



Investigation on the Management Strategy of Groundwater Resources in Taipei Basin by Numerical Simulation

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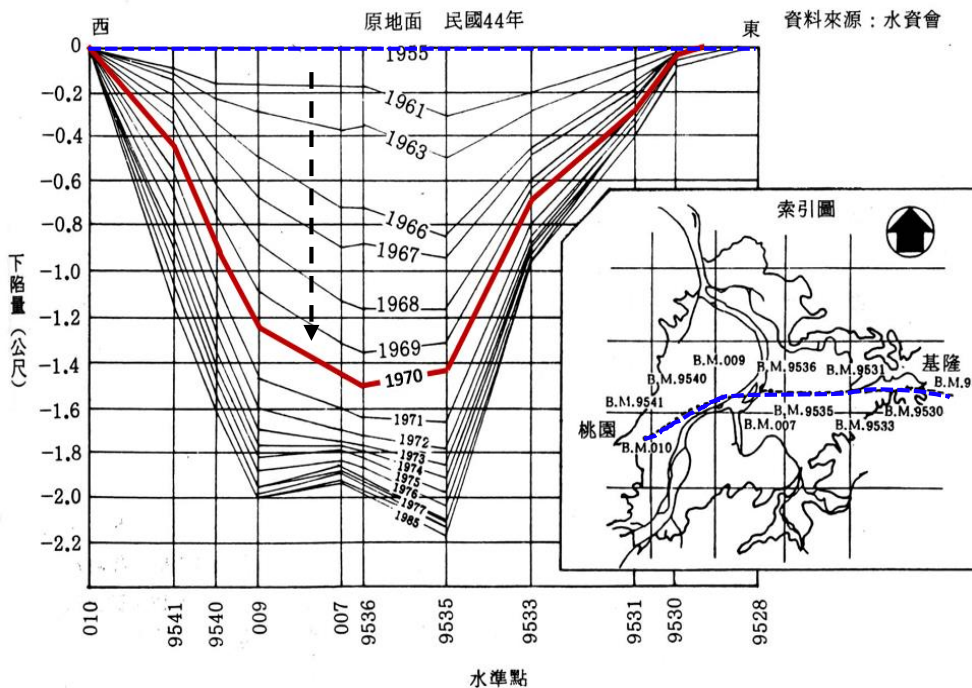
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Date : 2022.10.14

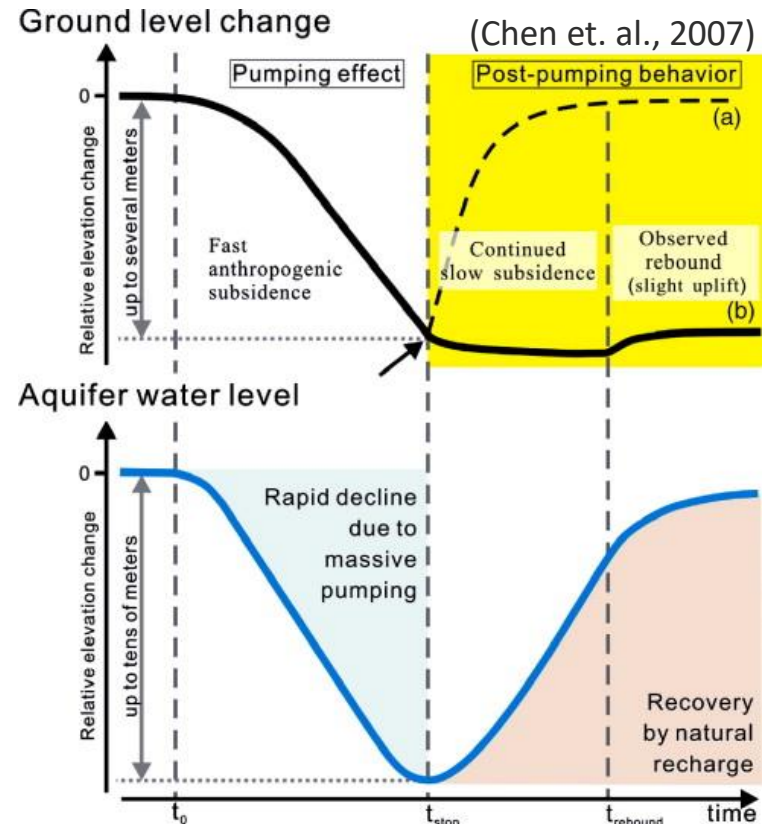
Introduction



- ◆ Groundwater over-pumping resulted in **severe land subsidence** in Taipei Basin, especially during 1955–1970. (Hwang and Wu, 1969, Wu, 1987)
- ◆ **Excessive groundwater pumping** will cause human-induced **land subsidence** and pose severe problems including damage to the building.
- ◆ **Pumping-induced subsidence** is resulted from **irreversible compaction** of fine-grained silt and clay layers (Holzer, 1984, Waltham, 2002).



