

# KARST ECOSYSTEM TYPES



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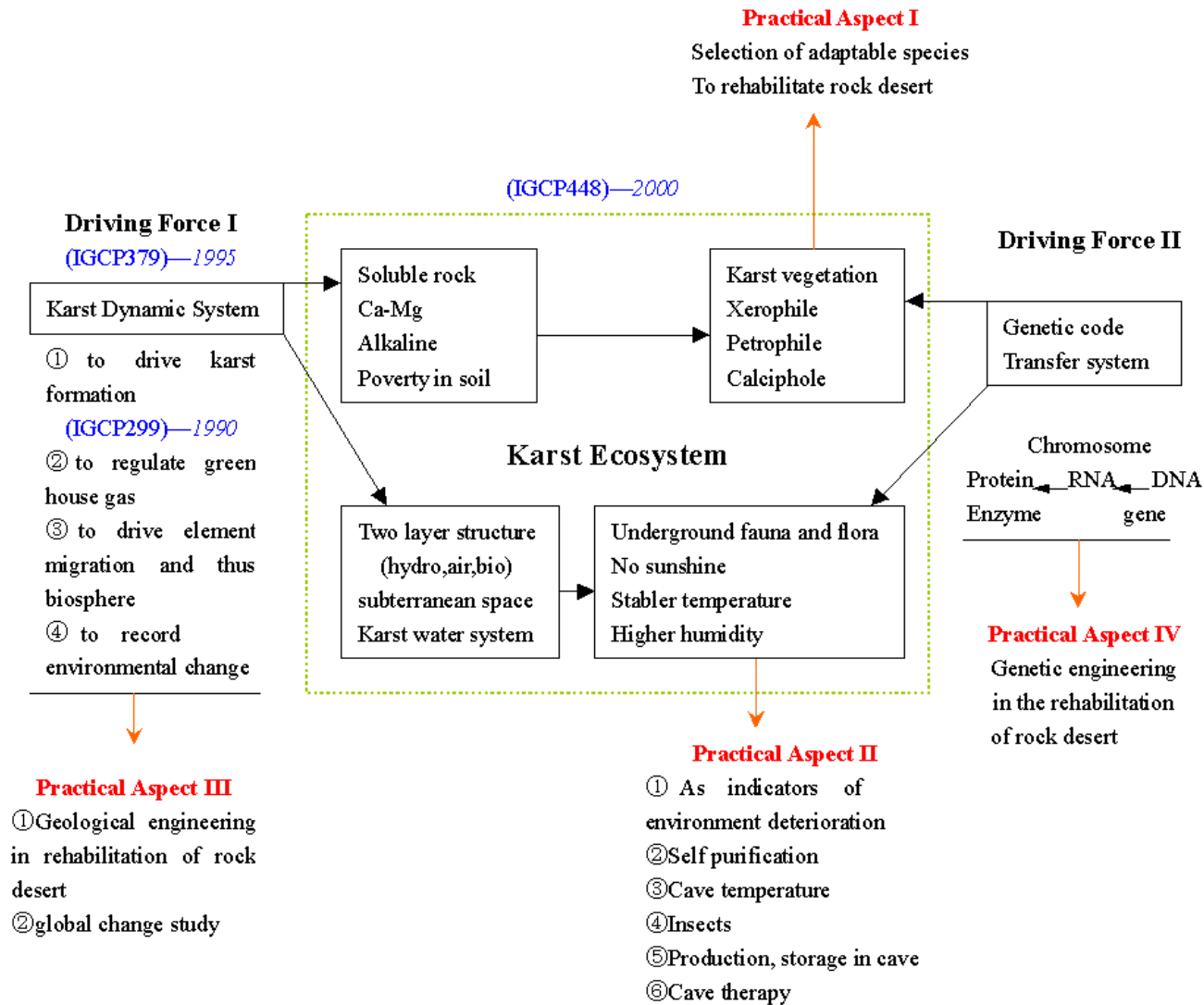


