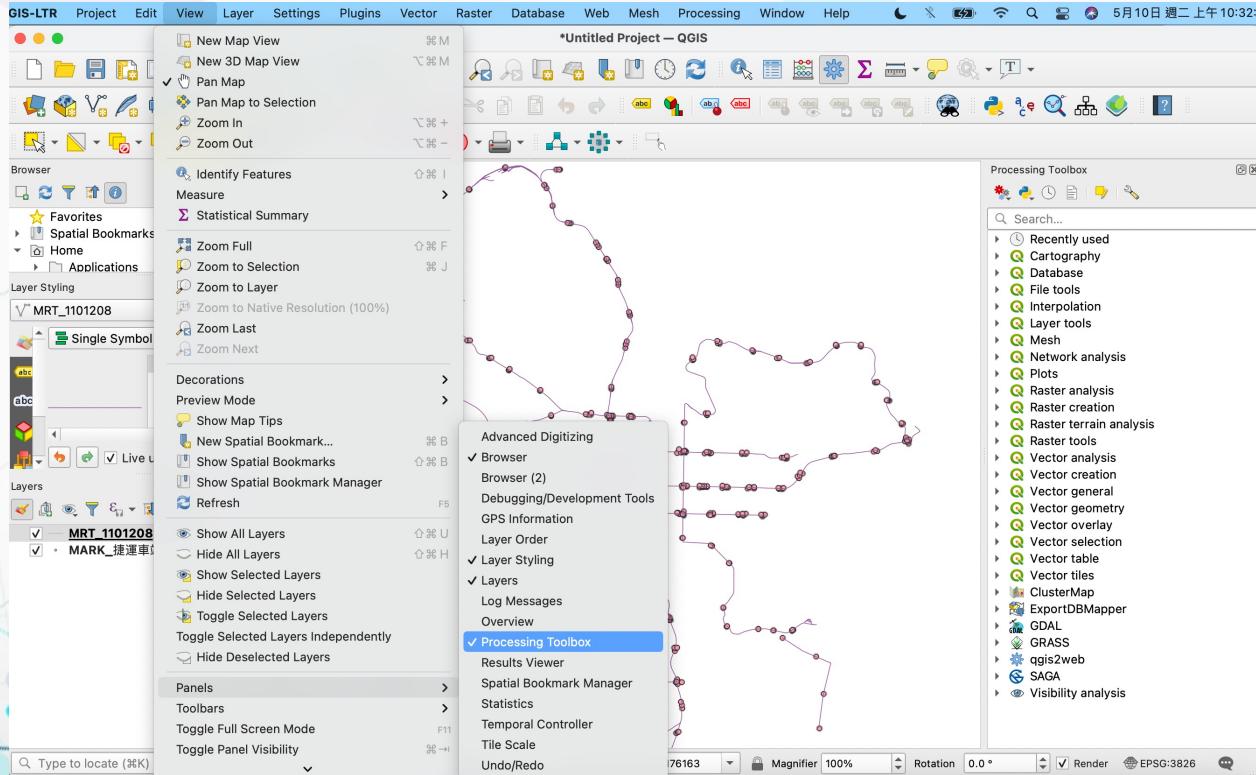
Load, Extract, Property

再次前情提要

如果工具箱不見掉 . . .

Processing Toolbox 工具箱

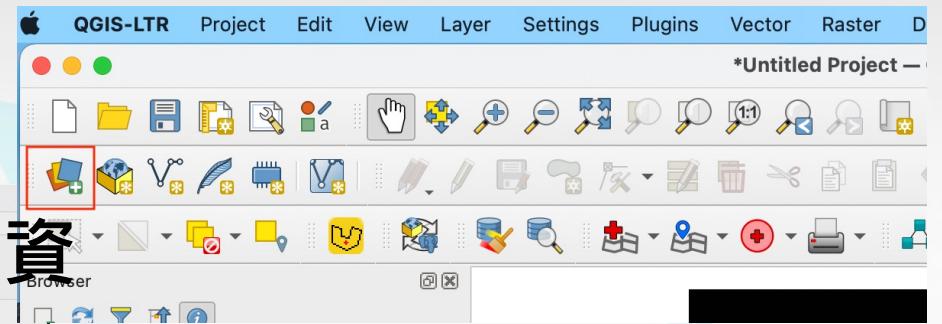
View > Panels > Processing
Toolbox 勾起來



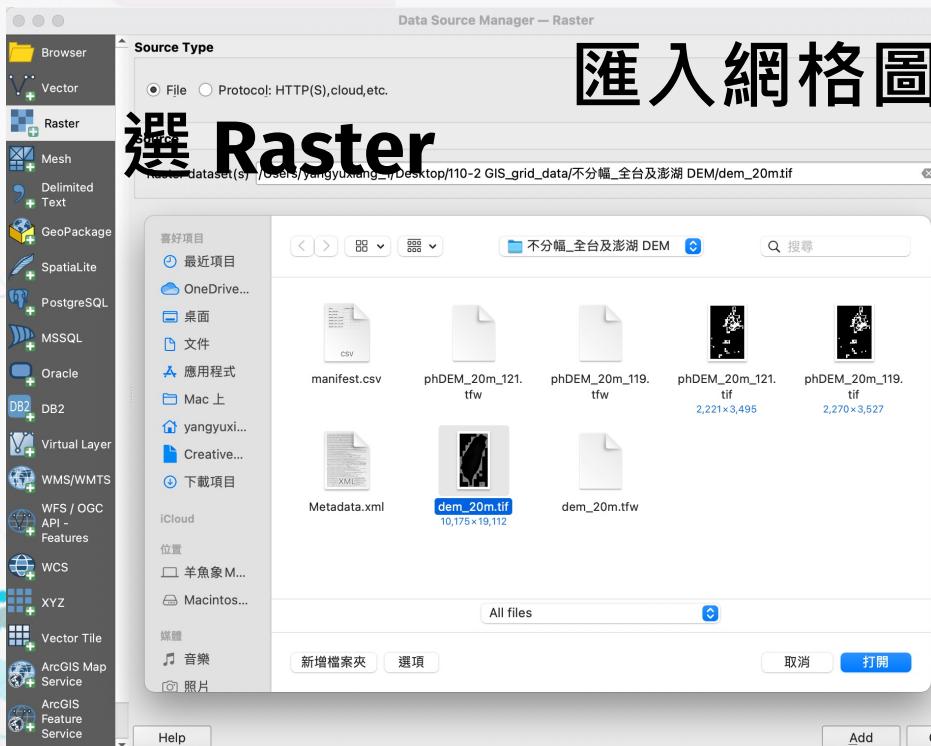
可以使用關鍵字搜尋

Load Raster Data

1



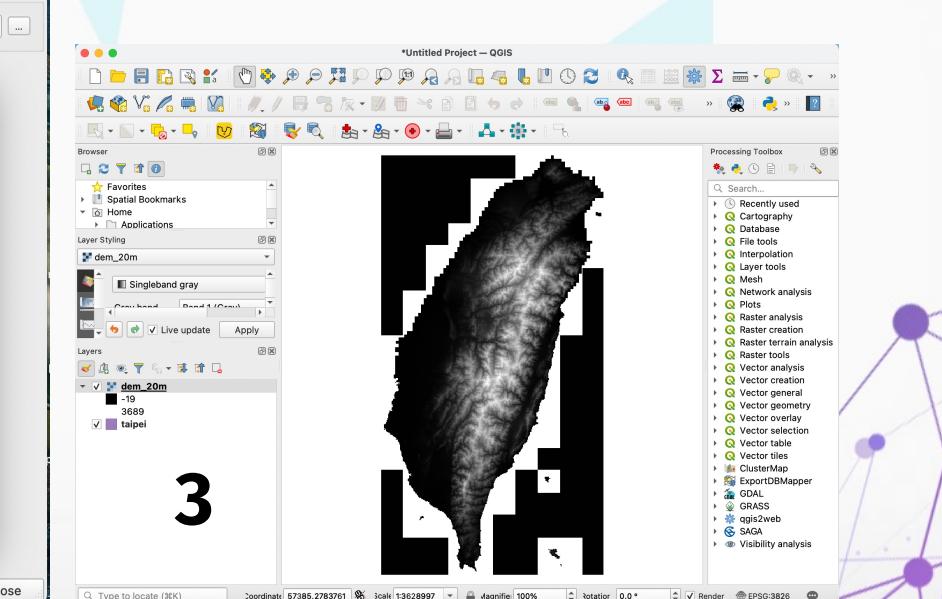
2



選 Raster

匯入網格圖資

3



5

Clip Raster by Mask Layer 切割出研究區

- 切割出台北市範圍的網格資料



Processing Toolbox

clip raster

Recently used

Clip raster by mask layer

GDAL

Raster extraction

Clip raster by extent

Clip raster by mask layer

SAGA

Clip Raster by Mask Layer

Parameters Log

Input layer: dem_20m [EPSG:3826]

Mask layer: taipei [EPSG:3826]

Selected features only

Source CRS [optional]

Target CRS [optional]

Assign a specified nodata value to output bands [optional]

0%

Help Run as Batch Process... Cancel Close Run

Input= 網格資料

Mask= 範圍資料

Symbology Change 1 – single band pseudocolor

對圖層點右鍵選properties 或是，左鍵雙擊圖層

The screenshot illustrates the process of changing symbology for a single band pseudocolor layer in QGIS.