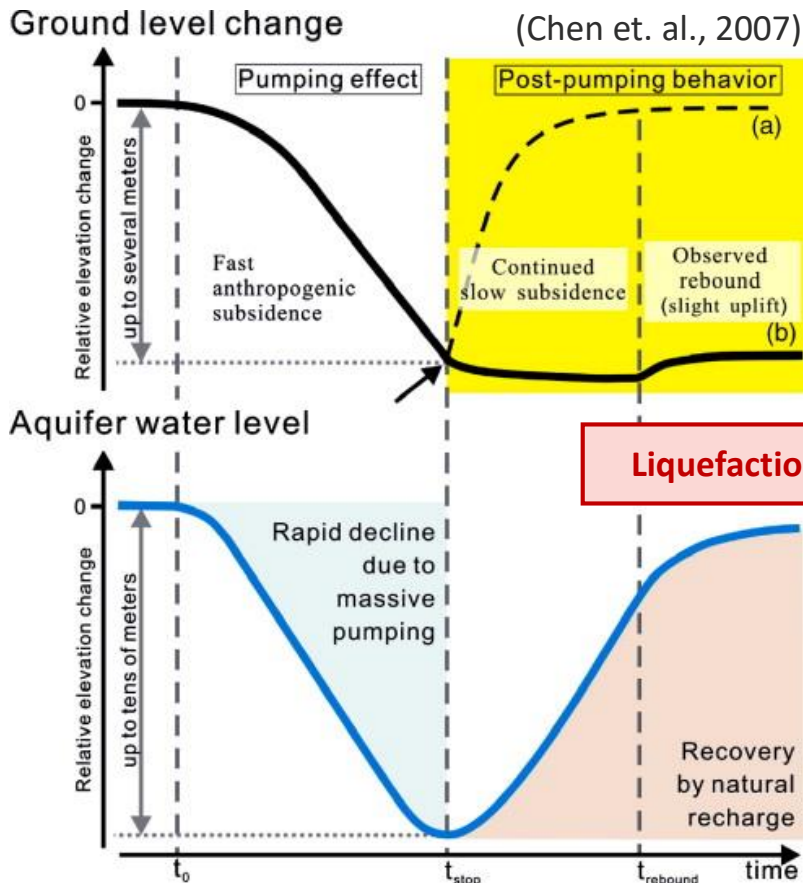
→ Land subsidence in Taipei Basin during 1955-1985 (Wu, 1987)



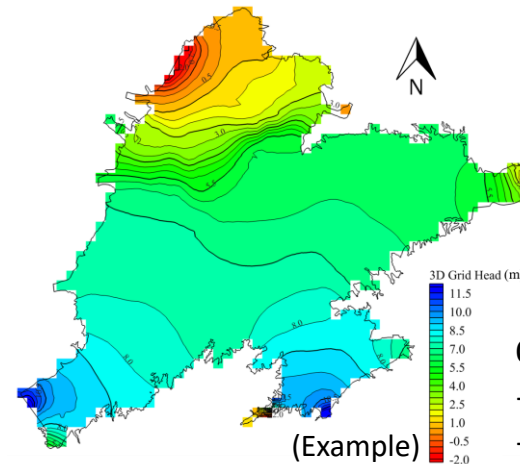
Introduction



- ◆ The purpose of **groundwater resource management** is to mitigate the potential of these disasters and effectively use groundwater resources.
- ◆ The management strategy depends on **the numerical models** which help to **quantify the groundwater level and land subsidence** under various scenarios.



