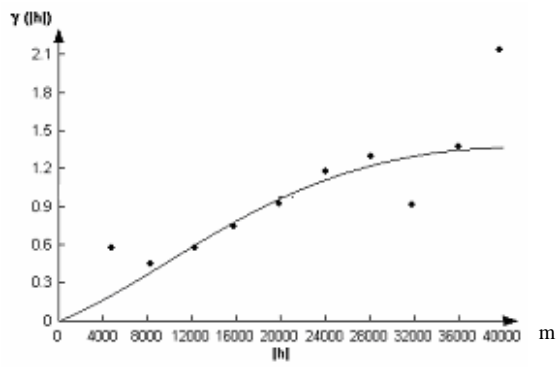


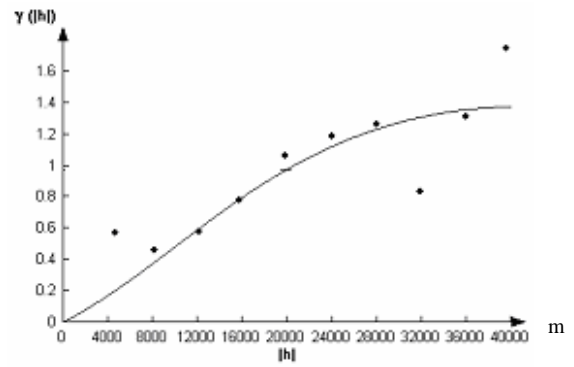
附錄一、

屏東平原含水層二地下水質常態化後變異元分析結果

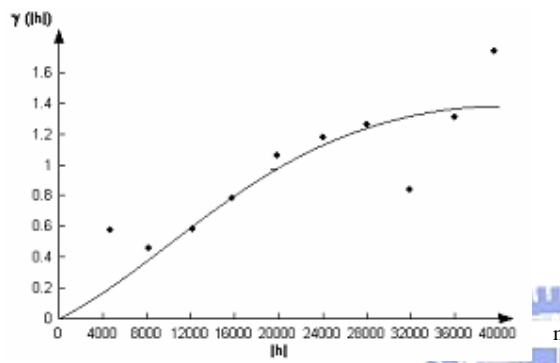




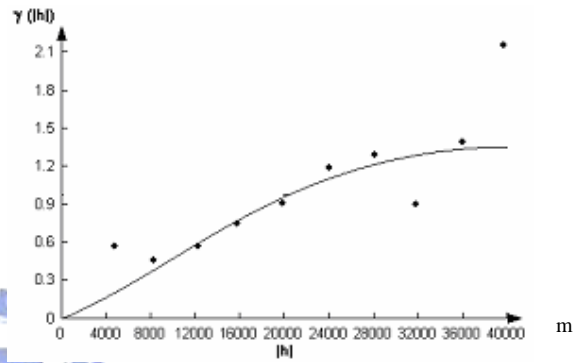
EC-EC



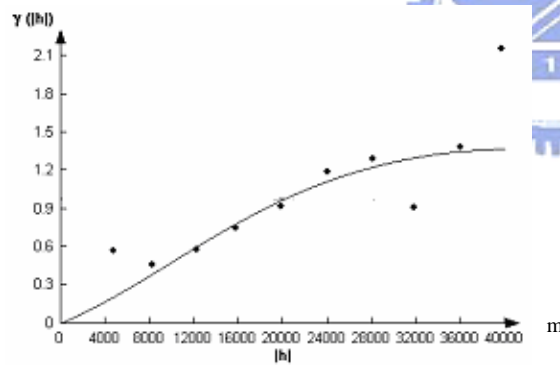
TDS-Cl



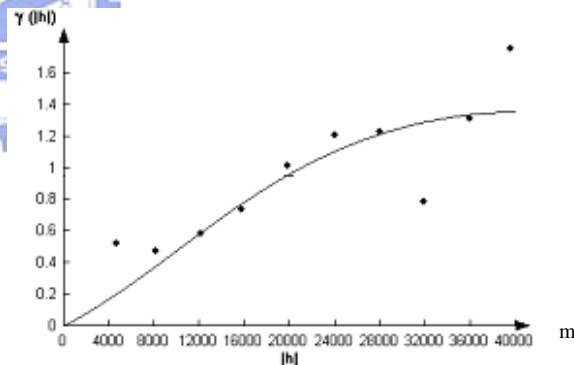
EC-TDS



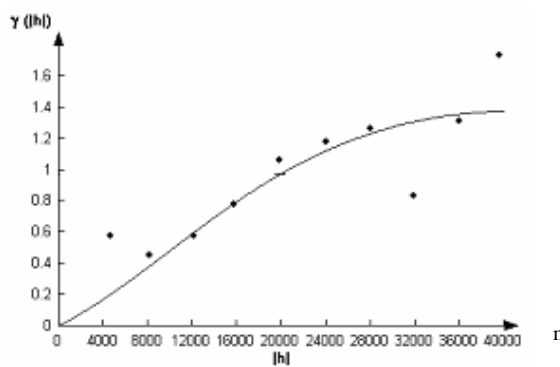
Cl-Cl



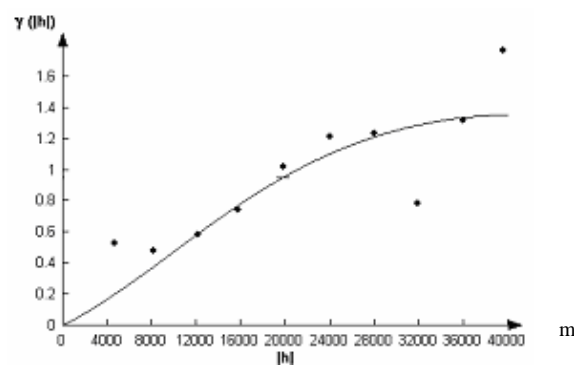
TDS-TDS



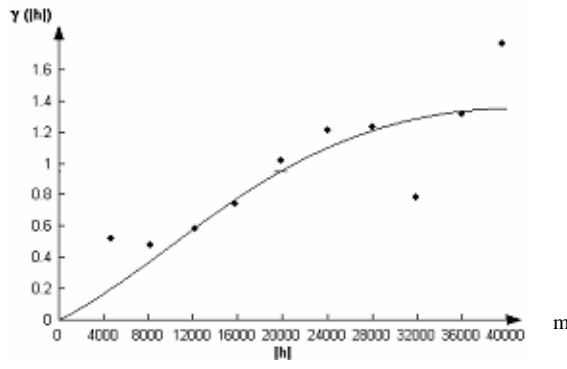
EC-Na



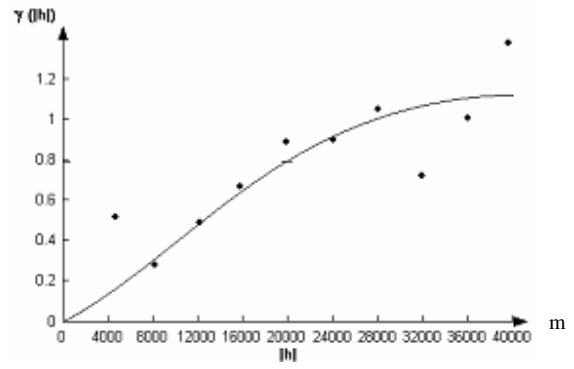
EC-Cl



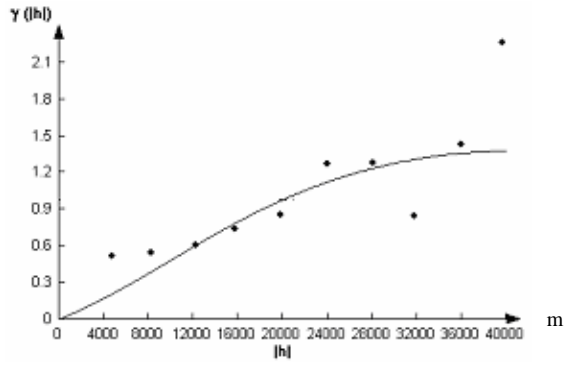
TDS-Na



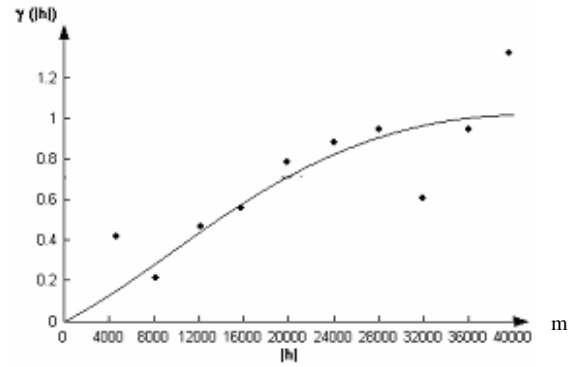
Cl-Na



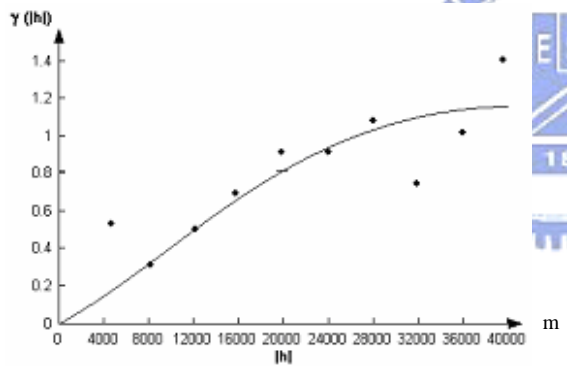
Cl-Ca