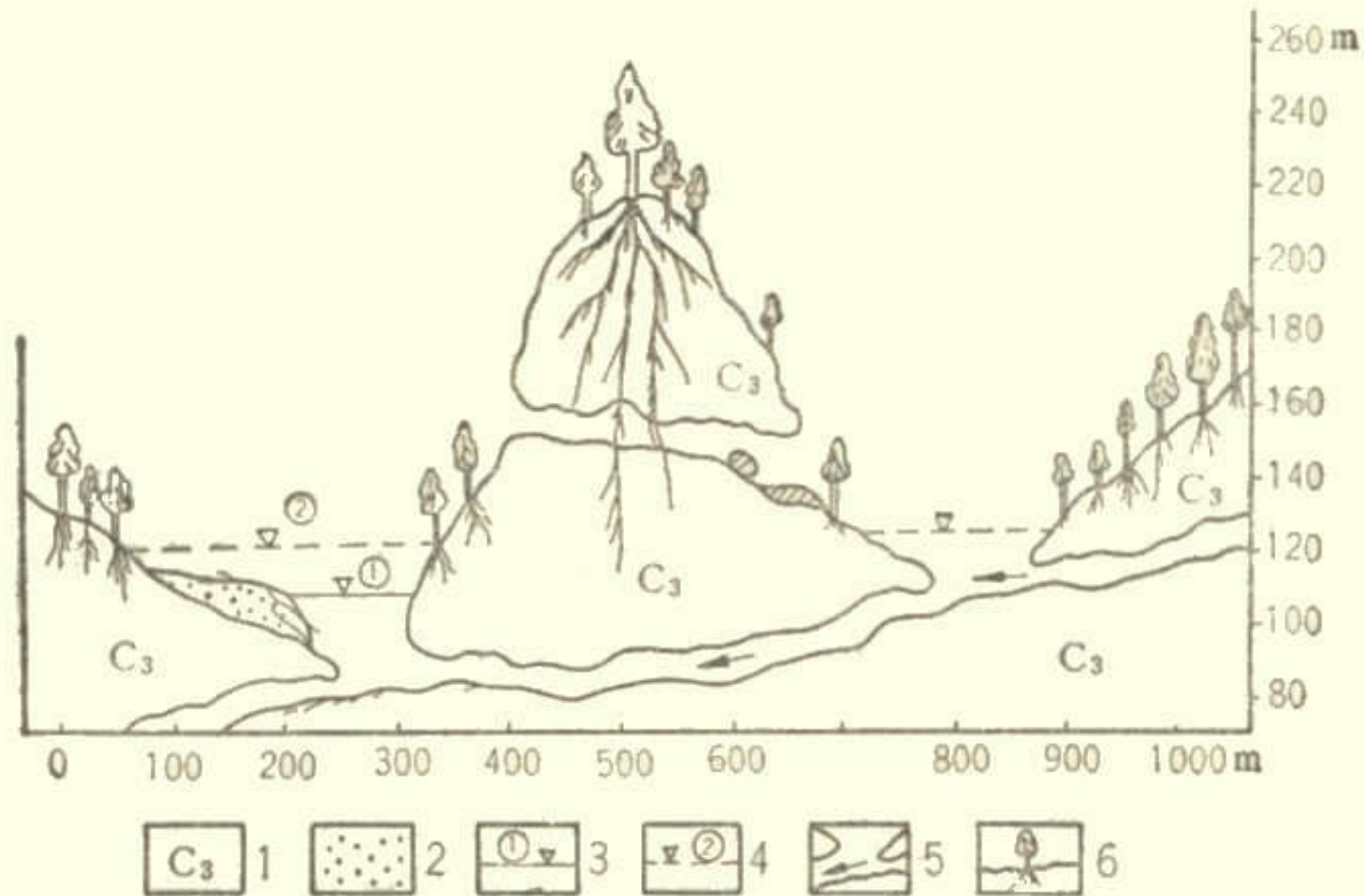
# Structure of Karst Ecosystem

**A karst ecosystem is an ecosystem configured by a set of karst features. It is on the interfaces of lithosphere (soluble rocks and fractures), hydrosphere, atmosphere and biosphere.**

**Because of the development of underground space in karst terrains, a karst ecosystem is composed of both surface ecosystem and subsurface ecosystem.**