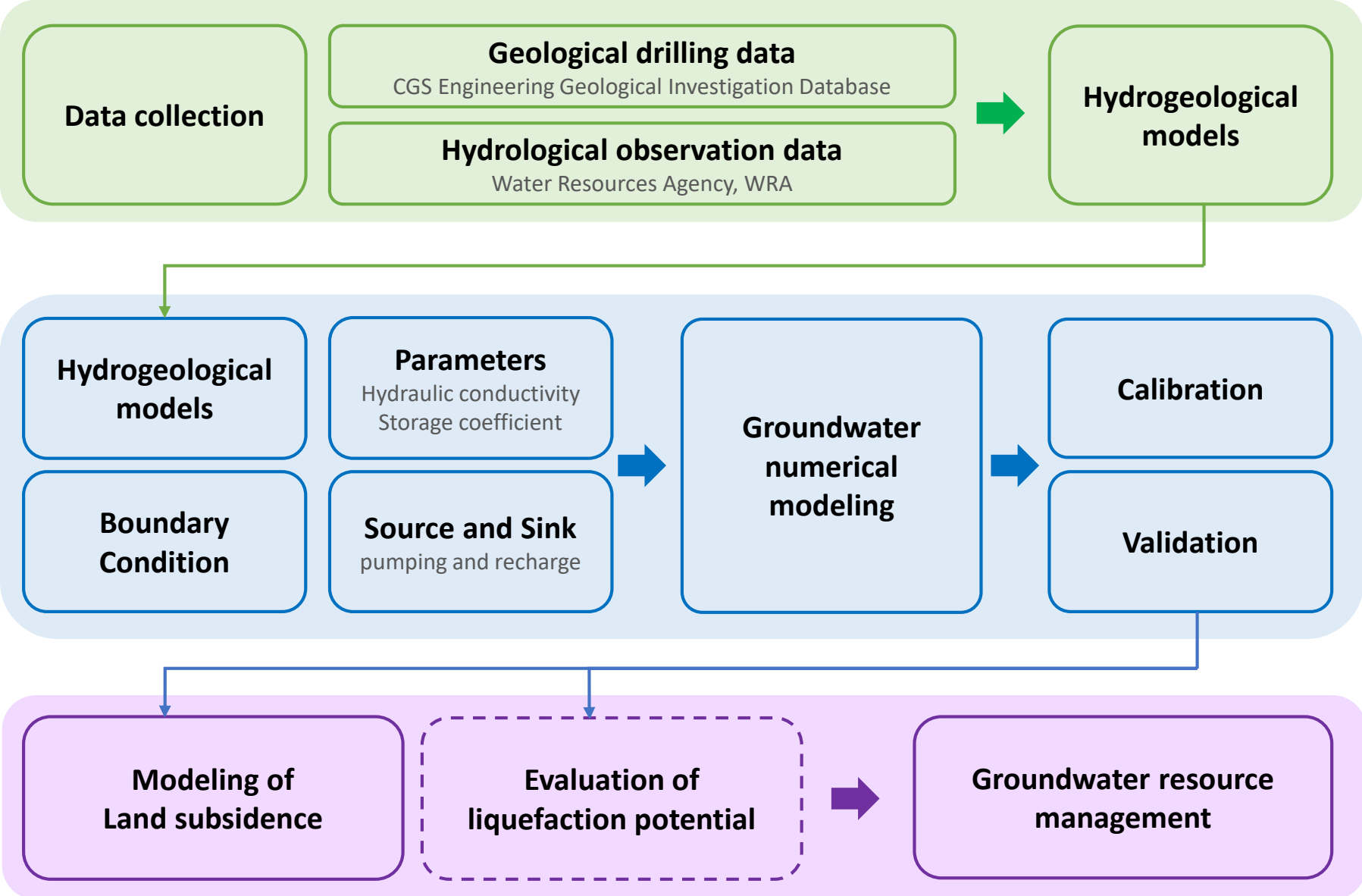
Groundwater numerical modeling



- Quantify
- Groundwater level
 - Land subsidence

Methodology

Flow chart



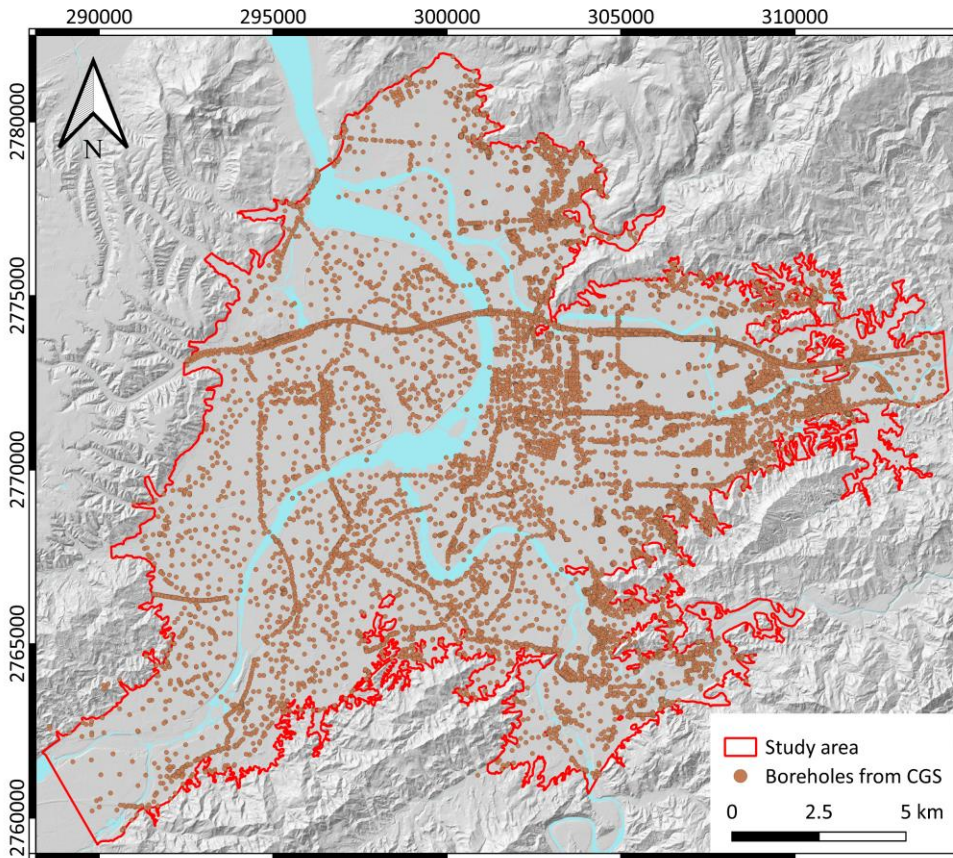
Data collection - drilling data

- ◆ The drilling data were classified into **three hydrogeological units**.