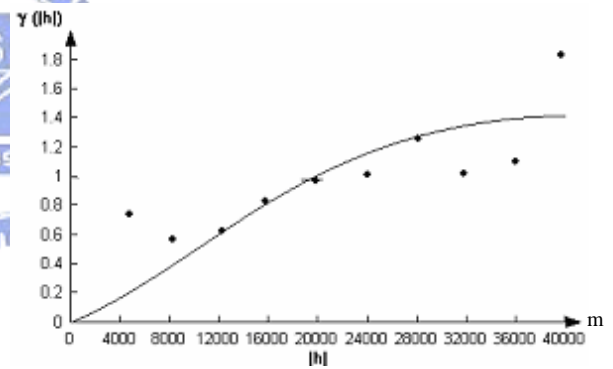
Na-Na



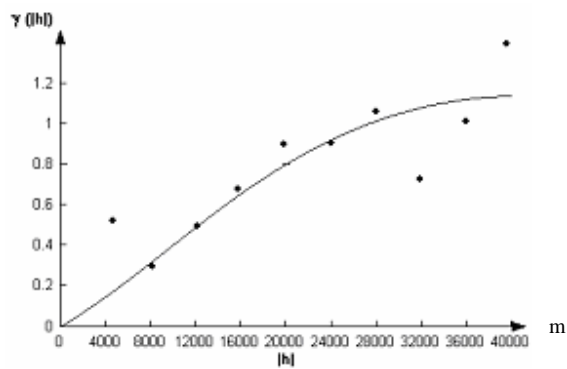
Na-Ca



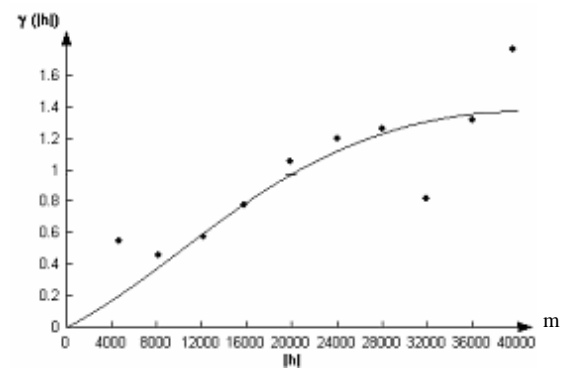
EC-Ca



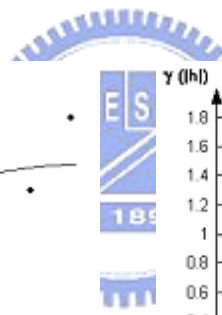
Ca-Ca

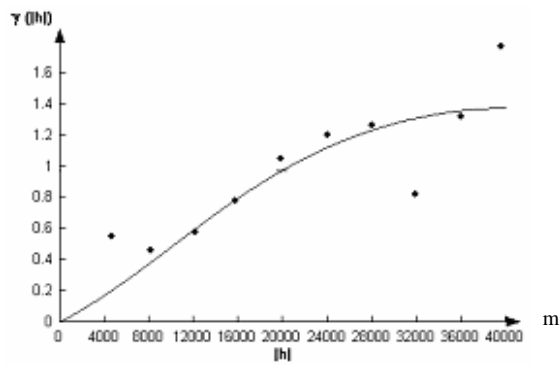


TDS-Ca

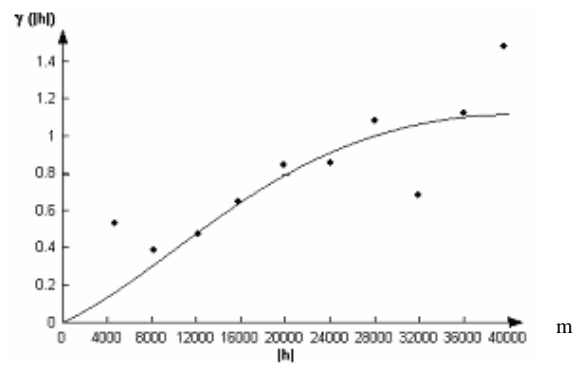


TDS-Mg

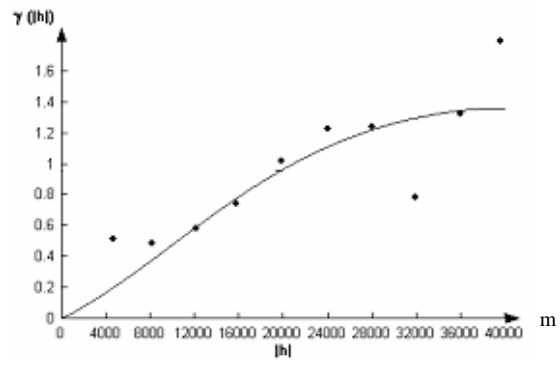




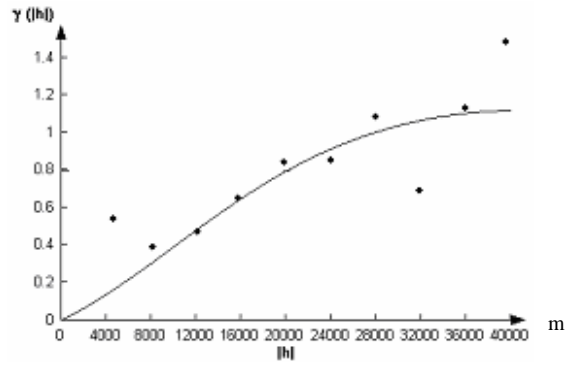
Cl-Mg



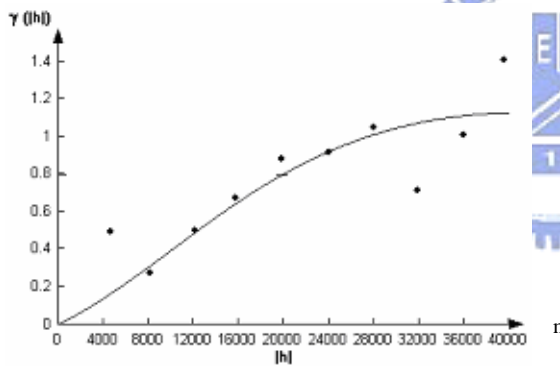
TDS- SO_4^{2-}



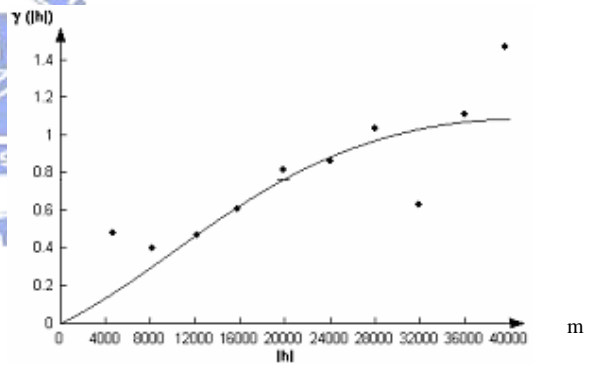
Na-Mg



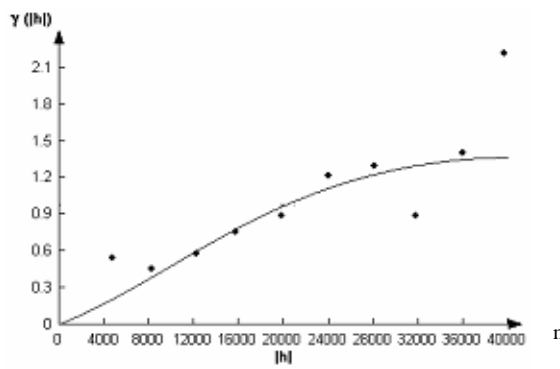
Cl- SO_4^{2-}



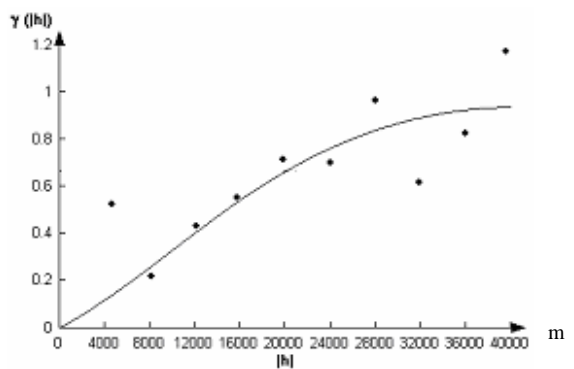
Ca-Mg



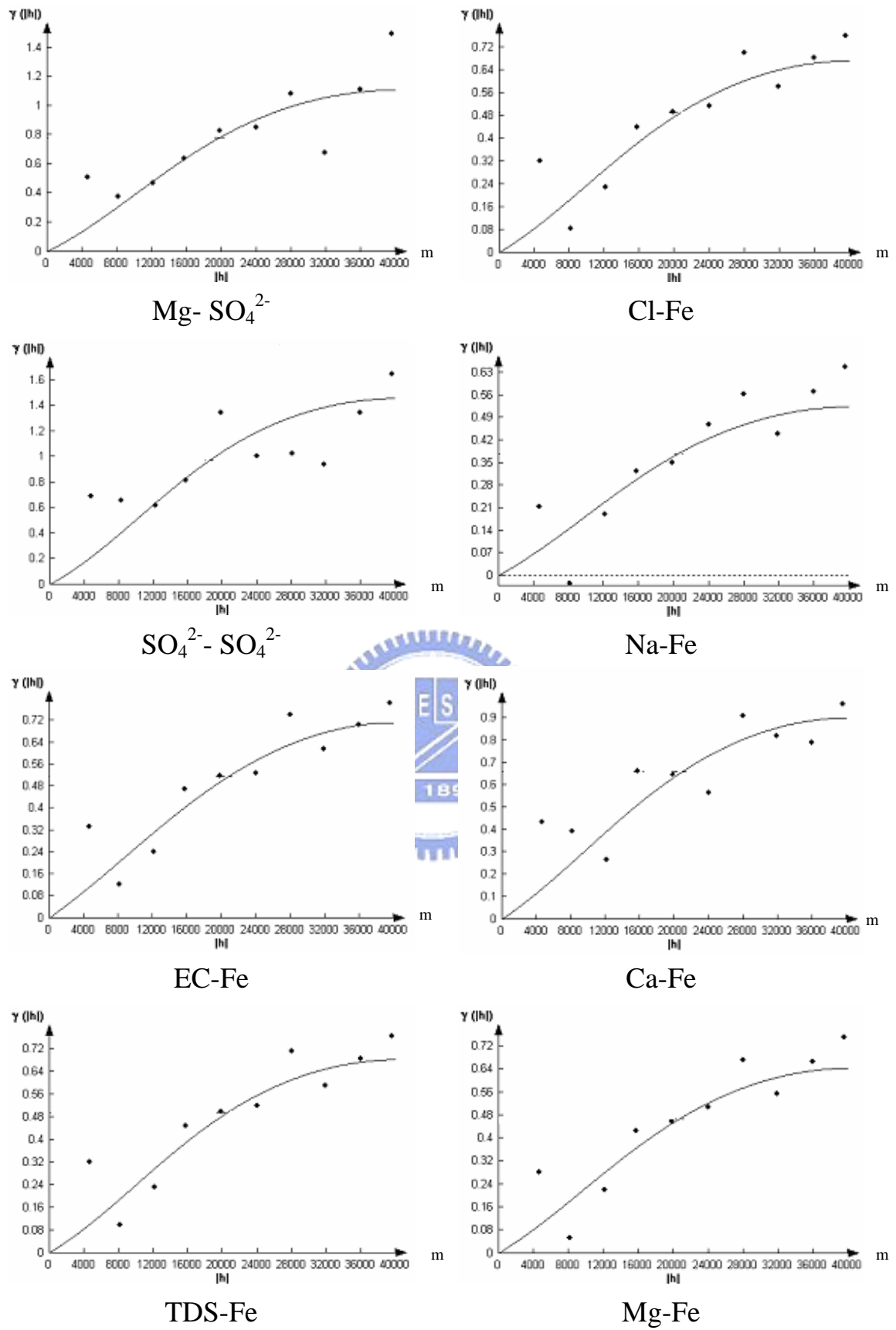
Na- SO_4^{2-}