Left Panel (Layer Properties - taipei dem - Symbology):

- Band Rendering:** Render type is set to "Singleband pseudocolor".
- Band:** Band 1 (Gray) is selected.
- Min:** Value 0 is set, and **Max:** value 1111 is set.
- Interpolation:** Linear.
- Color ramp:** A color gradient bar is shown, with the "Spectral" ramp currently selected.
- Label unit suffix:** Value 0 is labeled "0".
- Label precision:** Value 0 is labeled "0".
- Value Color Label Table:**

Value	Color	Label
0	Cyan	0
222	Green	222
444	Yellow	444
667	Orange	667
889	Brown	889
1111	Black	1111
- Mode:** Continuous.
- Classify:** A button for creating classes based on the data values.
- Blending mode:** Normal.
- Brightness:** 0.
- Contrast:** 0.

Middle Panel (Color ramp type dialog):

Please select color ramp type:
Gradient
Color Presets
Random
Catalog: cpt-city (selected)
Catalog: ColorBrewer

Right Panel (Map View):

A map of Taipei, Taiwan, showing elevation using a pseudocolor scale. The map is divided into districts, each labeled with its name in Chinese. The color gradient ranges from dark blue (low elevation) to dark red (high elevation), with intermediate colors like green, yellow, orange, and brown. The map includes a network of blue lines and purple dots.

Annotations:

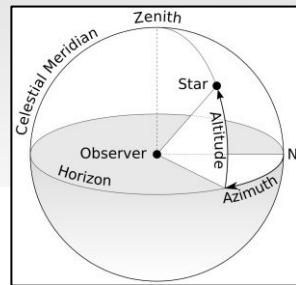
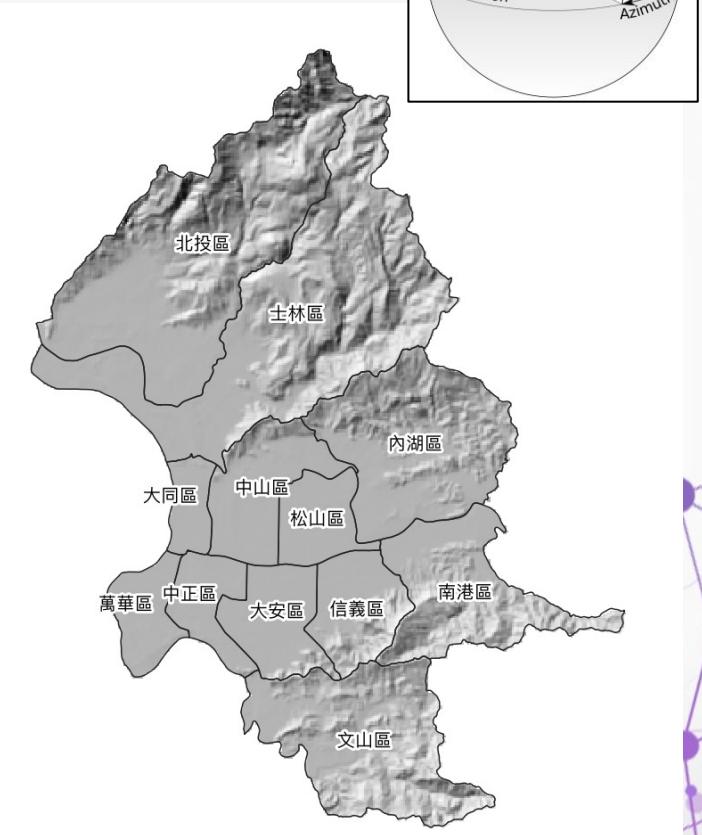
- Top Center:** 單波段偽彩色 (Single-band pseudocolor)
- Bottom Left:** 分類方式 (Classification method)
- Bottom Center:** 分幾類 (Divide into several categories)
- Bottom Right:** Classify -> Apply-> OK

附圖

Symbology Change 2 – Hillshade



參數意義如附圖



Symbology Change 3 – Contour

Layer Properties — Clipped (mask) — Symbology

Band Rendering

Render type: Contours

Input band: Band 1 (Gray)

Contour Interval: 100.00

Contour Symbol: 等高線

Index Contour Interval: 500.00

Index Contour Symbol: 計曲線區間

Input Downscaling: 4.00

Color Rendering

Blending mode: Normal

Brightness: 0

Contrast: 0

Gamma: 1.00

Saturation: 0

Hue: Colorize

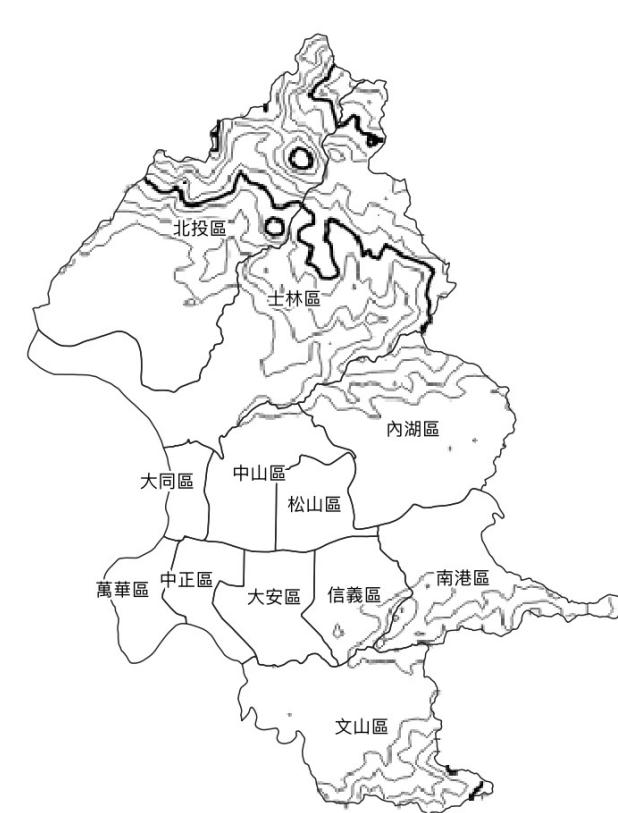
Strength: 100%

Grayscale: Off

Resampling

Zoomed: in Nearest neighbour out Nearest neighbour Oversampling: 2.00 Early resampling

Help Style Apply Cancel OK



網格資料讀取與呈現

第二部分

坡度、坡向、視域分析、等高線繪製

坡度 Slope

Raster ->
Analysis ->
Slope

Slope

放入網格資料

Parameters Log

Input layer
 Clipped (mask) [EPSG:3826]

Band number

Ratio of vertical units to horizontal
1.000000

Slope expressed as percent instead of degrees

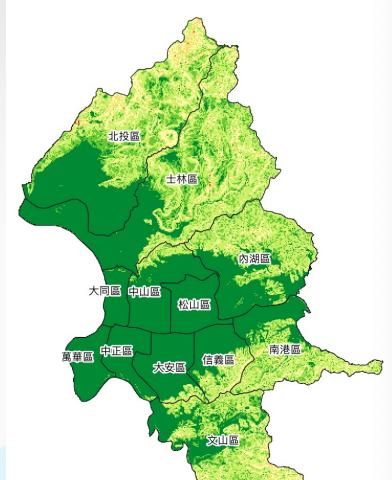
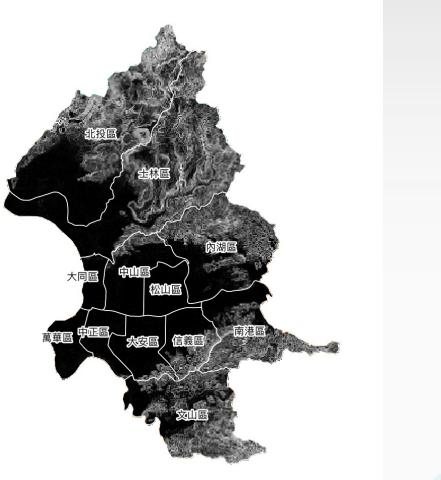
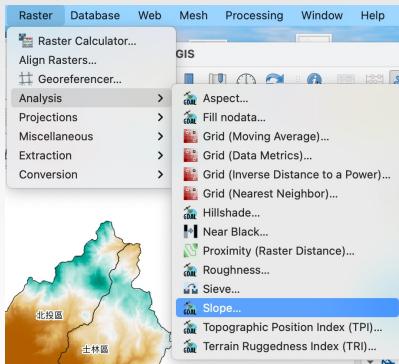
Compute edges

Use ZevenbergenThorne formula instead of the Horn's one

Advanced Parameters

0%

Help Close



從symbology手動調整顏色



一級坡(坡度≤5%)	
二級坡5%<坡度≤15%	
三級坡15%<坡度≤30%	
四級坡30%<坡度≤40%	
五級坡40%<坡度≤55%	
六級坡55%<坡度≤100%	
七級坡坡度 > 100%	