# Structure and Characteristics of A Karst Ecosystem

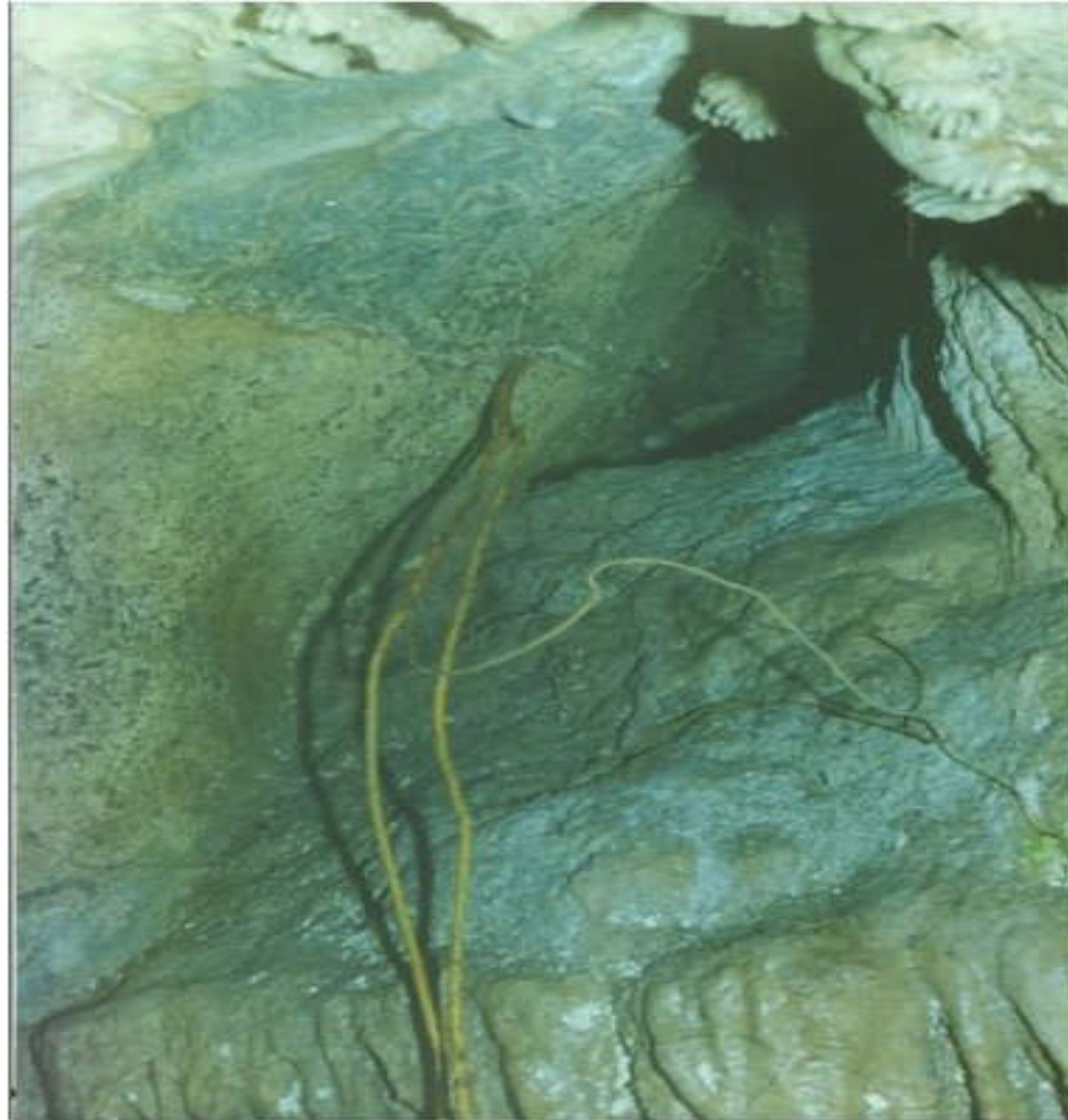




## Two layer Structure of a Karst System and Related hydrology & Ecology

1.Upper Carboniferous; 2.Alluvial deposit; 3.Lower water table; 4.Timber line controlled by flood water table; 5. Doline and underground stream; 6. Tree and its root system





**Root in cave**



**Root reaching underground stream**



**Petrophile Feature of Karst ecosystem: Trees grow on limestone rock, with root system penetrating deeply into rock system**





**Xerophile Feature of karst ecosystem: Cactuses(*Opuntia dillenii*) grow in dry karst regions even with annual precipitation more than 1000mm**