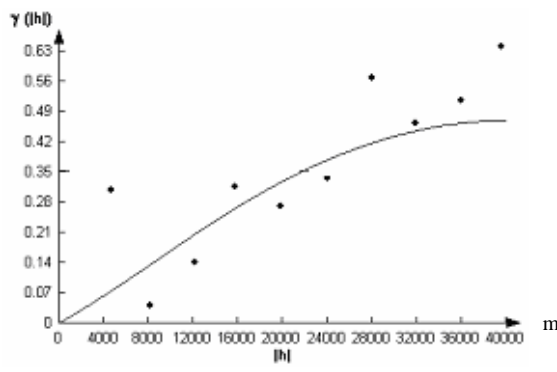


Mg-Mg

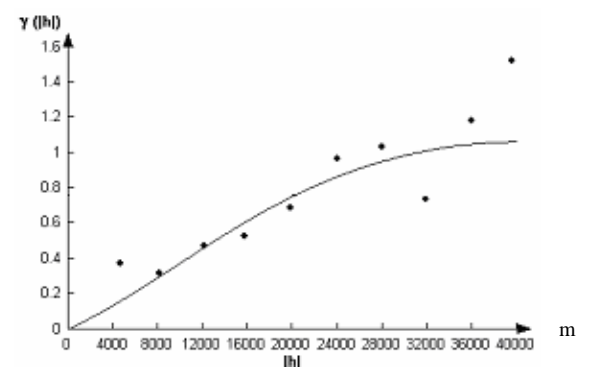


Ca- SO_4^{2-}

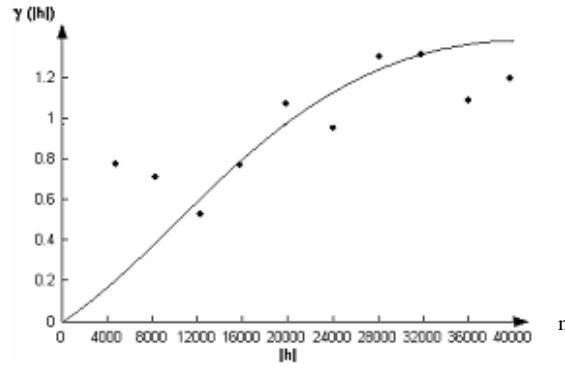




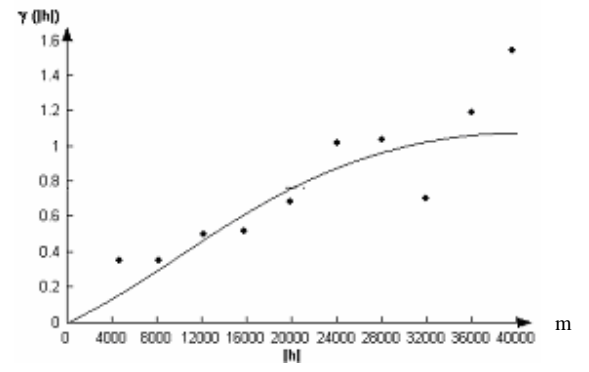
SO₄²⁻-Fe



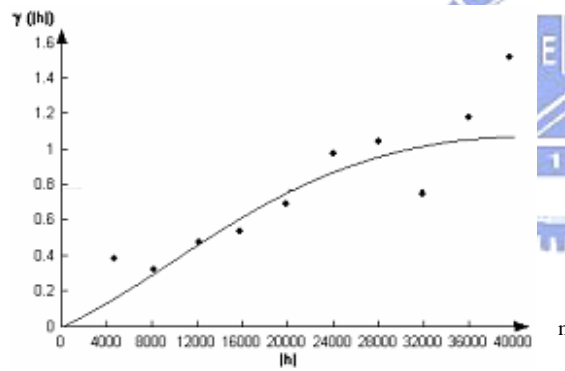
Cl-Mn



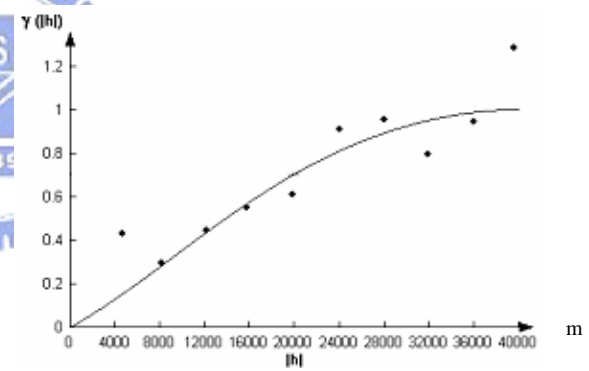
Fe-Fe



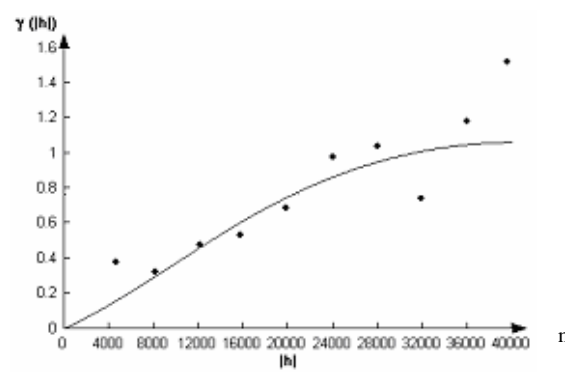
Na-Mn



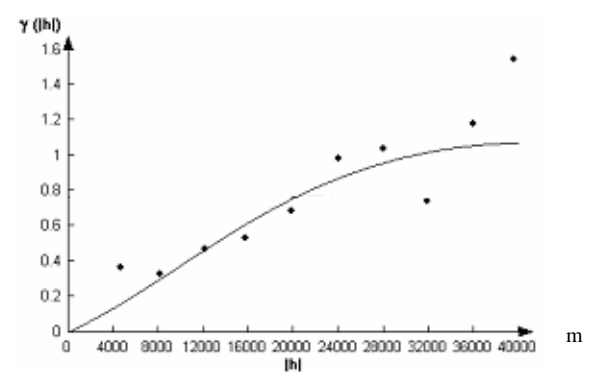
EC-Mn



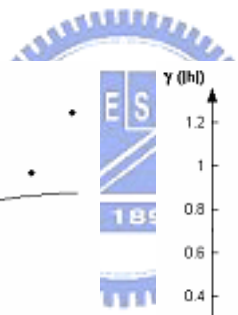
Ca-Mn

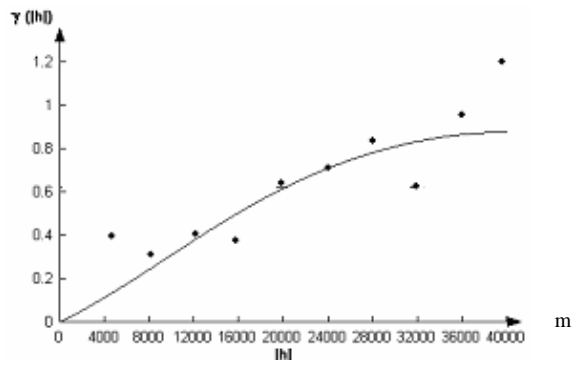


TDS-Mn

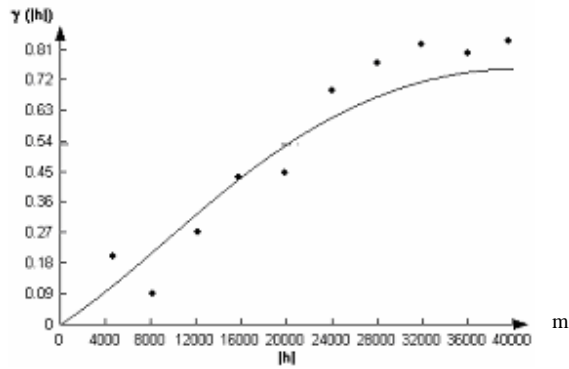


Mg-Mn

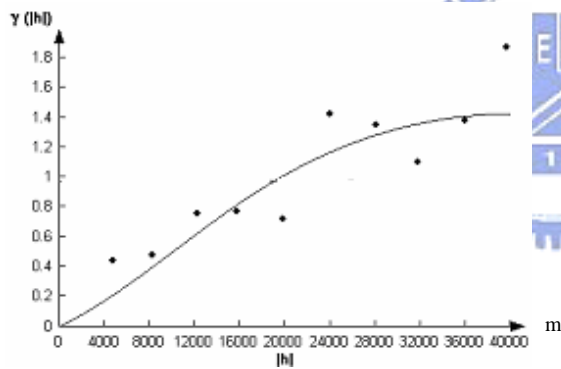




$\text{SO}_4^{2-}\text{-Mn}$



Fe-Mn



Mn-Mn

附錄二、VARIOWIN 程式概敘及使用步驟



本研究使用 VARIOWIN 程式分析水質資料之半變異元及複半變異元，而此程式可從網際網路下載取得，(網址：<http://www-sst.unil.ch/research/variowin/variowin.zip>)。本程式是由 Yvan Pannatier (University of Lausanne, Switzerland) 於 1996 年發展完成，包括三個小程式：Prevar2d、Vario2D with PCF、Model，而 VARIOWIN 程式主要是提供二維空間的資料分析與半變異圖的分析與套配。此外，本程式亦提供下列功能：

- variogram, madogram, correlogram, Stand. variogram, covariance
- cross variogram, cross madogram, ...
- h-scatterplots and clouds of the correlation functions
- directional variograms, madogram, ...
- interactive identification and masking of data pairs
- variogram, madogram ,..., surfaces exported in a grid format (these can so be compared)
- interactive modeling of the correlation functions