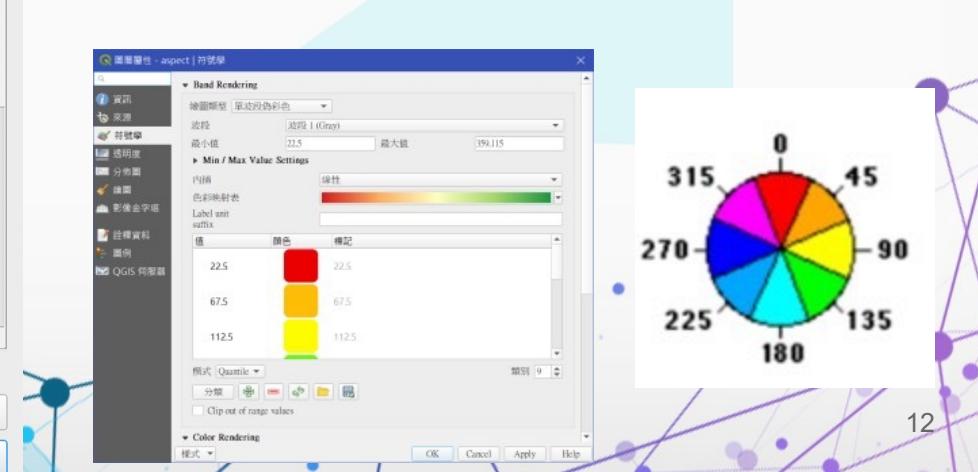
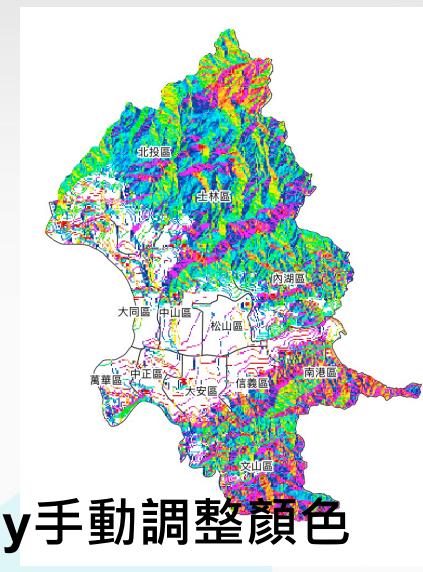
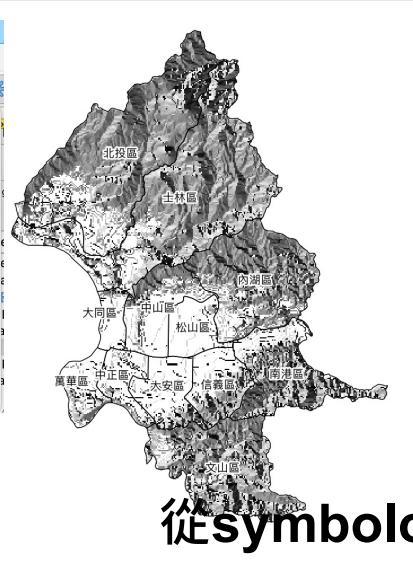
坡向 Aspect

Raster >
Analysis >
Aspect

The screenshot shows the QGIS interface with the 'Raster' menu open, specifically the 'Analysis' submenu. The 'Aspect...' option is highlighted. Below the menu, a processing dialog box is open for the 'Aspect' tool. The 'Input layer' dropdown contains 'Clipped (mask) [EPSG:3826]'. The 'Parameters' tab is selected, showing the following configuration:

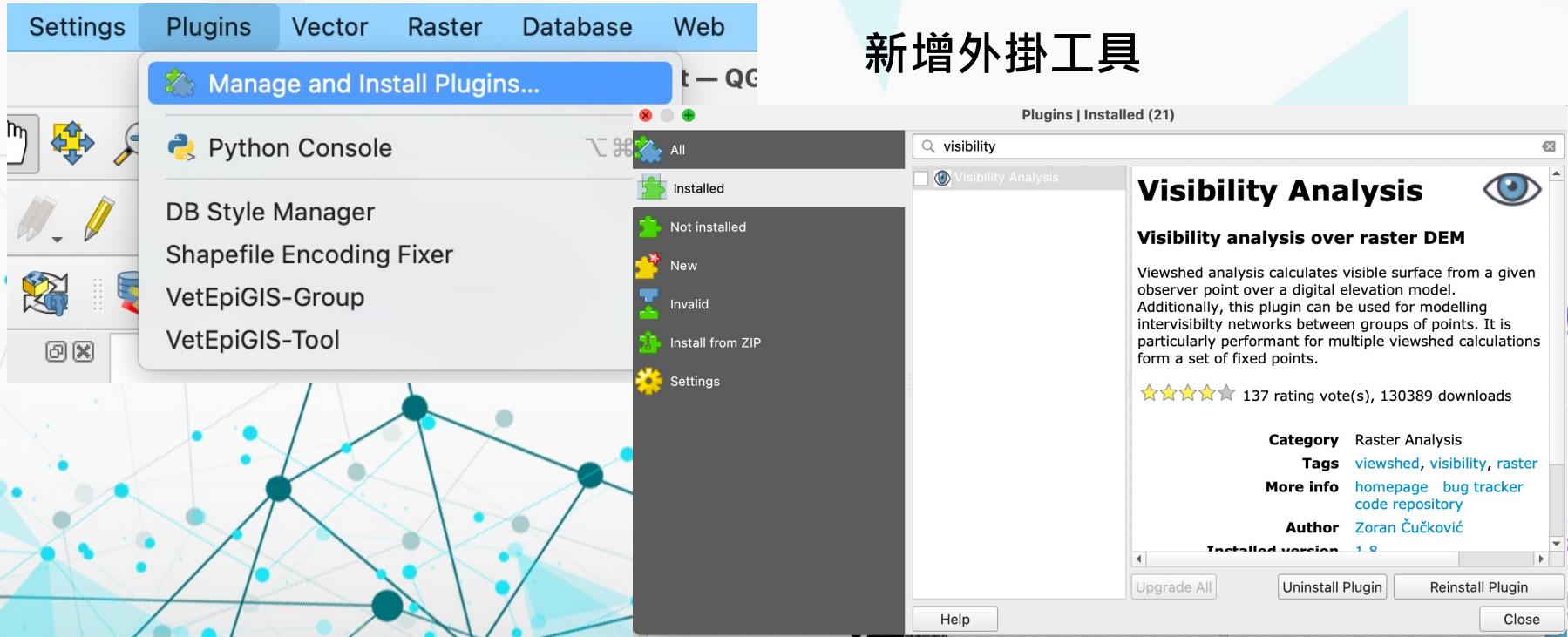
- Band number:** Band 1 (Gray)
- Advanced Parameters:** Additional creation options [optional]
- Output parameters:** 0% progress, Cancel, Close, Run, Help, Run as Batch Process...

放入網格資料 (Insert Grid Data) is overlaid on the dialog.



View Shade 視域分析 1

需要先安裝外掛程式：上方欄位>plugins>Manage and install plugins> Visibility Analysis



View Shade 視域分析 2 create view point

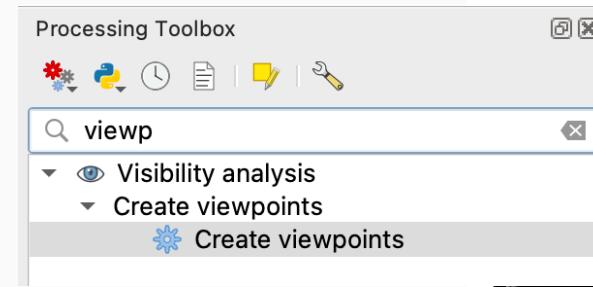
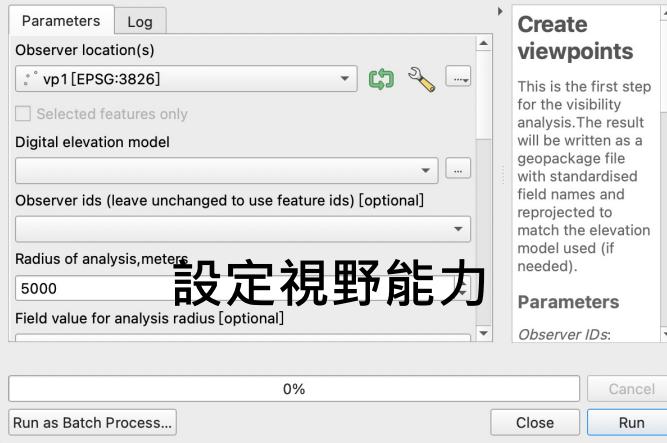
主要步驟：

1. 新增觀覽點 polypoint (新增點位圖層為實習三的內容)