## Rock Deaertification in Shuicheng, Guizhou, China







**Life in Subterranean Ecosystem, *parasilurus cochinchinensis*  
(Linyun, Guilin, Guangxi, China)**



**Fig.20 Cave spider, *porrhomma converum*,  
deterioration of pigment**



**Effect of Ca-rich geochemical  
background of karst ecosystem:  
Calciphile species: *Lonicera  
hypoglauca* Miq**





**Calciphile plant in karst ecosystem: Pteridium**

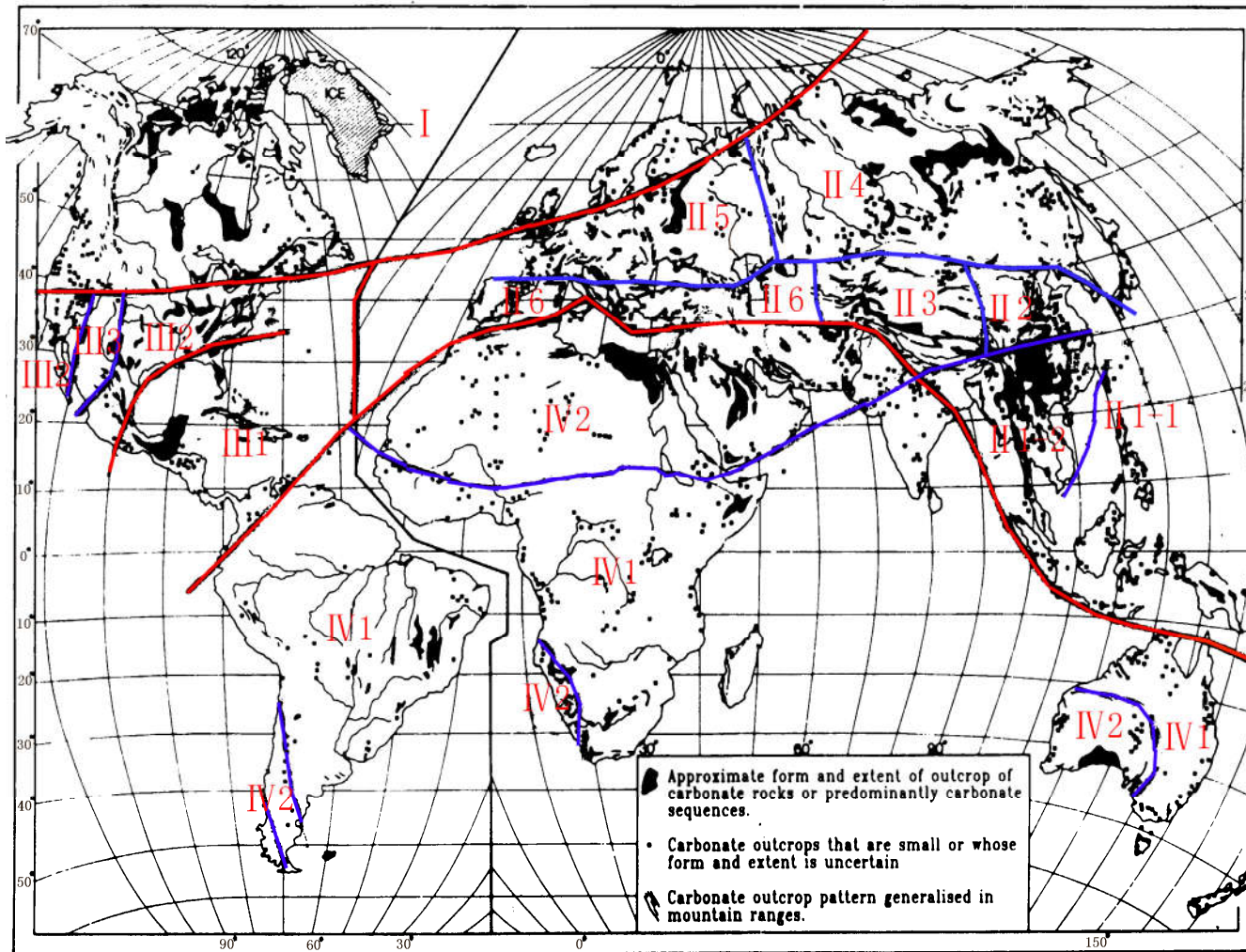




# Types of karst Ecosystem of the World

- The karst ecosystems in different parts of the world are quite different, in accordance with their particular
  - climatic,
  - geologic,
  - pedological,
  - hydrological,
  - topographical,
  - vegetational
- anthropological conditions