工程地質探勘資料庫

Engineering Geological Investigation Database



EPSG: 3826

→ Total **10,768** boreholes

工程名稱：信義區三興段資源回收廠基地

地點：信義區

鑽孔編號：18_BH01

鑽孔標高：8.00 M

地下水位：3.90 M

深度：50.00 M

座標系統：

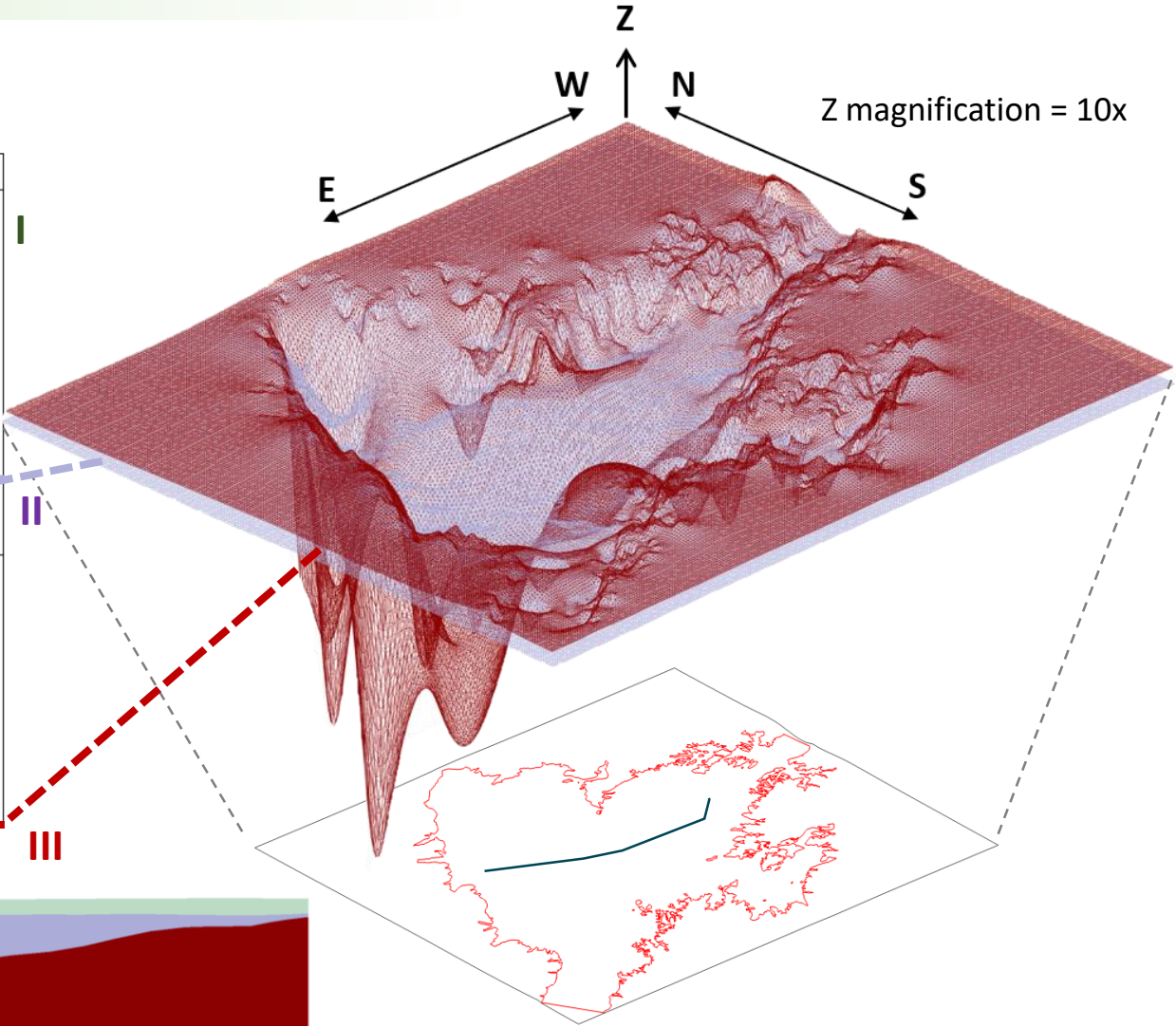
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深度 (m)	標準貫入	地質圖元	岩心破裂指數	岩心破裂程度	岩心風化程度	岩石或土壤性質描述
0						回填層(卵礫石夾雜砂土)
3						棕灰色粉土質黏土
2						灰色細砂
4						Sand
5						
6	36					灰色粗中礫砂夾礫石偶夾卵石
38						Gravel
8	18					
10	30					
12	33					灰色粉土質黏土偶夾細砂及貝屑
3						Clay & Silt
14	3					
3						
16	3					
18	3					
4						
20						