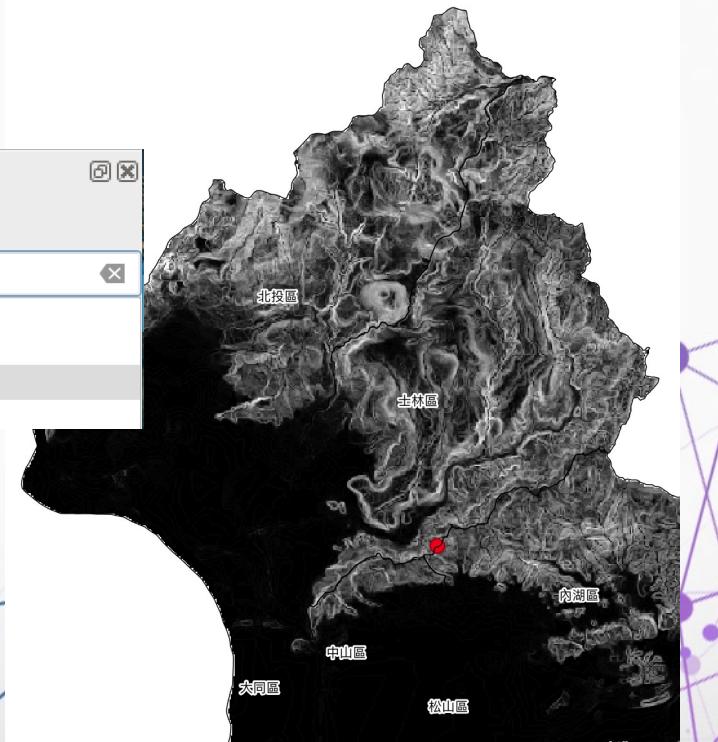
2. 把現成的polypoint 創建成 viewpoint

3. 利用 viewshed 視域分析 範圍

輸入polypoint 點位向量資料



建立觀看點位

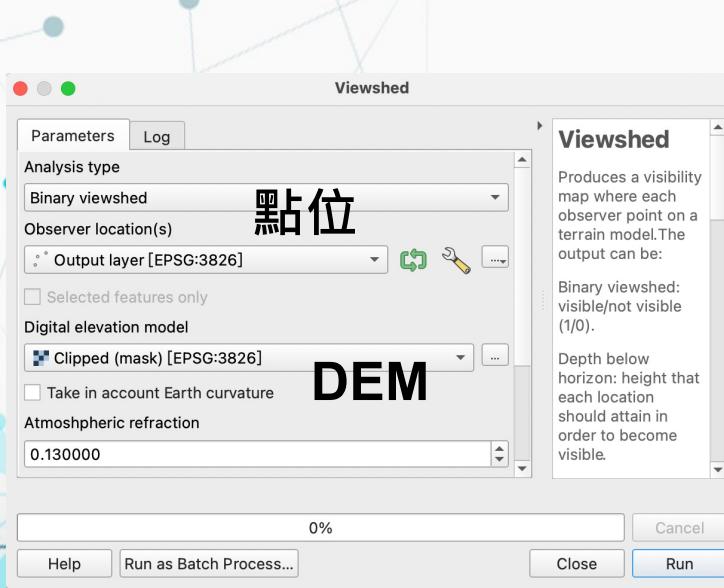


View Shade 視域分析 3 create view shed

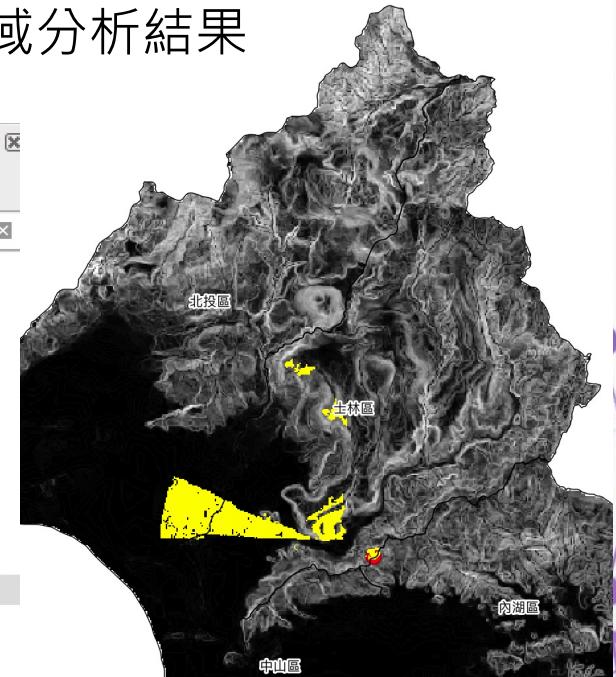
主要步驟：

1. 新增觀覽點 polypoint (新增點位圖層為實習三的內容)
2. 把 polypoint 創建成 viewpoint

3. 利用 viewshed 視域分析 範圍



視域分析結果



等高線 Contour

Contour

Parameters Log

Input layer
Clipped (mask) [EPSG:3826]

Band number
Band 1 (Gray)

Interval between contour lines
10.000000

Attribute name (if not set,no elevation attribute is attached) [optional]
ELEV

Offset from zero relative to which to interpret intervals [optional]
0.000000

0% Cancel Run

Help Run as Batch Process...

Vector Raster Database Web Mesh Processing Window

Raster Calculator... Align Rasters... Georeferencer... Analysis Projections Miscellaneous Extraction > Clip Raster by Extent... Clip Raster by Mask Layer... Contour...

GIS

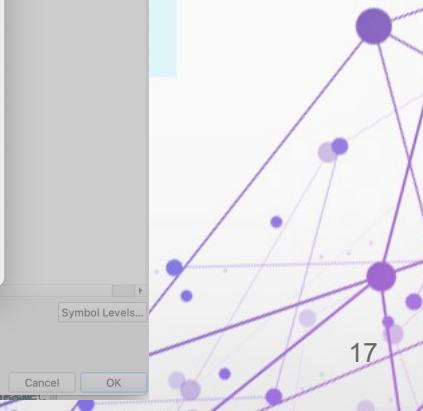
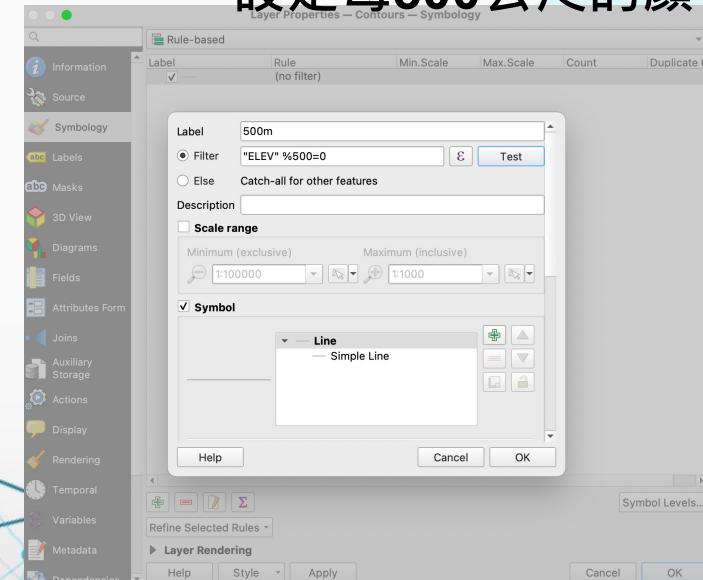
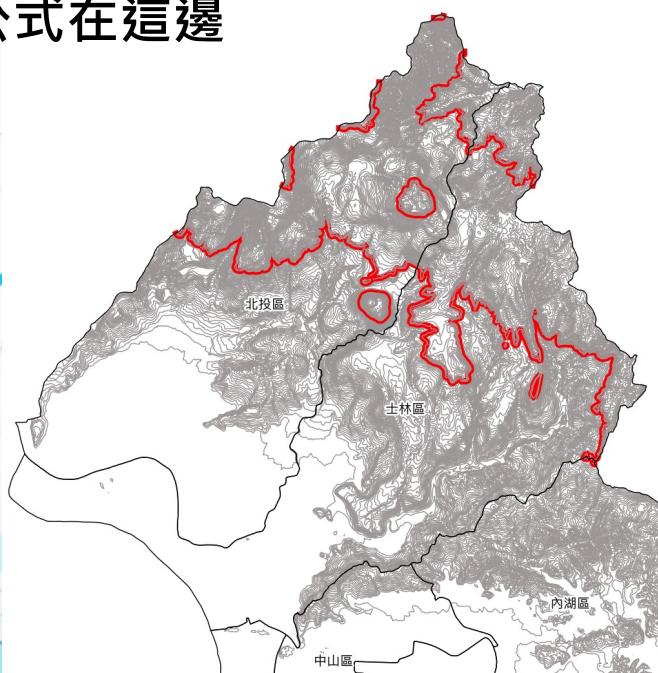
The screenshot displays the QGIS interface with the 'Contour' processing tool open. The 'Raster' menu is selected, and the 'Extraction' submenu is active, showing options like 'Clip Raster by Extent...', 'Clip Raster by Mask Layer...', and 'Contour...'. The main window shows a map of a mountainous region with numerous contour lines. Several districts are labeled in Chinese: 北投區 (Beitou District), 士林區 (Shilin District), 內湖區 (Neihu District), 中山區 (Zhongshan District), and 松山區 (Songshan District). The 'Contour' dialog contains fields for input layer (Clipped (mask) [EPSG:3826]), band number (Band 1 (Gray)), interval (10.000000), attribute name (ELEV), and offset (0.000000). Progress bar at 0% and buttons for Help, Run as Batch Process..., Close, and Run are also visible.