For a proper understanding and management of karstland, it is necessary to distinguish the ecosystems in different karst areas of the world into different types.



**I, Glacial Karst Ecosystem**

**II, Eurasian Karst Ecosystem:**

**II-1, Tropic-Subtropical**

II-1-1 porous limestone

II-1-2 hard limestone

**II-2, Semiarid**

**II-3, Tibet plateau**

**II-4, Temperate semihumid**

**II-5, European platform**

**II-6, Mediterranean-Tethys**

**III, North American Karst Ecosystem**

**III-1, Tropic porous limestone**

**III-2, Temperate humid-semihumid hard limestone**

**III-3, Arid karst**

**IV, Gondwana karst Ecosystem**

**IV-1, Humid-Semihumid**

**IV-2, Arid**

## Types of Karst Ecosystem of the World





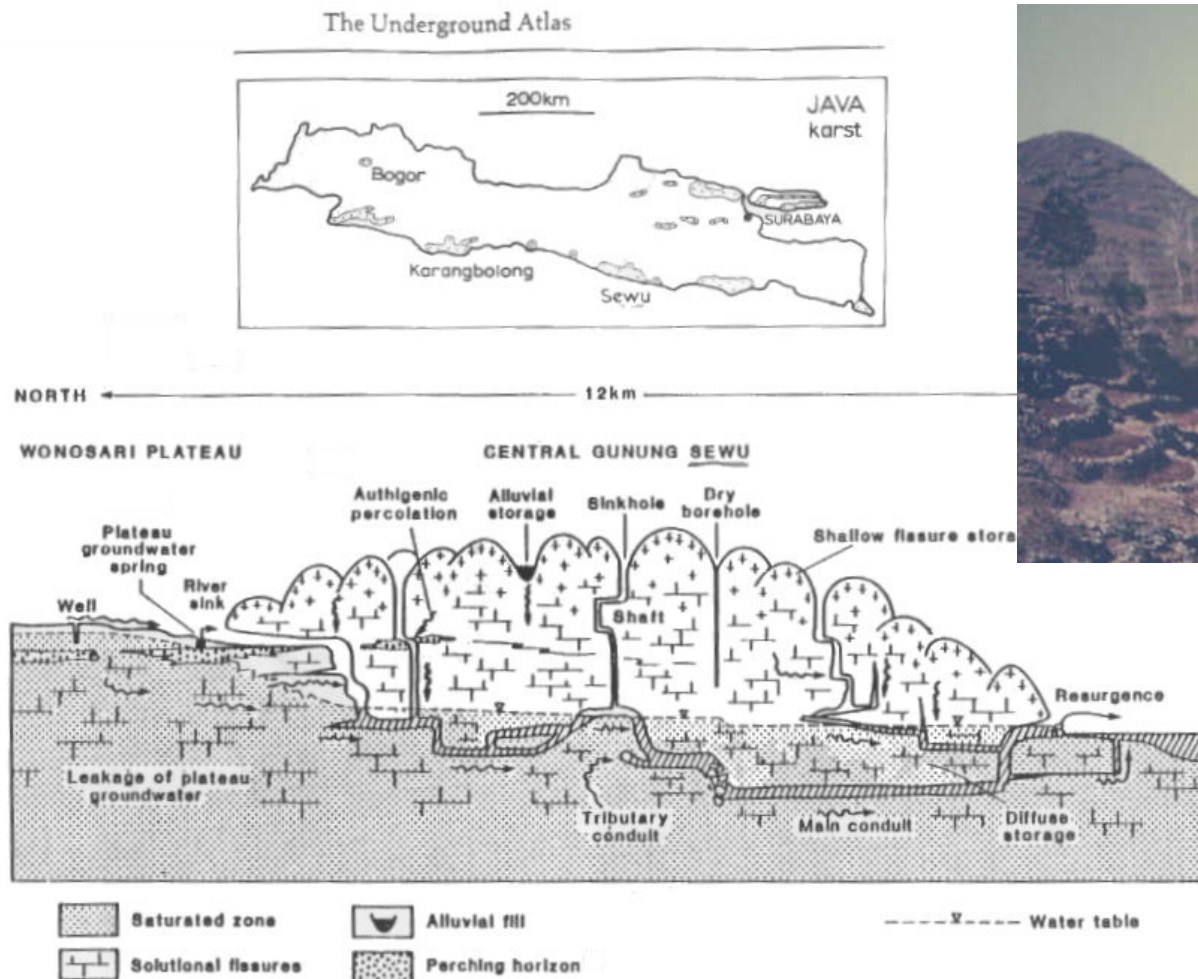
**Glacial Karst Ecosystem: Pasture on pavement**