以上是對 VARIOWIN 程式的基本介紹，如想對此程式有更詳細的了解，以下三個網址可提供查詢。

<http://www-sst.unil.ch/research/variowin/index.html>

<http://sal.agecon.uiuc.edu/csiss/pdf/variowin.pdf>

http://www.ai-geostats.org/software/Geostats_software/variowin.htm

接下來，便是針對本研究利用 VARIOWIN 程式分析水質資料的流程做一說明。

步驟一：建立資料檔

```

2D-Data set: transported gossan material (Riotinto, Spain)
12
easting metres
northing metres
EC
TDS
Cl
Na
Ca
Mg
SO4(2-)
Eh
Fe
Mn
197199 2480945 0.393999021 0.46644689 0.628193226 0.2499491
210206 2481360 -0.287658149 -0.28645727 -0.259710908 -0.244507
197221 2484469 -0.219575798 -0.224226542 -0.258828422 -0.177359
193156 2485971 2.397565346 2.247911042 2.200996837 1.2161191
187485 2487965 5.00970452 5.074588479 5.073610879 5.4650040
195798 2490241 -0.140100074 -0.173828417 -0.189549186 -0.209493
188414 2493802 -0.245419302 -0.254684539 -0.250044805 -0.219526

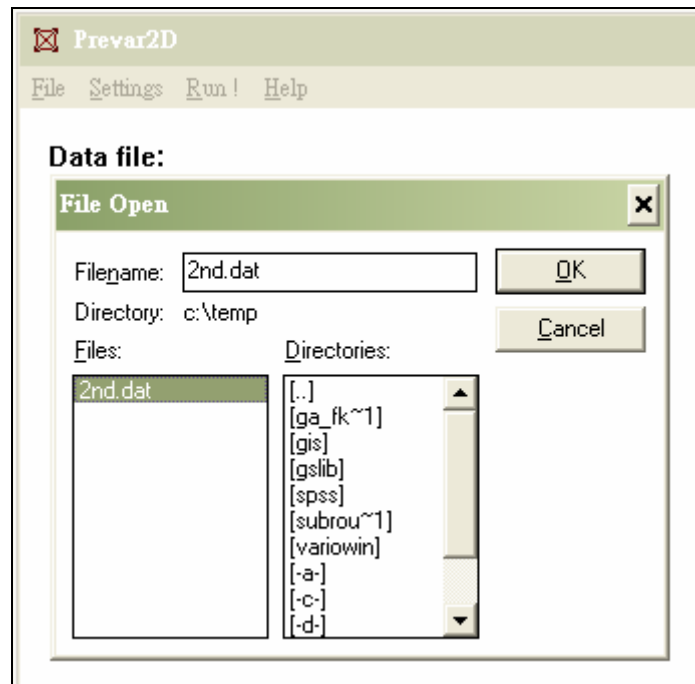
```

上圖為資料檔建立之格式，須注意檔案開頭第一行(2D-Data set: ...)必須存在，否則程式將無法讀入檔案。第二行為變數總個數，上限為 15 個。第三行到第 n 行(n=變數總個數+2)為變數宣告，一個變數一行，共 n-2 行。第 n+1 行開始為空間點之水質資料，每一行共有 n-2 欄資料，各欄裡的資料順序與變數宣告之順序相同，以上圖為例：197199 為 x 軸座標(向東遞增)、2480945 為 y 軸座標(向北遞增)、0.393999021 為 EC 在此點之量測值、0.46644689 為 TDS 在此點之量測值、.....。檔案儲存一定得存成副檔名為.dat 之檔案，否則 Prevar2d 程式將無法讀取資料檔。

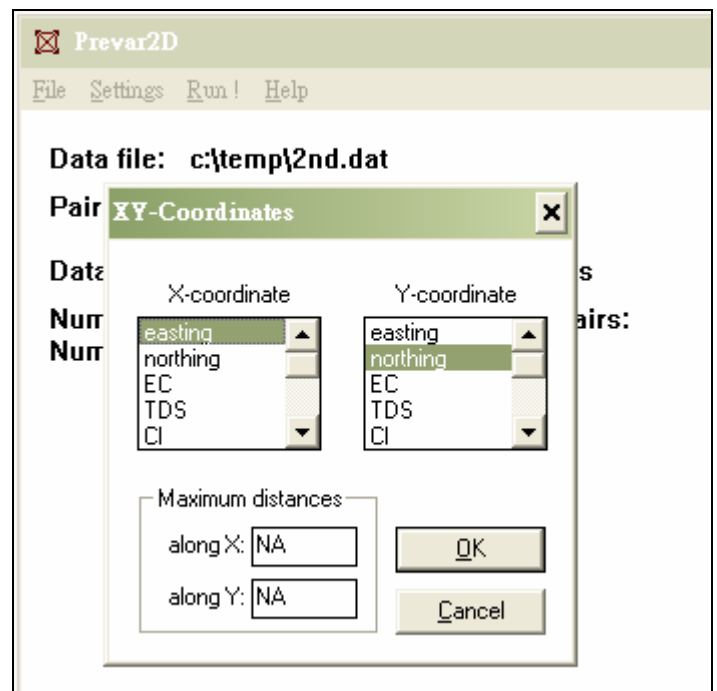
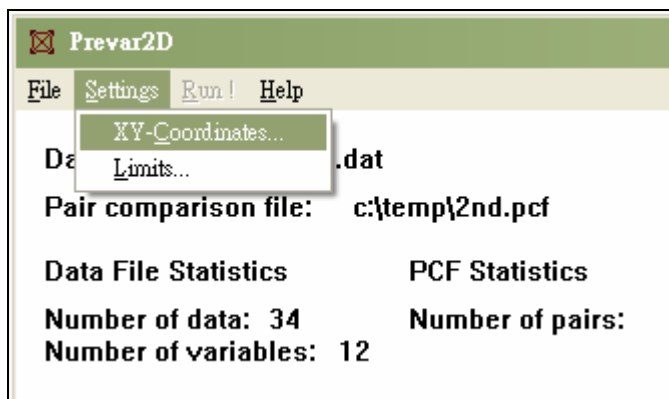
步驟二：以 Prevar2d 計算所有點位的配對數