Rule-Based Symbology 調整等高線樣式 Contour Symbology

Symbology：每500公尺用特別的線標出來

$$\text{"ELEV" \%}500=0$$

公式在這邊



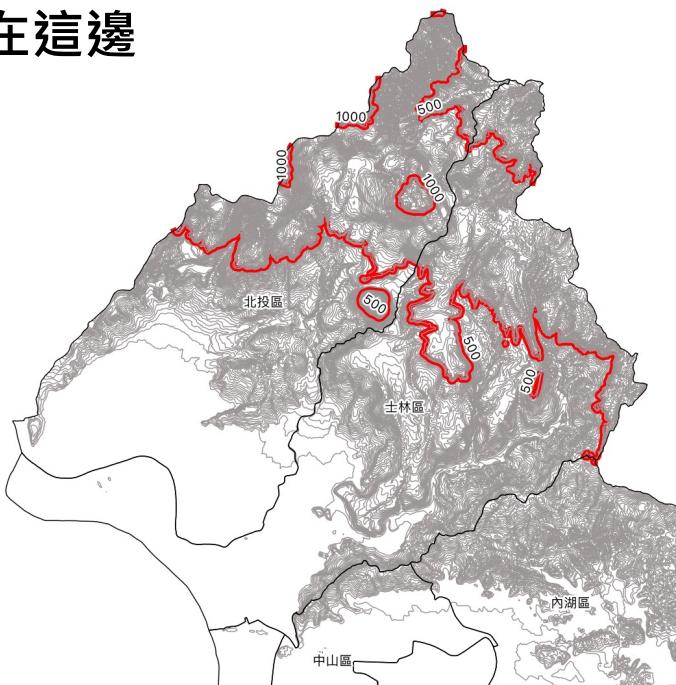
Rule-Based Labeling

調整等高線樣式 Contour Label

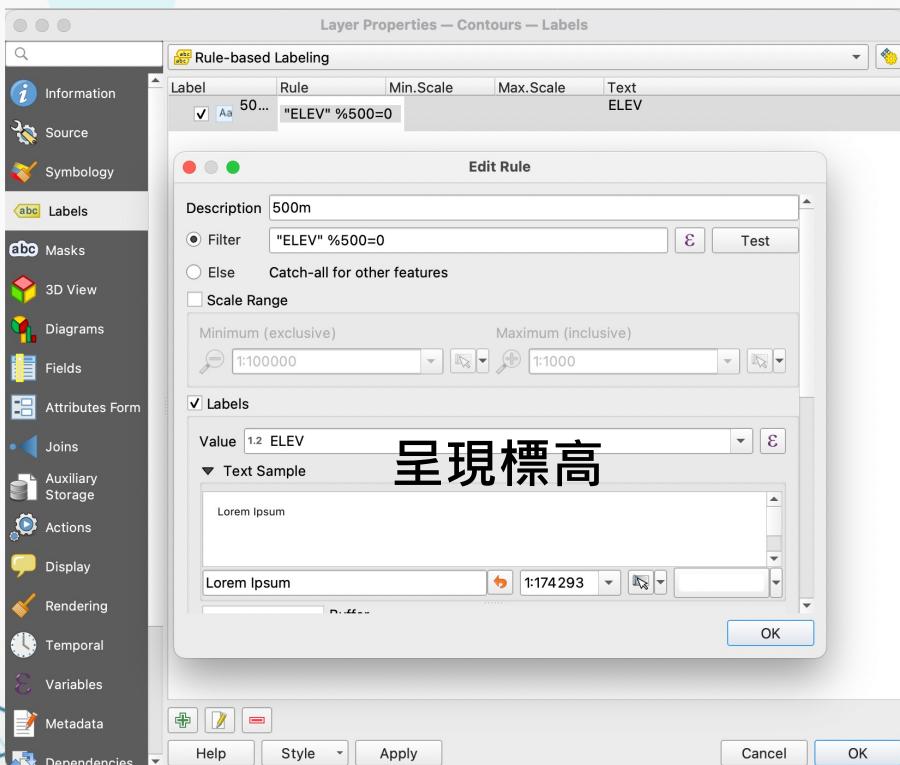
Symbolology : 每500公尺用特別的線標出來

"ELEV" %500=0

公式在這邊



篩選出每500公尺的等高線
呈現每500公尺的標籤



呈現標高

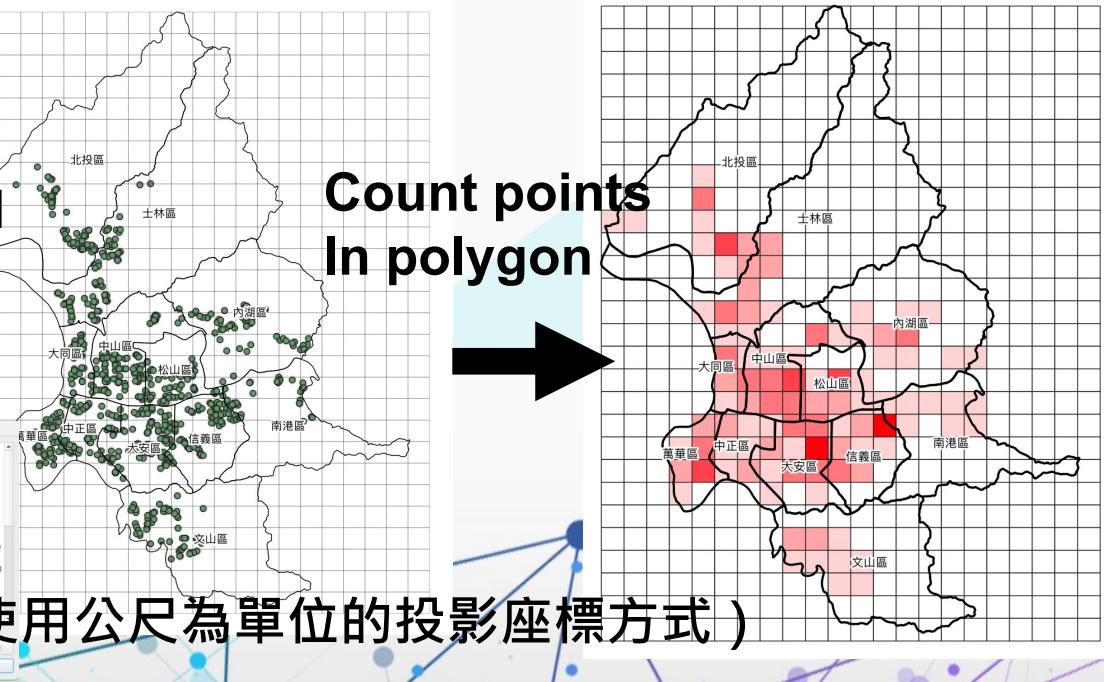
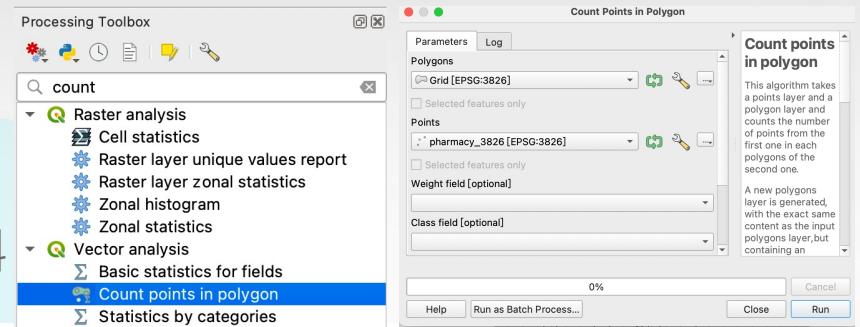
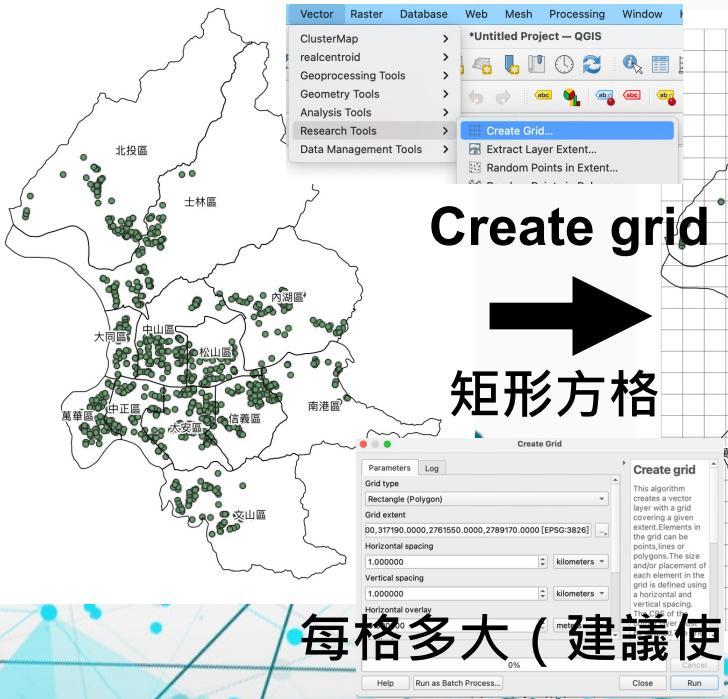
網格資料讀取與呈現