**Glacial karst ecosystem: Forest on pavement**

# Tropical karst ecosystem on Tertiary porous limestone: pottery agriculture in Gunu Sewu, Indonesia







**Subtropical karst in Guilin, China**





**Rock desertification in Northern Vietnam: subtropical karst ecosystem on hard Carboniferous limestone**





**Semiarid karst ecosystem  
on Proterozoic limestone,  
Beijing**





**Temperate Humid karst Ecosystem on Cambrian limestone, Taibai Mt., South Korea**





**Hwanson Cave,  
South Korea**



**Taiga forest and Steppe in Siberia karst, Russia**





**High mountain karst, Tibet, China**





**Central Europe Karst  
Ecosystem, Poland**



*Quercus rotundifolia* Lam, A calciphile and petrophile plant, Southern Spain







**Tufa cascades deposition by deep source CO<sub>2</sub> degassing on Tethys Belt, Pamukale, Turkey**





**Big Karst spring on ophiolite of a Tethys nappe, Turkey**



**Karst Ecosystem on Porous Tertiary limestone of tropical Puerto Rico**

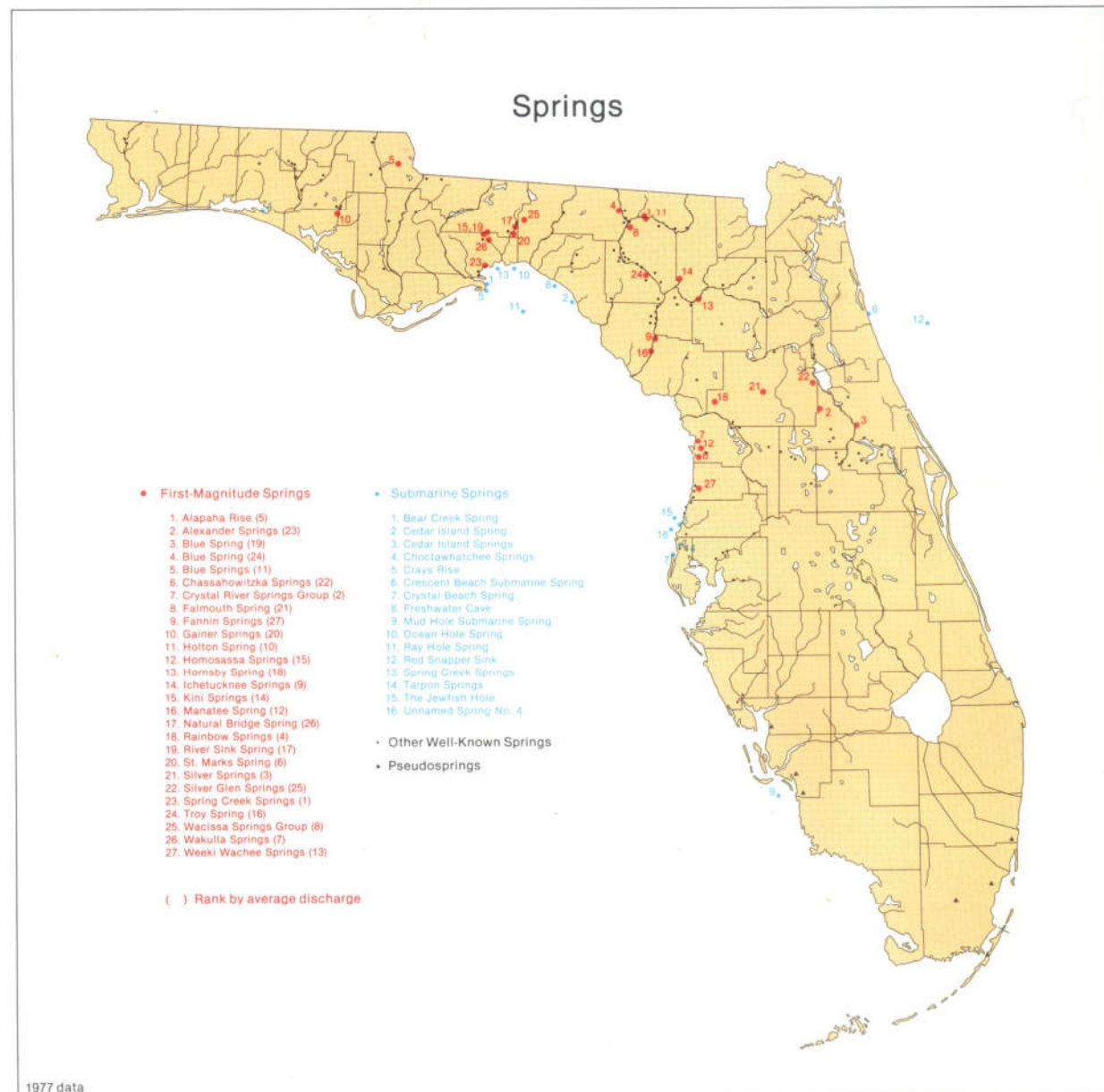




**Porous Tertiary limestone, A major aquifer of Florida, USA**



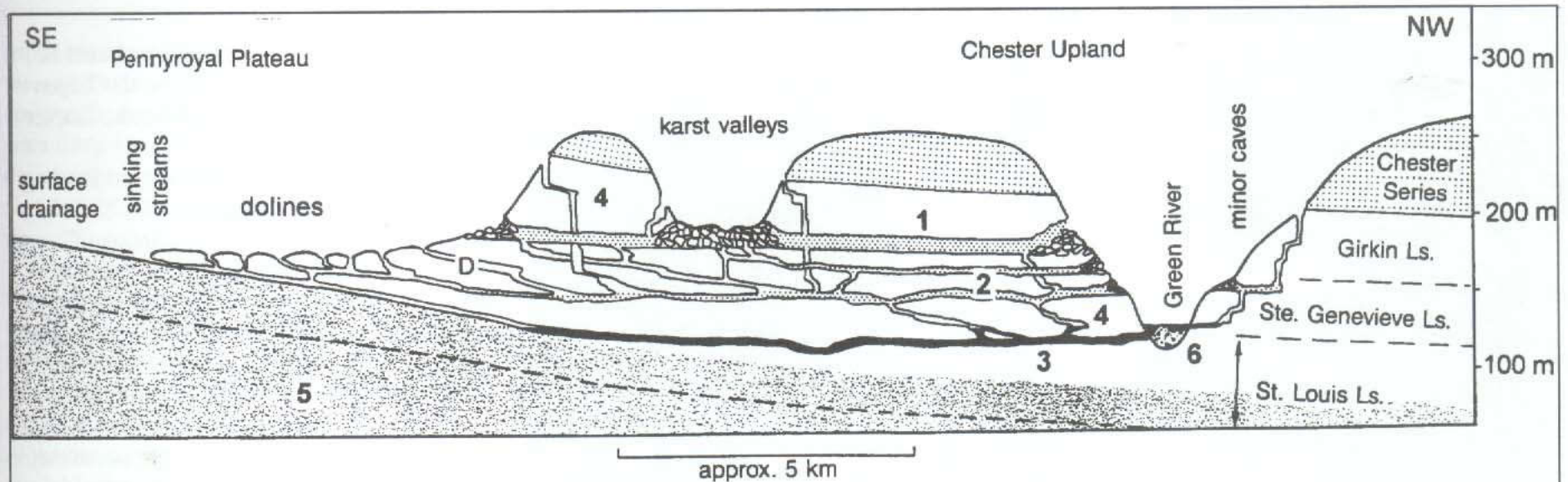
# The distribution of big karst springs in Florida, USA



## Silver Spring, the biggest karst spring in Florida, USA







5.3.8 Figure 4. Generalized profile through Mammoth Cave, showing the relation of cave levels to strata and to surface features. 1—Large upper-level canyons of Tertiary age.

2—Tubular passages of Pleistocene age. 3—Active phreatic tubes at and below fluvial base level. 4—Active and relict vadose canyons and shafts. 5—Impure limestone

with poor karst development. 6—Late Pleistocene alluvial fill up to 16 m thick. None of the “minor caves” on the north side of the river are longer than 3 km.

**Karst ecosystem in Carboniferous limestone, Kentucky, USA, enjoying many subterranean species**

## Sinkhole plain of Kentucky karst ecosystem,USA







**Arid karst ecosystem, Nevada, western USA**

# Cretaceous and Tertiary porous limestone overlying directly on PreCambrian metamorphic rocks, Nullarbor plain, weatern Australia,A typical geological setting of Gondwana karst ecosystem