Data collection - drilling data

Wu, 1979, Chia, 1999

地質分類	地質厚度(m)	累計厚度(m)		地層別		水文地質
黃棕色黏土	1-6	6	1-6	台北地表黃棕土層 CL CL-ML		自由 含 水 層
灰色沉泥	2-8	40-70	40-70	第六次層 ML	松山層	
灰色沉泥質砂	2-20			第五次層 SM		
灰色沉泥質黏土	6-29			第四次層 CL-ML		
黃灰色沉泥砂	0-19			第三次層 SM		
灰色沉泥質黏土	0-19			第二次層 CL-ML		
礫質砂	0-15			第一次層 SM		
紅棕土	0-3			90-120		200-250
上礫石層	30-60	新莊層				
黏土砂礫(夾層)	10-20					
中礫石層	10-30					
黏土	10-20					
下礫石層	5-10					

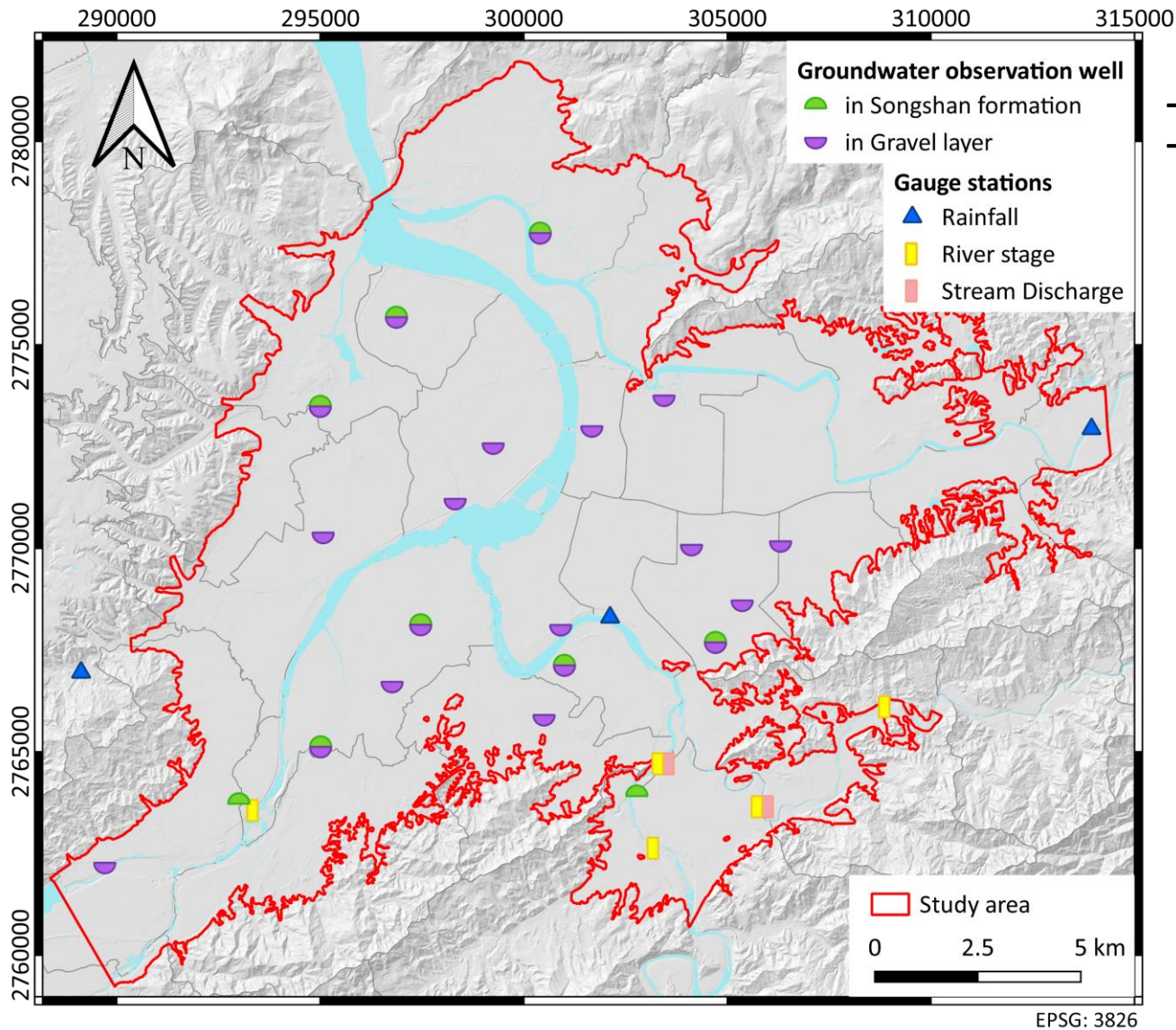


I. Songshan Formation

II. Gravel Layer of Taipei Basin

III. Basement of Taipei Basin

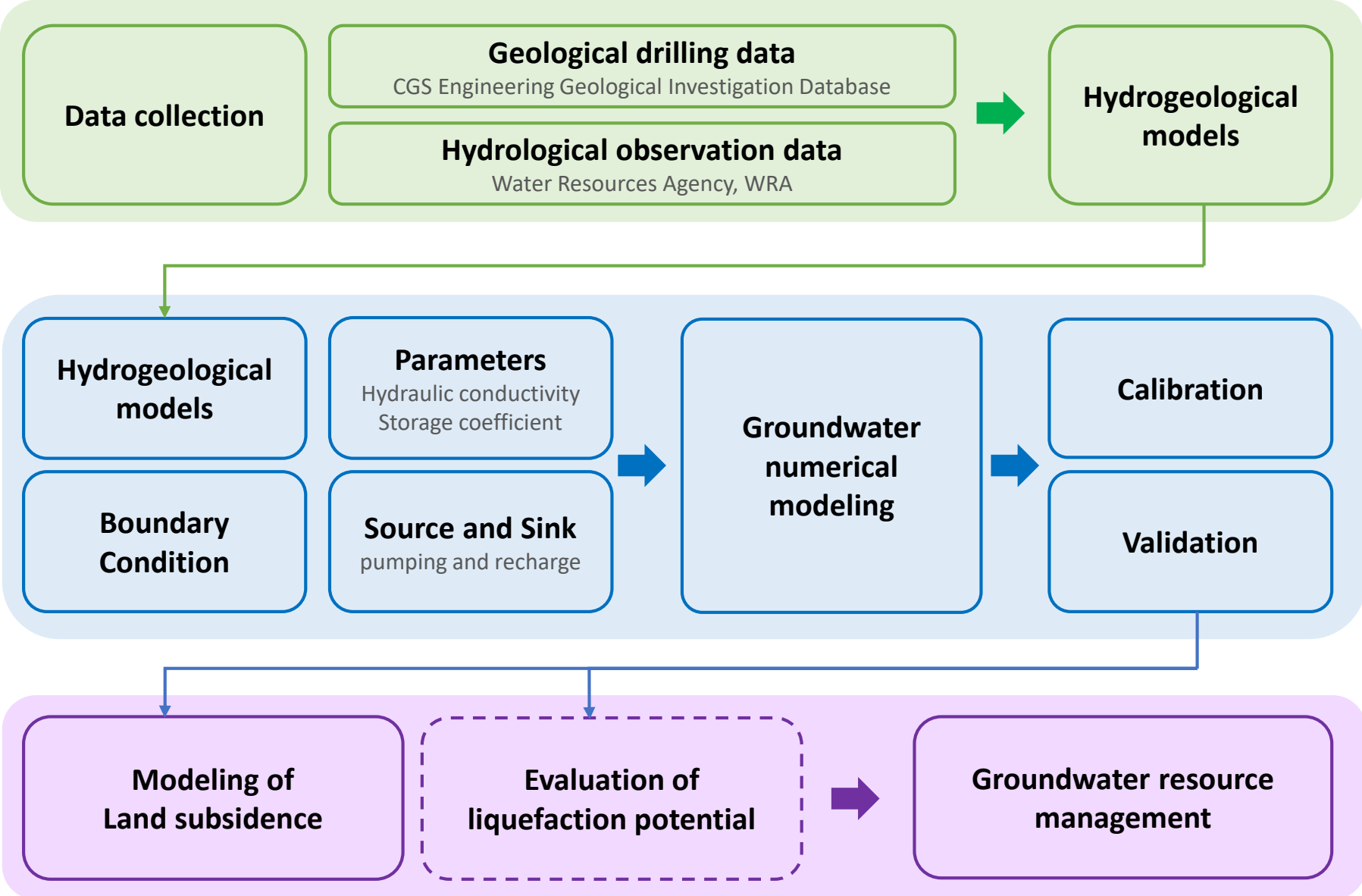
Hydrological observation data



→ 9 wells in Songshan formation
→ 21 wells in Gravel layer

Methodology

Flow chart



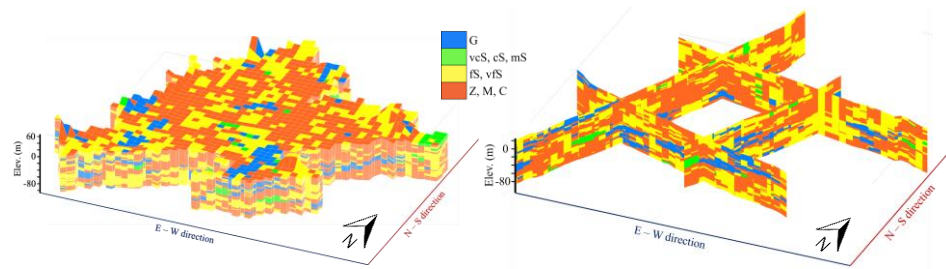
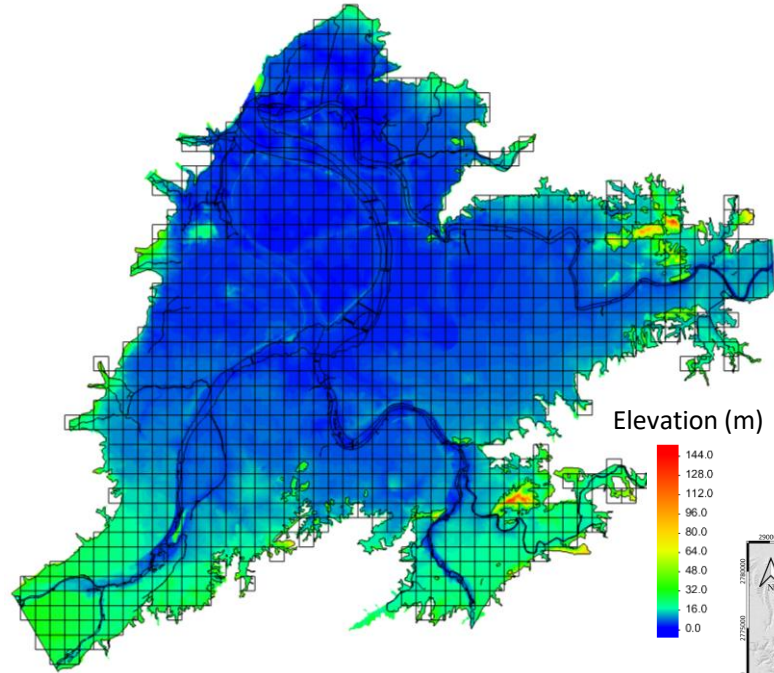
Hydrogeological models