第三部分

向量資料網格化

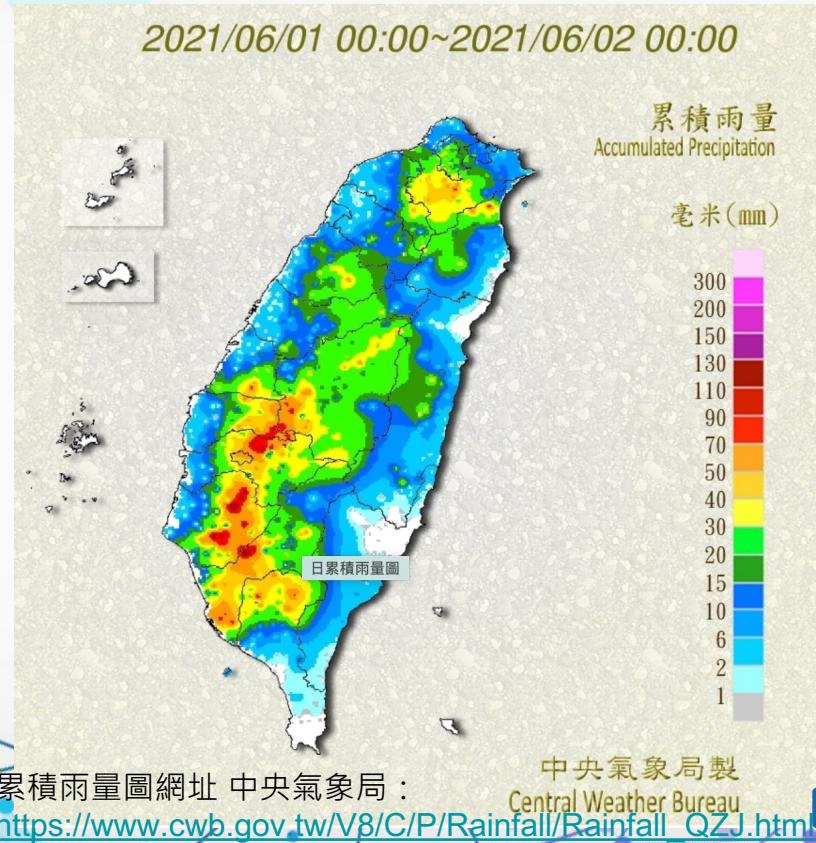
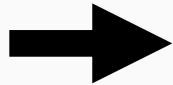
Create Grid

- 建立虛擬網格，把向量資料轉成網格資料



實戰演練：中央氣象局累積雨量分布地圖

	station_id	station_name	lon	lat	city	city_sn	town	town_sn	attribute
1	01E310	南勢山	120.7271	24.5898	苗栗縣	11	後龍鎮	91	水利署第2河...
2	01E030	橫龍山	120.9606	24.4717	苗栗縣	11	泰安鄉	101	水利署第2河...
3	COR540	佳冬	120.5442	22.4212	屏東縣	20	佳冬鄉	341	局屬無人測站
4	COU760	東澳	121.825	24.5238	宜蘭縣	7	南澳鄉	93	局屬無人測站



A	B	C	D	E	F	G	H	I	J	
1	station_id	obsTime	ELEV	RAIN	MIN_10	HOUR_3	HOUR_6	HOUR_12	HOUR_24	NOW
2	C0S980	2021/6/1 0:00	350	-998	-998	-998	-998	0.5	0.5	0.5
3	K2E710	2021/6/1 0:00	350	-998	-998	-998	-998	0.5	0.5	0.5
4	C0G880	2021/6/1 0:00	350	-998	-998	-998	-998	0.5	0.5	0.5
5	C0B520	2021/6/1 0:00	250	-998	-998	-998	-998	0.5	0.5	0.5

中央氣象局：累積雨量分布地圖（使用 EPSG:4326）

資料來源：中央氣象局自動雨量站（雨量觀測資料僅提供即時資料，.json檔案）：

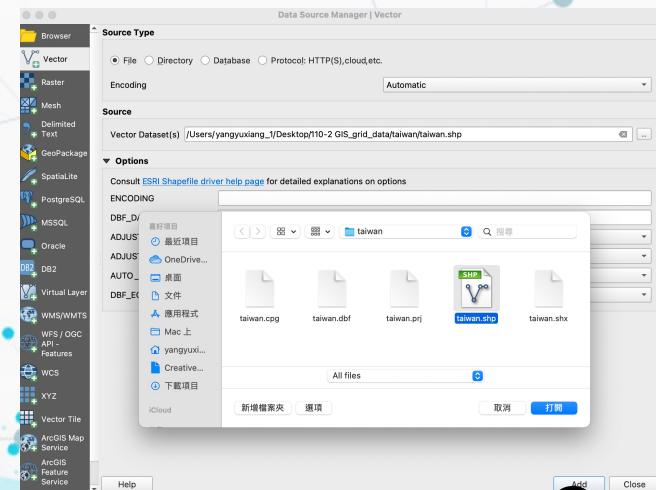
<https://data.gov.tw/dataset/9177>

- 概念流程重點：

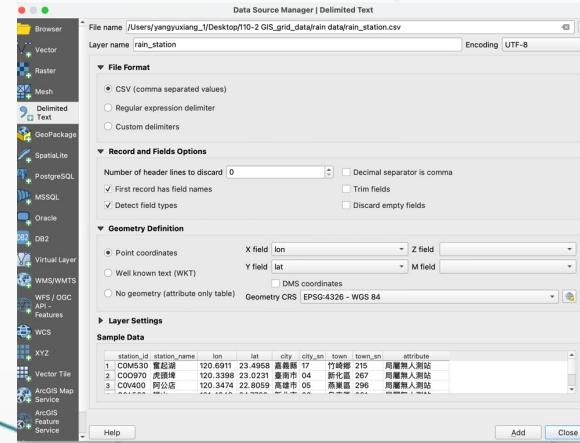
1. 下載資料，包含 0601的降雨資料（.json檔，自行轉換成.csv檔案）、雨量測站站點資料（.csv）。
2. 兩個.csv匯入QGIS，測站設定為點圖層，並且透過測站 id join雨量的24小時累積雨量（HOUR_24）資料。
3. 把負值修改為0，空缺值修改為-1（參考後面投影片），最後輸出為.shp（polyline）。
4. 針對 polyline，使用內插 Interpolation>IDW，並且調整參數（參考後面投影片）
5. 處理完後為網格資料（raster），用台灣範圍的shapefile，利用raster>extraction>clip raster by mask，切出台灣內的雨量網格資料。
6. 用切出的資料，調整Symbology為Singleband pseudocolor，選顏色、數值分類的點選以及輸入（上一頁投影片），並另存Style為.qml檔案，記得interpolate 選擇discrete。

1. Load Data

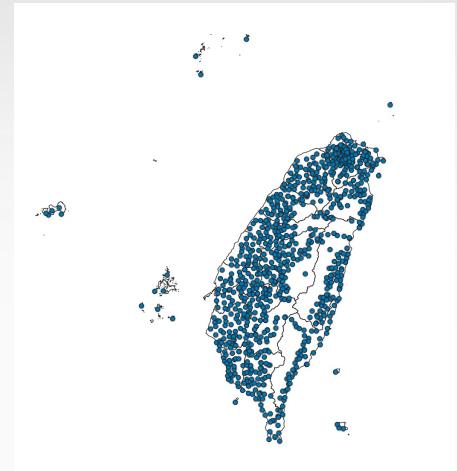
Taiwan shp



Rain station. csv



Create geometry by X, Y Coordinates

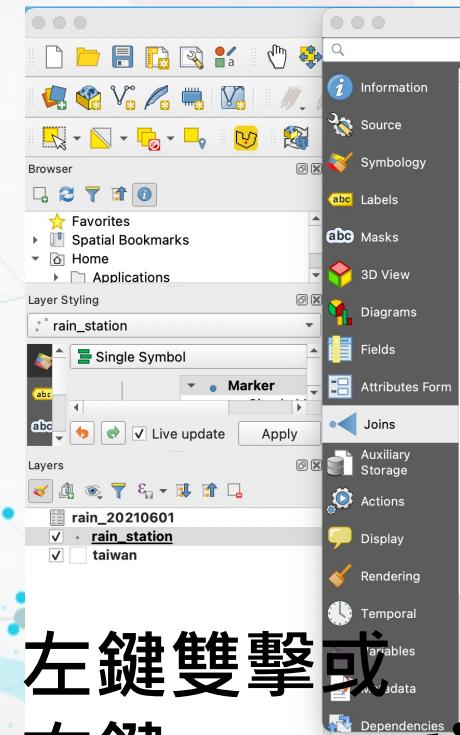


Rain data

station_id	station_name	lon	lat	city	city_en	town	town_en	attribute
1	COM530	120.6911	23.4958	嘉義縣	Chiayi County	竹崎鄉	Zukeng Township	測站
2	COD970	120.3398	23.0231	臺南市	TM	新化區	267	周麗華測站
3	COV400	120.3474	22.8059	高雄市	Kaohsiung City	楠東區	296	周麗華測站

station_id	obs_time	ELEV	RAIN	MIN_10	HOUR_3	HOUR_6	HOUR_12	HOUR_24	NOW
1	2022-06-01 00:00:00	350.000	-998.000	-998.000	-998.000	-998.000	0.500	0.500	0.500
2	2022-06-01 00:00:00	350.000	-998.000	-998.000	-998.000	-998.000	0.500	0.500	0.500
3	2022-06-01 00:00:00	350.000	-998.000	-998.000	-998.000	-998.000	0.500	0.500	0.500
4	2022-06-01 00:00:00	350.000	-998.000	-998.000	-998.000	-998.000	0.500	0.500	0.500
5	2022-06-01 00:00:00	350.000	-998.000	-998.000	-998.000	-998.000	0.500	0.500	0.500