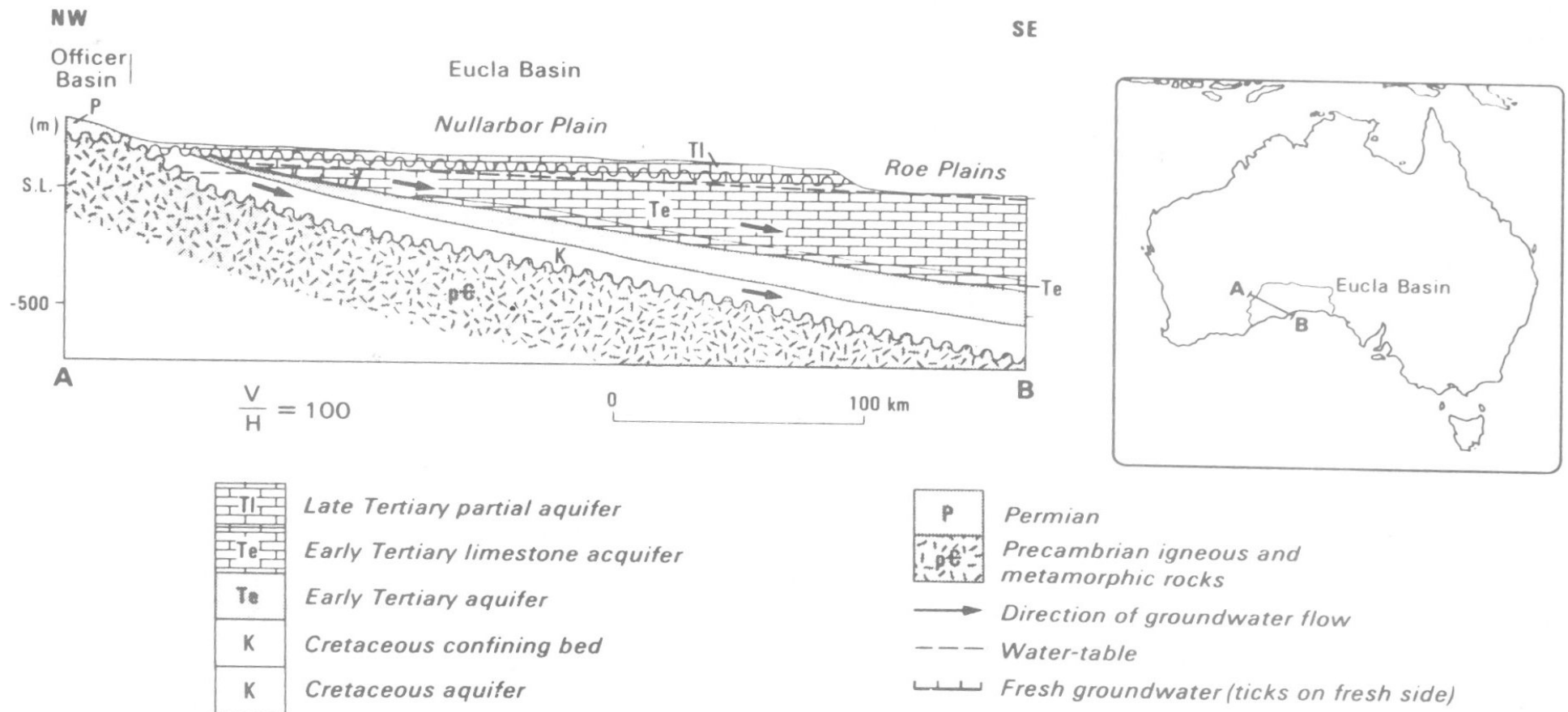


Figure 13: Schematic geological cross-section of the Eucla basin, showing direction of groundwater flow. From Smith (1989).





**Karst ecosystem on Devonian reef limestone, Buchan, SE Australia**



## **A natural shaft in Nullabor Desert, Wesern Australia**





**Madura Cave, developed in Quarternary limestone, Nullabor  
Desert, Western Australia**





**Savanna karst ecosystem on Proterozoic limestone, south Africa**





**Long denudation makes the thickness of soil usually remarkable in Gondwana karst, Belo Horizonte, NE Brazil**





**Bamboo forest in the karst of Belo Horizonte, NE Brazil**





# The Benefit of Karst Type Classification

A better understanding on the characteristics of each type of karst ecosystem will benefit the protection of karst areas and the rehabilitation of deteriorated karstland. For example, in the subtropical karst areas of southern China and southeast Asia, and some Mediterranean karst, the most important problems are the leakage of water and the shortage of soil. Rock desertification is usually a problem. However, in some boreal karsts, the development of underground drainage systems is helpful in draining away and buffering excess acidic water in bogs, therefore beneficial for the development of agriculture.



**Rock desertification  
in subtropical karst of  
South China**







**Above, excess acidic  
water in Taiga swamp  
near Berezniki, Central  
Ural, Russia**

**Below:  
Potato field in Kungur,  
SE of Perm, Russia,  
showing the advantage of  
karst underground  
drainage system for  
agriculture**







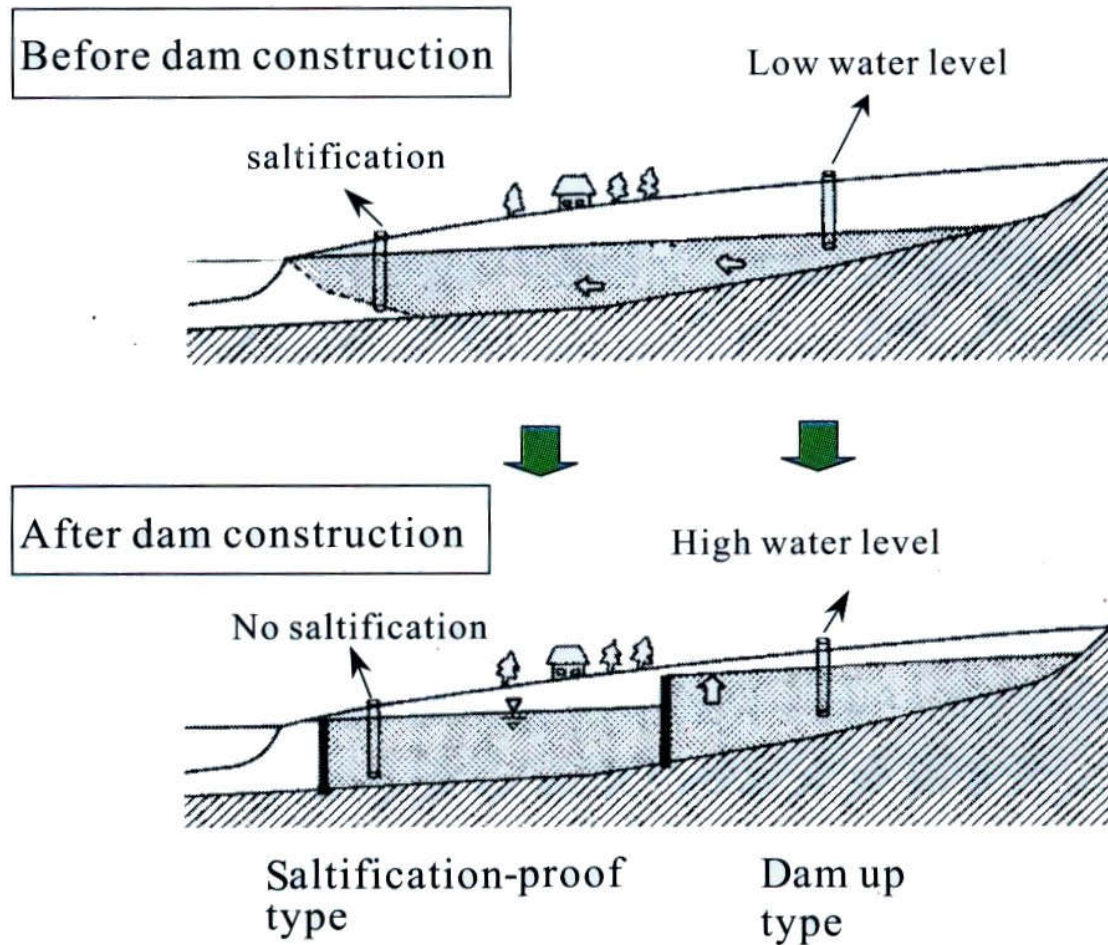
**Eucalyptus is good for draining away excess water to prevent salinization, Australia**