首先利用 Prevar2d 這個程式讀入上一步驟所建立之資料檔，並計算所有位置的配對數為多少。

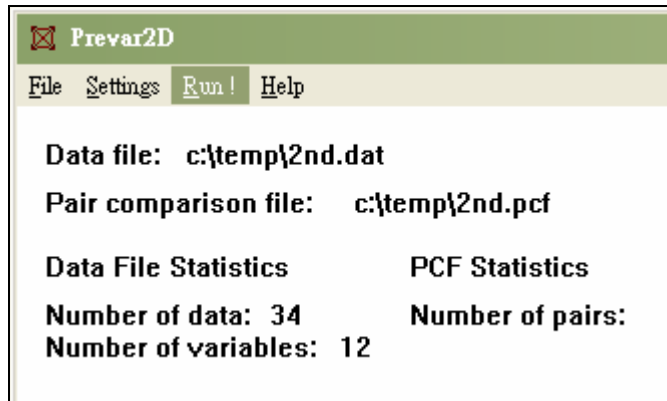
- 選擇讀入的檔案：



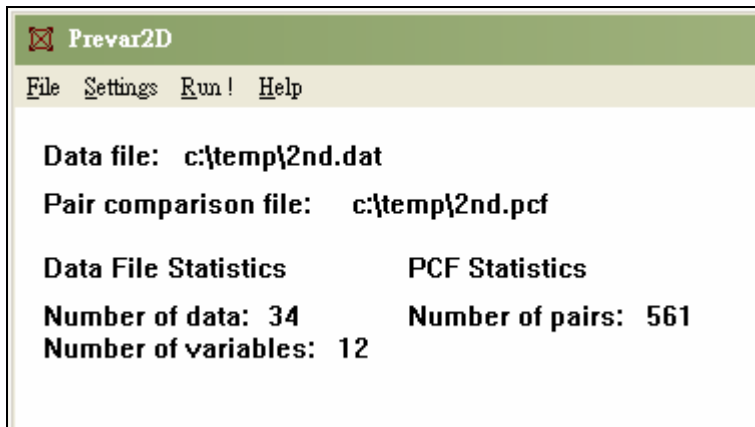
- 設定 x 軸與 y 軸



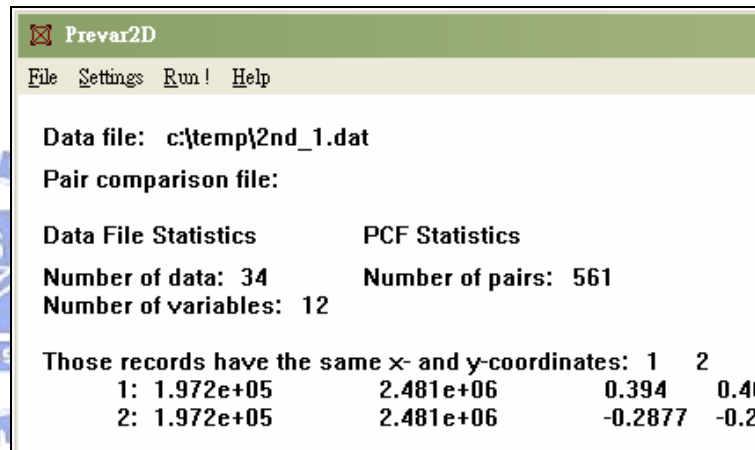
- 執行 Prevar2D



- 執行結果



若步驟一所建立之資料檔無誤，則畫面如上圖所示。

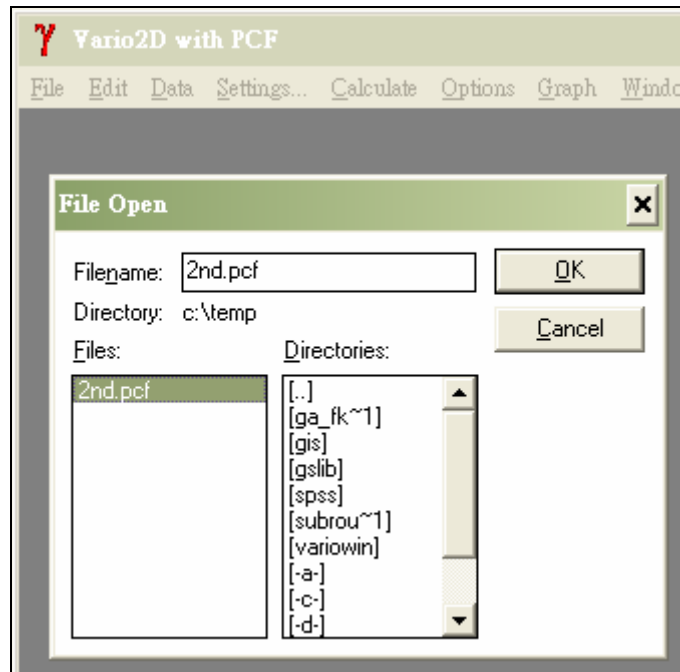


若步驟一所建立之資料檔有誤，則畫面顯示如上圖。

- 資料檔如無錯誤，則 Prevar2D 程式執行結束後，會產生一副檔名為 pcf 之檔案，提供 Vario2D with PCF 程式作後續之分析。

步驟三：以 Vario2D with PCF 程式繪出半變異圖或複半變異圖之圖形

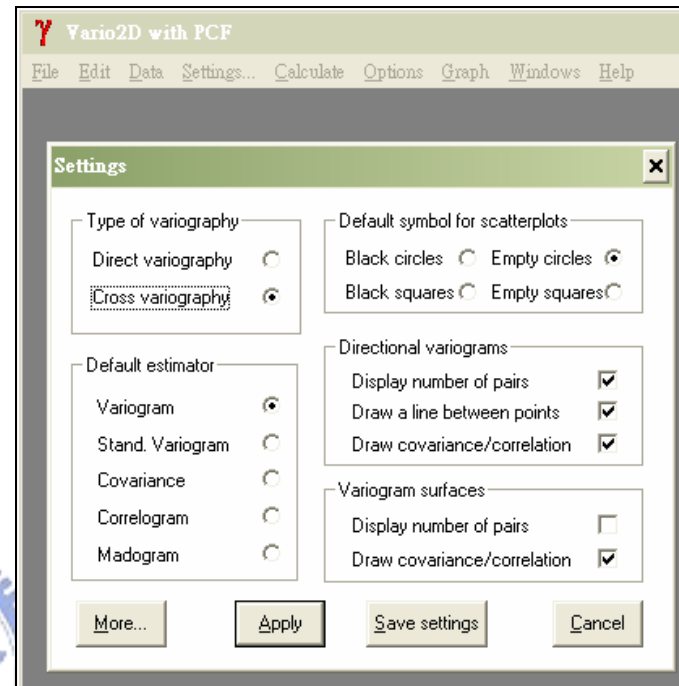
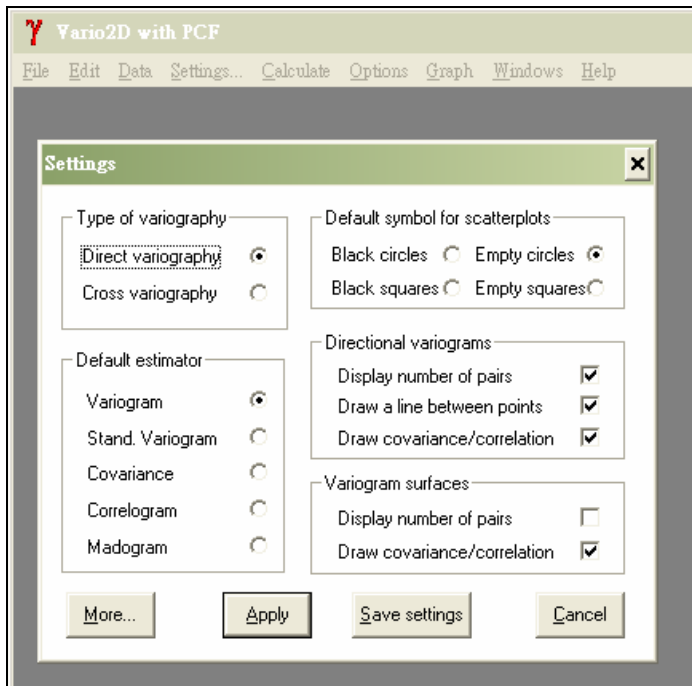
- 讀入步驟二產生之*.pcf 檔



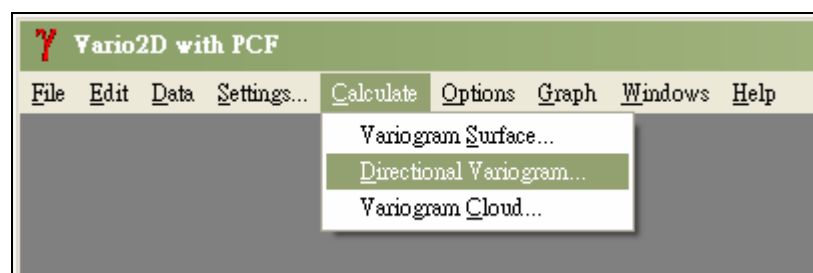
- 視半變異圖或複半變異圖調整設定



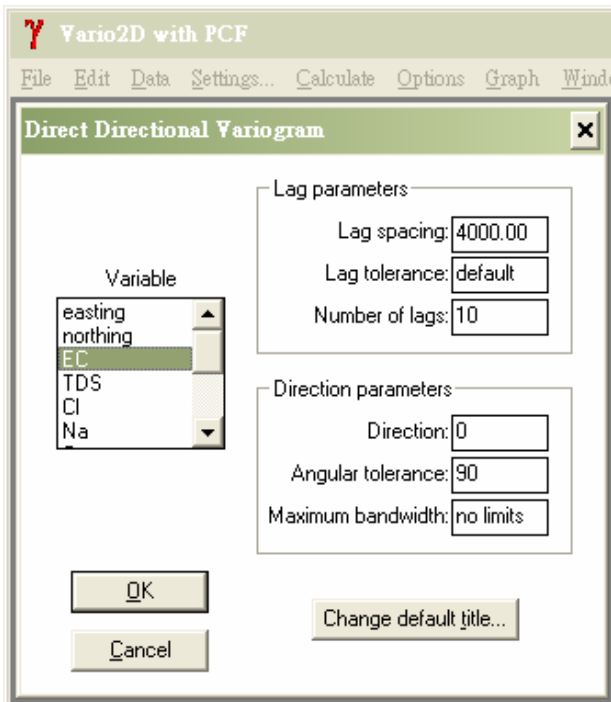
- 若為半變異圖，則在 Settings 裡 Type of variography 的選項設定為 Direct variography；若為複半變異圖，則設定為 Cross variography