2. Join Attribute



按下 + 號

Layer Properties — rain_station — Joins

相同測站id
合併資料
把雨量資訊進入
到測站資料

	town_en	attribute	obsTime	ELEV	RAIN	MIN_10	HOUR_3	HOUR_6	HOUR_12	HOUR_24	NOW
1	215	局屬無人測站	2021-06-02 ...	1385	-998	-998	-998	-998	9.5	29	29
2	267	局屬無人測站	2021-06-02 ...	71	-998	-998	-998	-998	0	77.5	77.5
3	296	局屬無人測站	2021-06-02 ...	56	-998	-998	-998	-998	0	51.5	51.5
4	61	局屬無人測站	2021-06-02 ...	405	0	0	0	0	14.5	39	39
5	57	水利署第10河段	2021-06-01 ...	33	0	0	0	0	6	33	33
6	175	農委會水土保	2021-06-02 ...	613	-998	-998	-998	-998	11	23	23
7	276	局屬無人測站	2021-06-02 ...	10	-998	-998	-998	-998	4.5	26	26
8	46	局屬無人測站	2021-06-02 ...	48	0	0	0	0	6	35	35
9	214	局屬無人測站	2021-06-02 ...	15	-998	-998	-998	-998	0	14	14
10	122	水利署第4河段	2021-06-01 ...	2303	0	0	1	1	13	39	39
11	119	局屬無人測站	2021-06-02 ...	563	-998	-998	-998	-998	1.5	5	5
12	116	局屬無人測站	2021-06-02 ...	311	-998	-998	-998	-998	17.5	17.5	17.5
13	38	北市府大工地	2021-06-02 ...	118	0	0	0	0	13	20	20
14	219	中央氣象局	2021-06-02 ...	26.9	-998	-998	-998	-998	0	59.5	59.5
15	99	局屬無人測站	2021-06-02 ...	83	-998	-998	-998	-998	15.5	15.5	15.5
16	217	局屬無人測站	2021-06-02 ...	40	-998	-998	-998	-998	2.5	37	37
17	53	局屬無人測站	2021-06-02 ...	3690	-998	-998	-998	-998	27	42	42
18	228	中央氣象局	2021-06-02 ...	2.3	-998	-998	-998	-998	0	31	31
19	29	局屬無人測站	2021-06-02 ...	287	0	0	0	0	15.5	15.5	15.5
20	218	雨量站	2021-06-02 ...	2	1	1	1	1	21.5	21.5	21.5

左鍵雙擊或
右鍵 properties

3. Modify Value

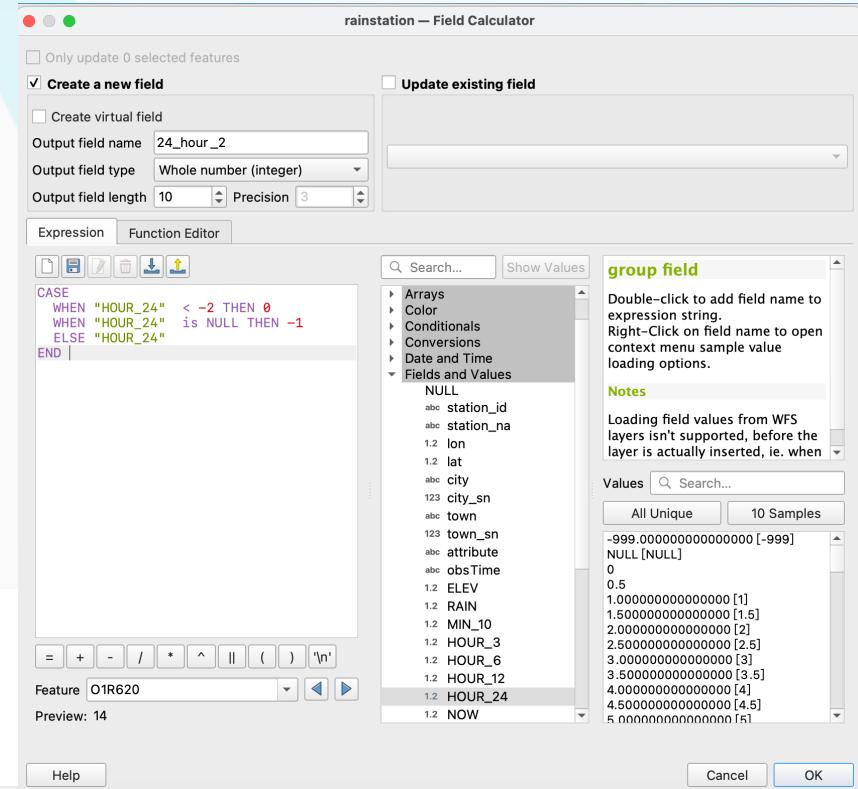
把負值 (-999) 修改為 0 , 把空缺
值修改為 -1

```
CASE
WHEN "HOUR_24" < -2 THEN 0
WHEN "HOUR_24" is NULL THEN -1
ELSE "HOUR_24"
END
```

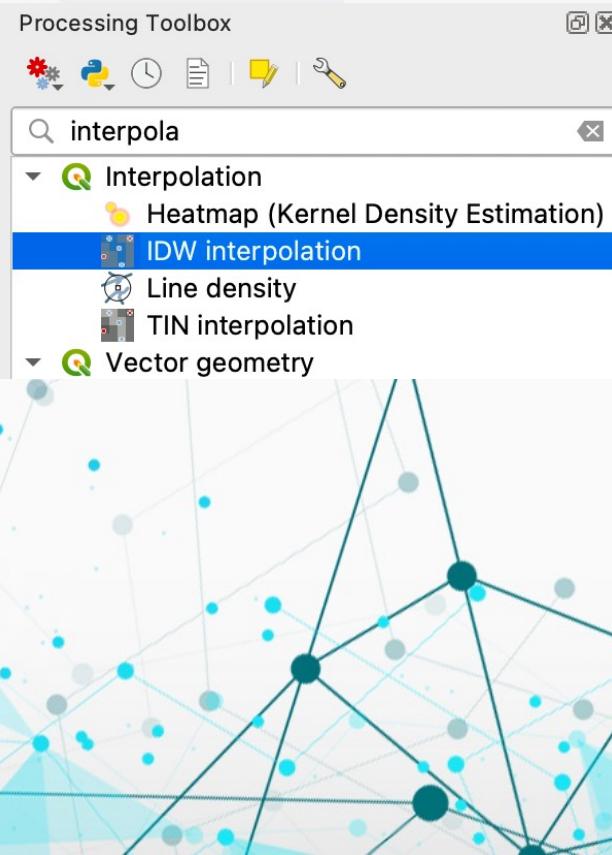
補充說明

- 雨量值小於 0.00 皆表示該時刻因故無資料。
- 雨量值為 -998.00 表示RAIN=MIN_10=HOUR_3=
HOUR_6= 0.00 。

● 說明檔案為-998，但資料實際是-999。

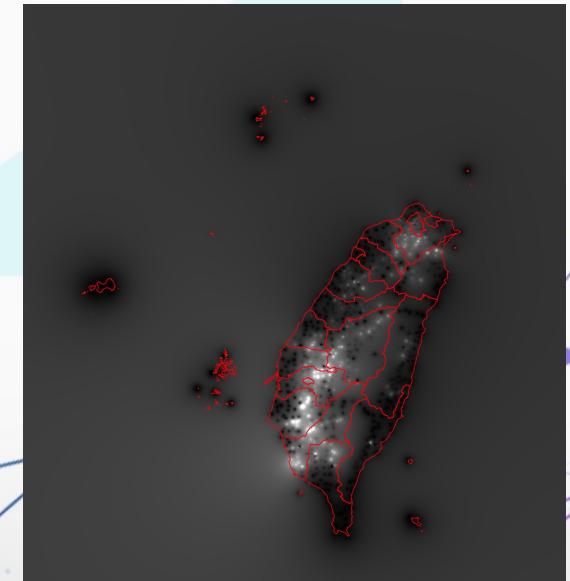
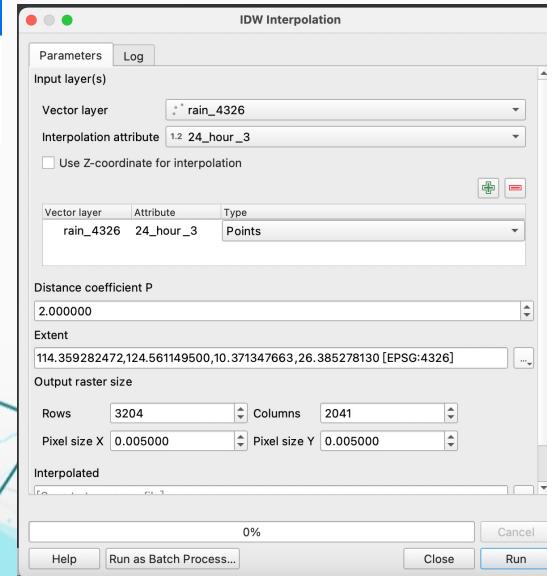