**Porous Quarternary reef limestone in Ryukyu Island, Japan**

## Big engineering work to prevent salt water intrusion in Ryukyu Is., Japan(Hiroyasu, 2001)





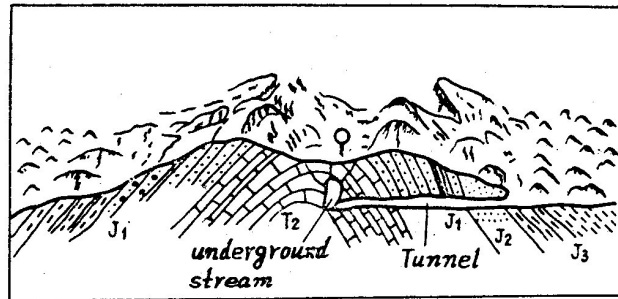


Fig 27. Underground stream near axial part of Longwangdong Anticline, Jiangbei county, Chongqing ( According to Nanjiang Hydrogeological Team )

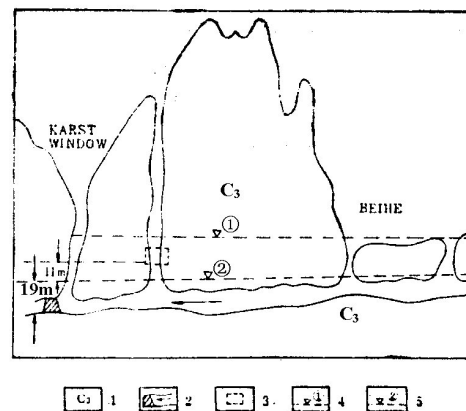
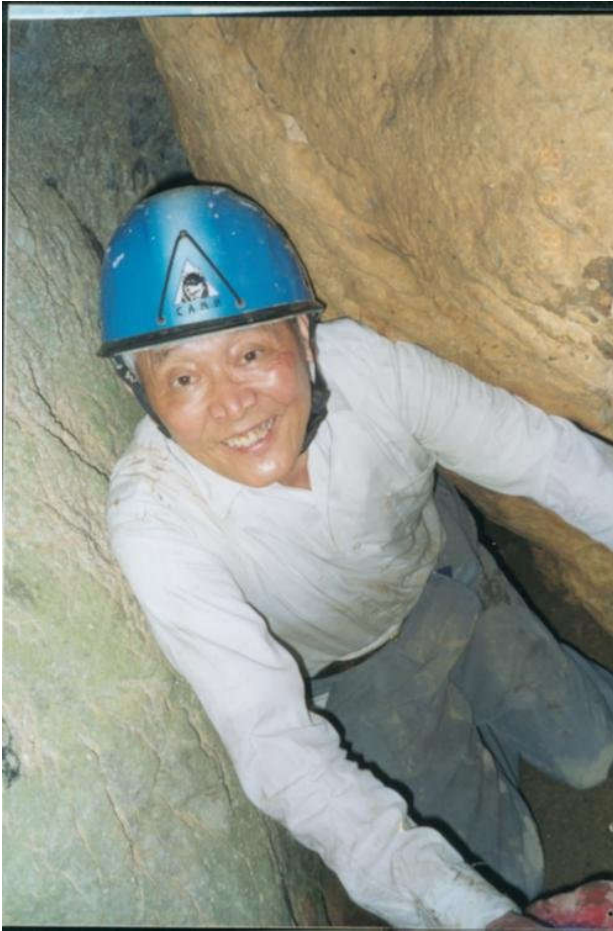


Fig 28. the Jijiao underground dam, Xincheng County, Guangxi

- 1—Upper Carboniferous, limestone;
- 2—subterranean stream and dam
- 3—cross section of the artificial tunnel;
- 4—highest flood season water level;
- 5—Lowest dry season water level,

**The advantage of hard,  
compact limestone**



**Thank you !**