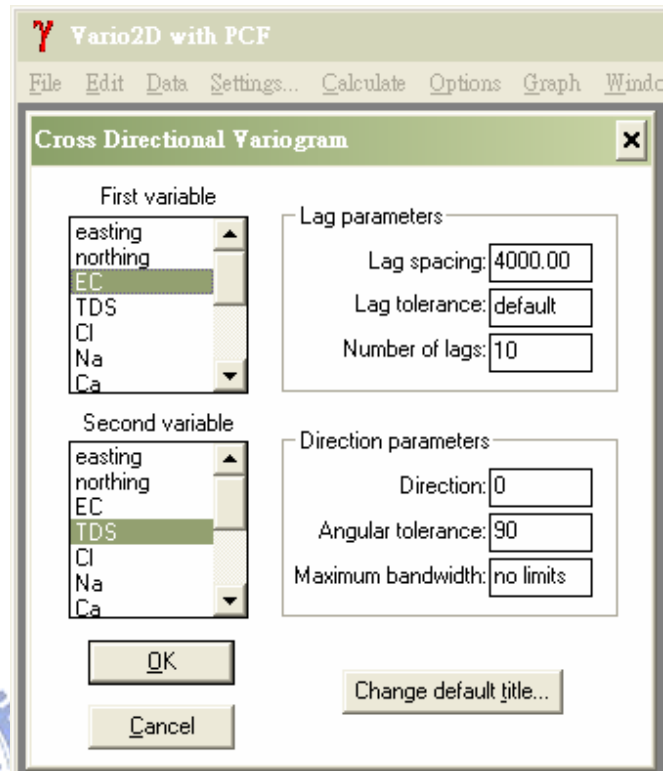
- 設定好之後，跟著下圖的選擇便可繪出半變異圖或複半變異圖



- 根據半變異圖或副半變異圖的不同，會有不同的視窗顯示

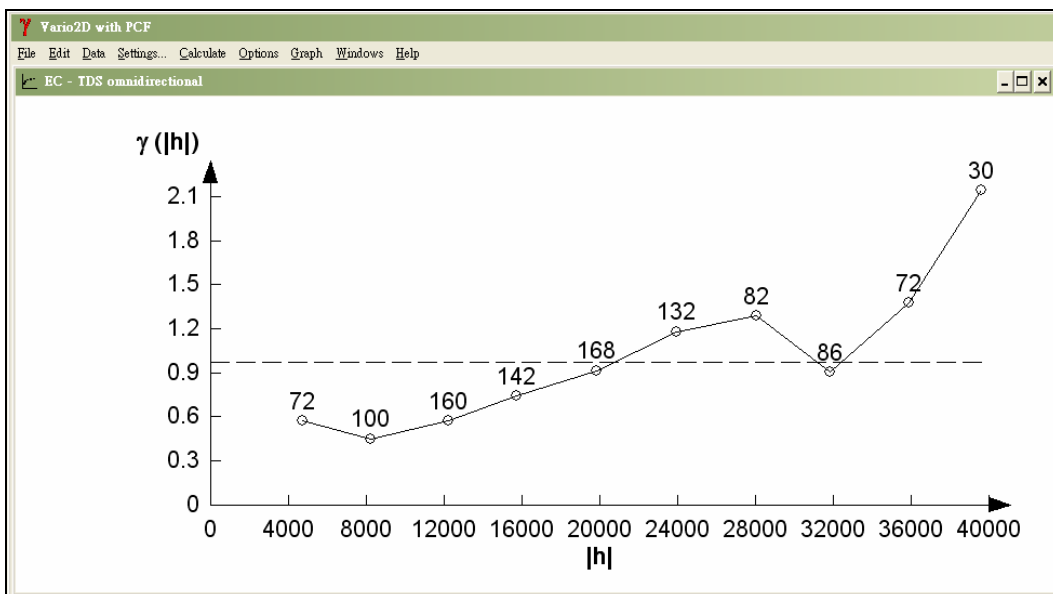


選擇半變異圖，會出現上圖視窗，在左邊的 Variable 選單裡可會出以何種變數為主之半變異圖。

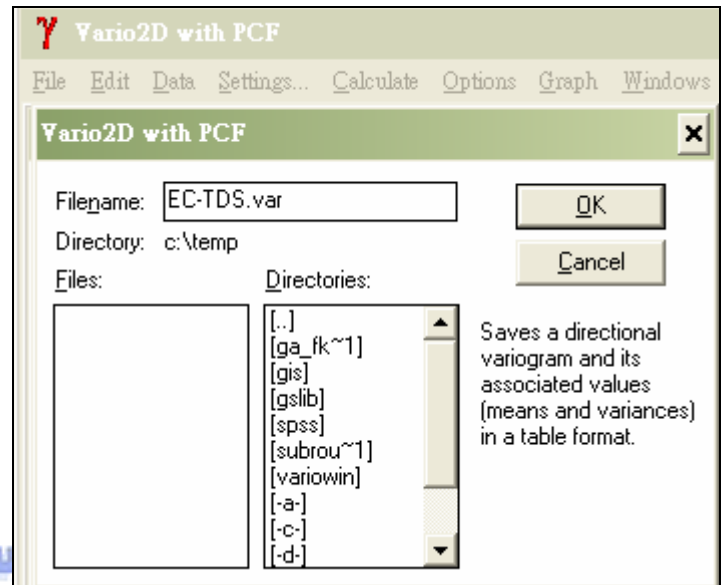
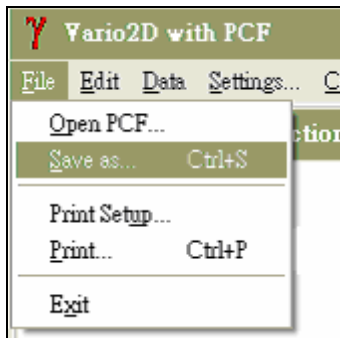