4. Interpolation IDW 距離反比權重內插



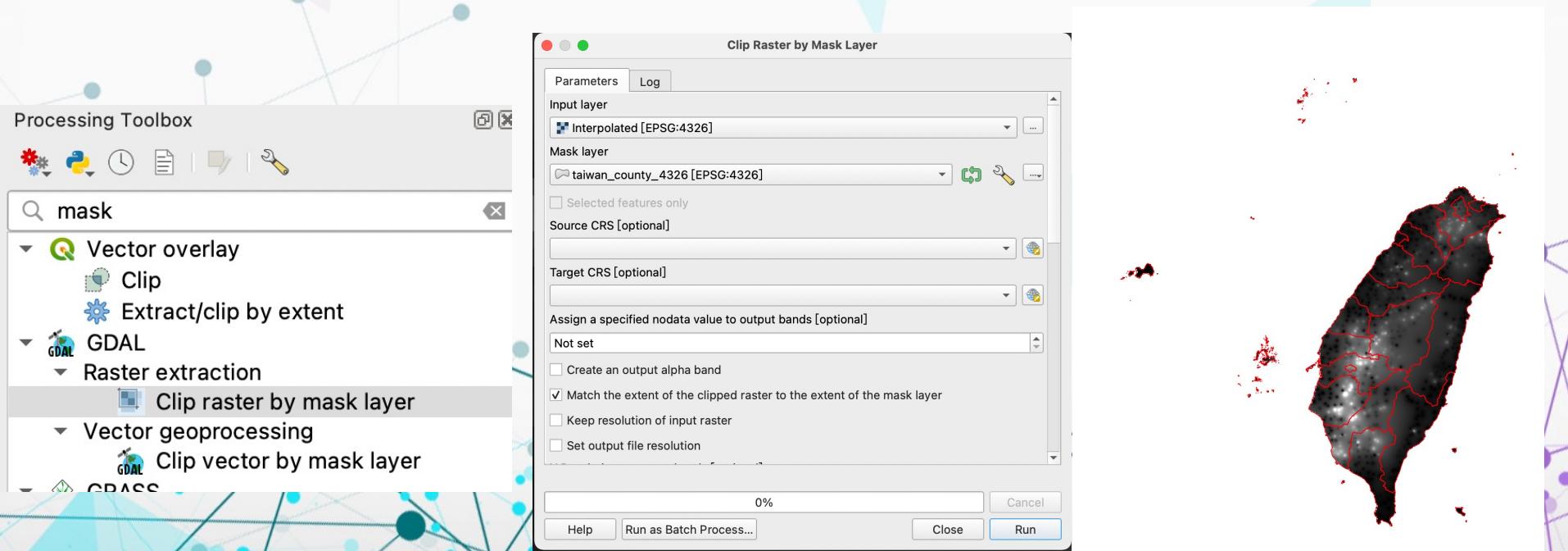
重點：

1. IDW空間內插 (spatial interpolate)
2. 權重選擇調整過後的數值 (H_24降水量) , Extent選擇台灣為範圍 。
3. Pixel Size 選 0.005 *0.005 (跑不動的話可以使用 0.01 *0.01)

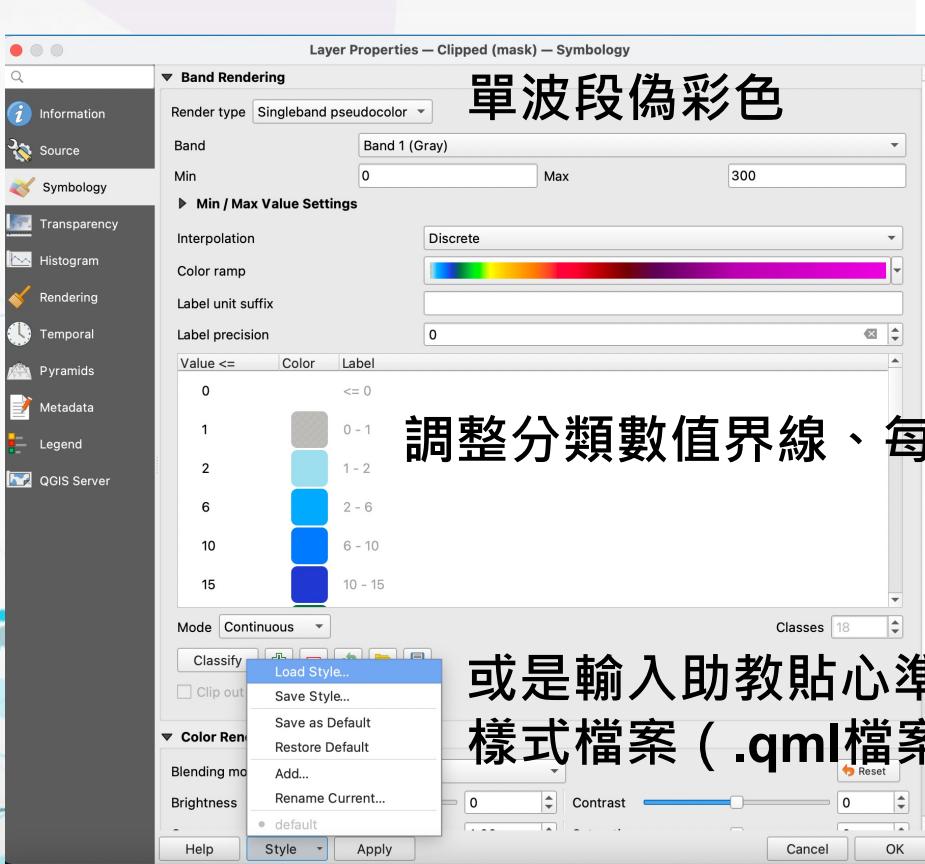


5. Clip for Taiwan Shape

- 處理完後為網格資料（raster），用台灣範圍的shapefile，利用 raster>extraction>clip raster by mask，切出台灣內的雨量網格資料。

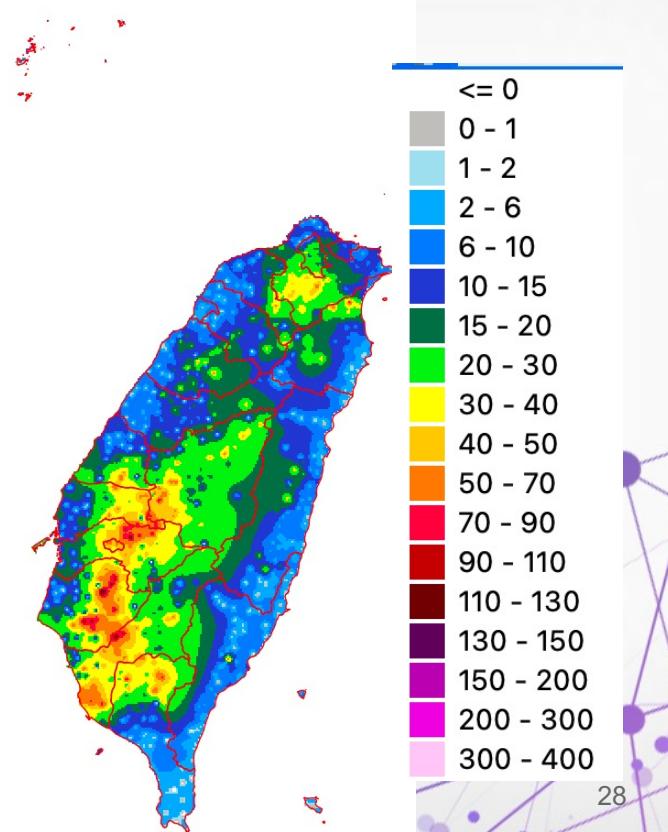


6. Adjust Symbology – Singleband PseudoColor



調整分類數值界線、每個分類顏色

或是輸入助教貼心準備的
樣式檔案 (.qml 檔案)



The End