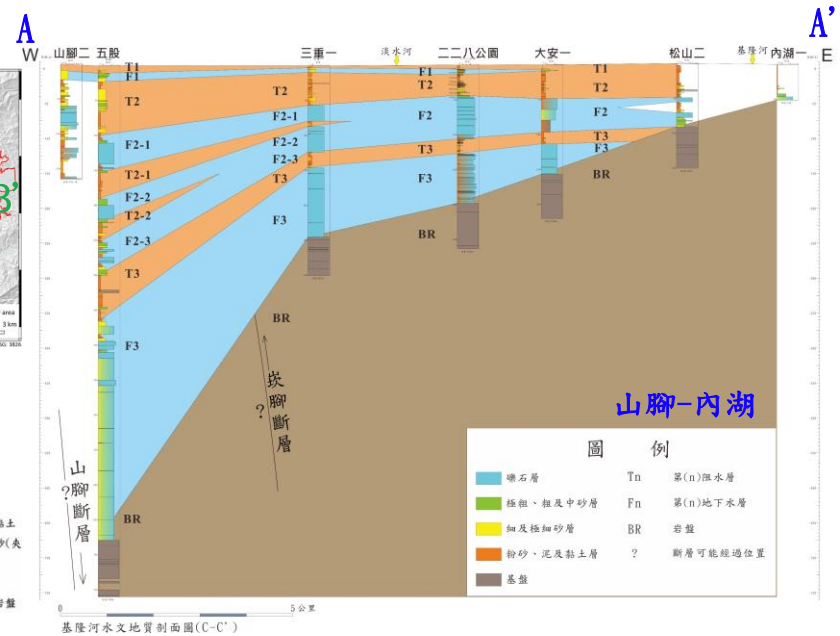
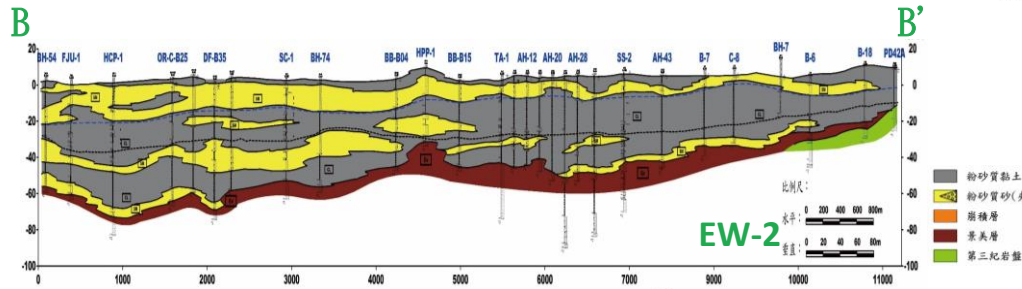
→ MODFLOW packages

◆ The grid size will be set to 500m in the horizontal direction.