選擇複半變異圖，會出現上圖視窗，在左邊的兩個 Variable 選單裡可會出以哪兩種變數為主之半變異圖。

- 選擇完畢後按下“OK”鍵便會呈現如下圖（以複半變異圖 EC-TDS 為例）

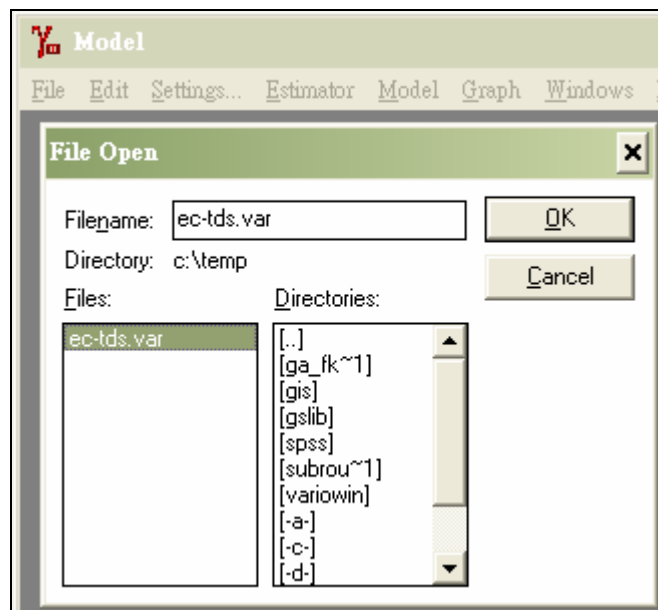


- 繪出半變異圖或複半變異圖後，將半變異圖或複半變異圖存成*.var 之格式，提供 Model 程式套配半變異元模式或複半變異元模式

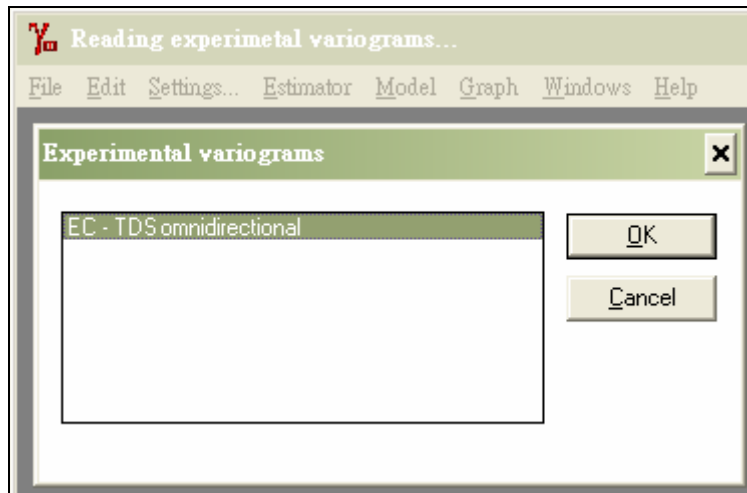


步驟四：套配半變異元模式或複半變異元模式

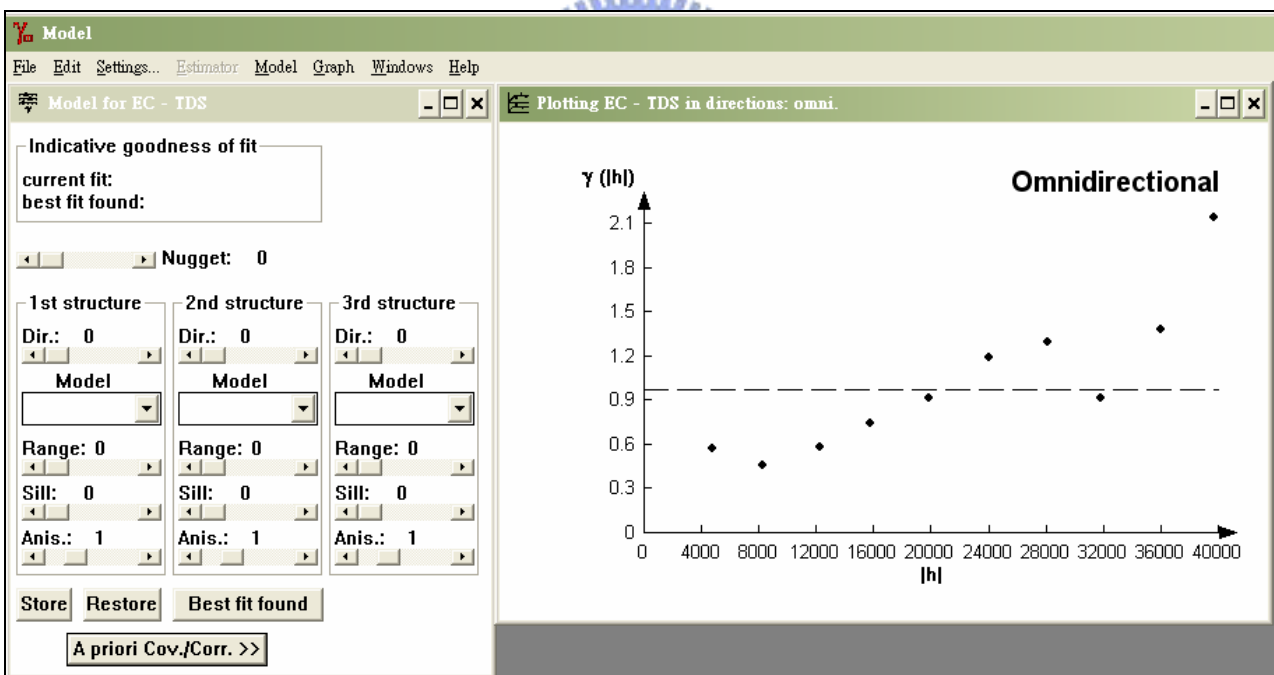
- 選擇欲套配之半變異圖或複半變異圖(以複半變異圖 EC-TDS 為例)



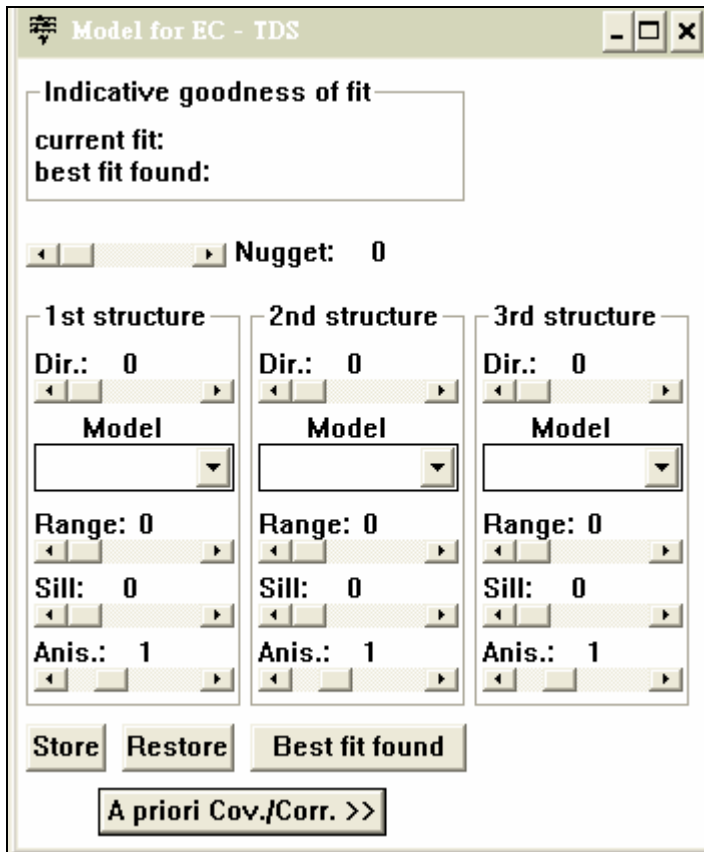
- 選定欲套配之半變異圖或複半變異圖後，會出現下列視窗，直接按下“OK”鍵即可。



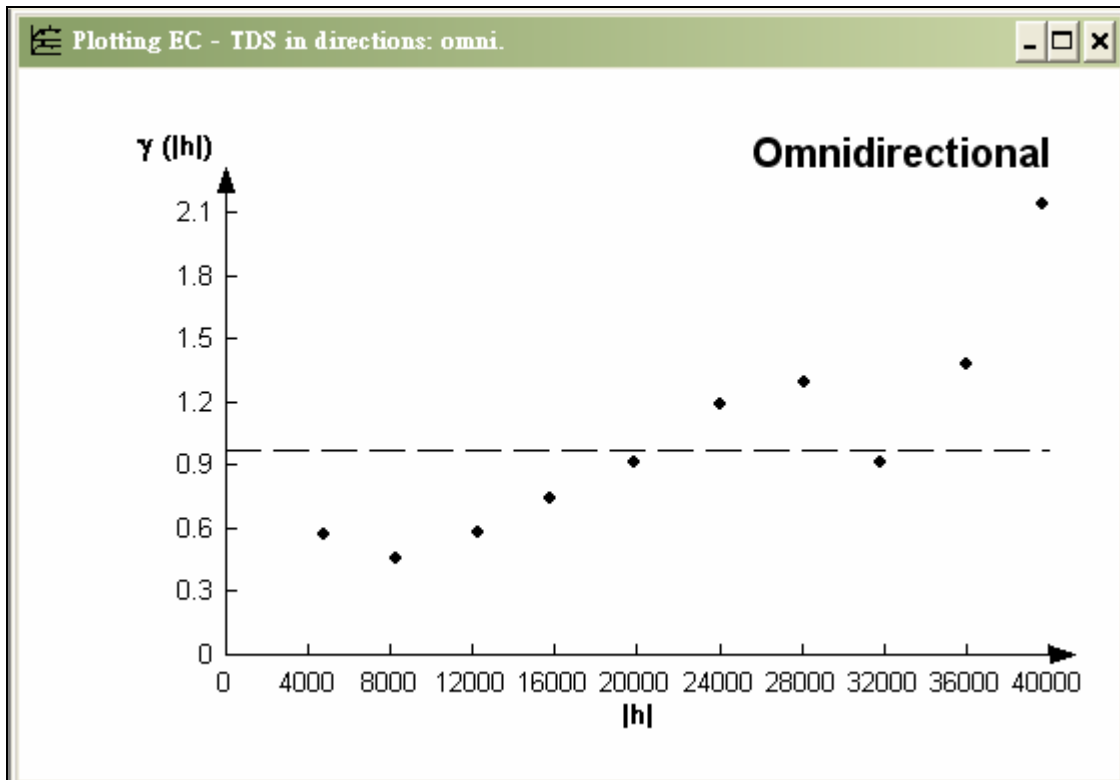
- 按下“OK”鍵後，出現下圖就可開始套配變異元模式。



- 下圖左為選擇套配變異元模式之視窗，此一共區域化線性組合最多可有 3 個空間結構(不包含金塊效應[Nugget effect])，而每個空間結構中可選擇套配之半變異元模式有四種，如下圖右。



- 套配後之結果會立刻呈現至下面所示之視窗



- 以本研究所套配出之 EC-TDS 複半變異元模式為例