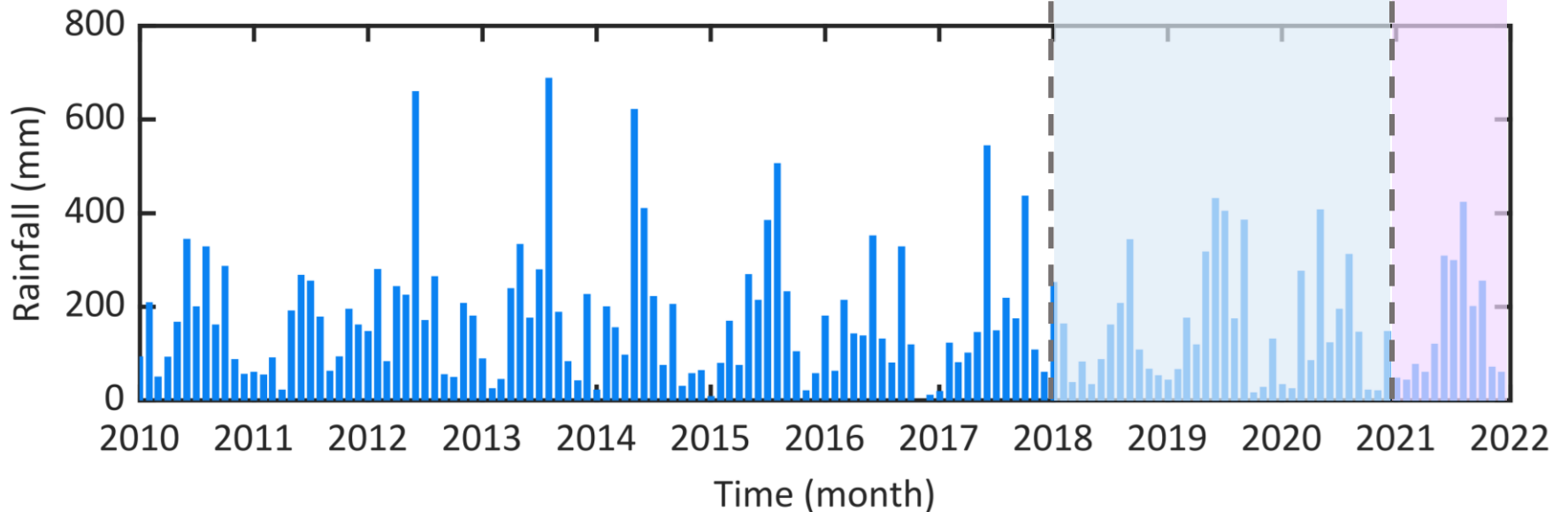
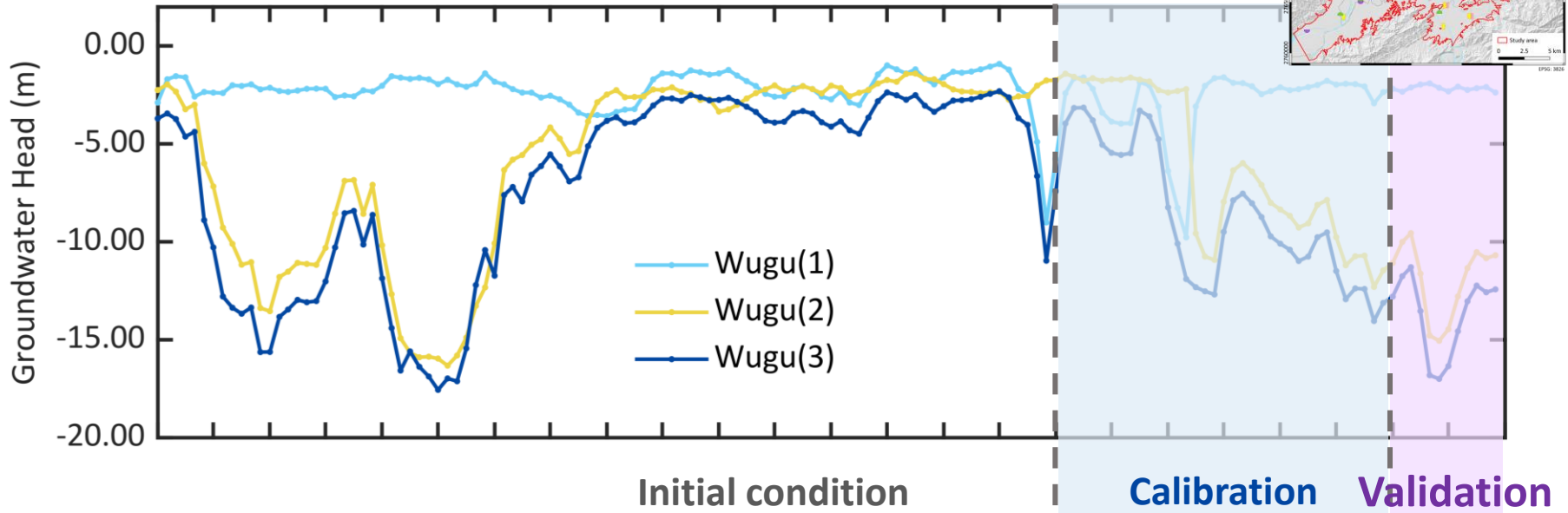
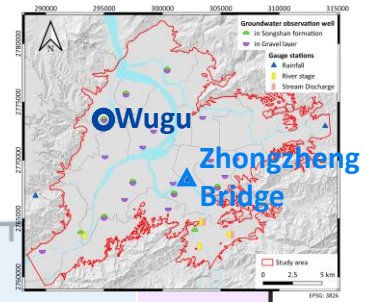
◆ Markov chain → Heterogeneously



◆ Horizontal ID → Layer system



Groundwater numerical modeling



Conclusions

- ◆ The drilling data have been classified into three hydrogeological units.
- ◆ The hydrogeological model has been established based on the hydrogeological units and layers.

Future works

- ◆ Several pumping scenarios will be proposed to evaluate the land subsidence using SUB package.
- ◆ Applying the numerical results to assess the reasonable groundwater level and provide a reference for groundwater resource management in Taipei Basin.

Thanks for your listening.