

A review on the establishment and research in hydrological experimental areas (catchments) in plain areas in China and abroad

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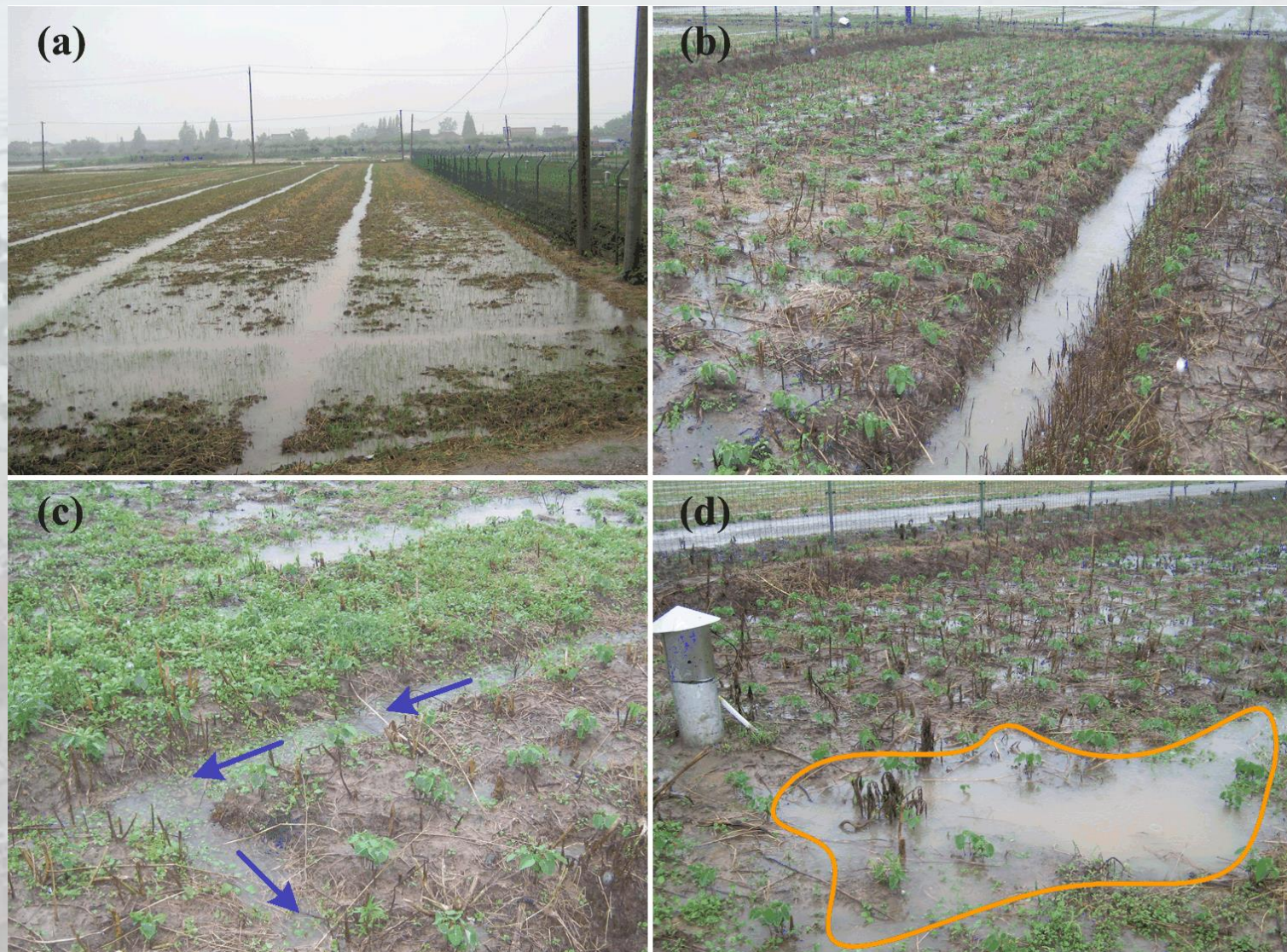




Fig.1 Characteristics of Jintan Hydrological Experimental area in Taihu Lake Plain during a rainfall process in 17 June 2015.
Photos: (a) a paddy field in the east of the experimental area, (b) a man-made drainage ditch inside,
(c) micro surface runoff pathway on field, (d) ponding area of the depression on field.

An aerial photograph of a city, likely in China, showing a large area of flooding. The water is a murky brown color, covering fields, roads, and parts of the city. In the foreground, there are several large, multi-story apartment buildings with red and grey facades. The background shows more buildings and a large body of water, possibly a river or lake, under a hazy sky.

The king's heart is in the hand of the LORD; he directs it like a
Watercourse(including furrow, river, ditch) wherever he pleases.

--- Proverbs 21:1(NIV)

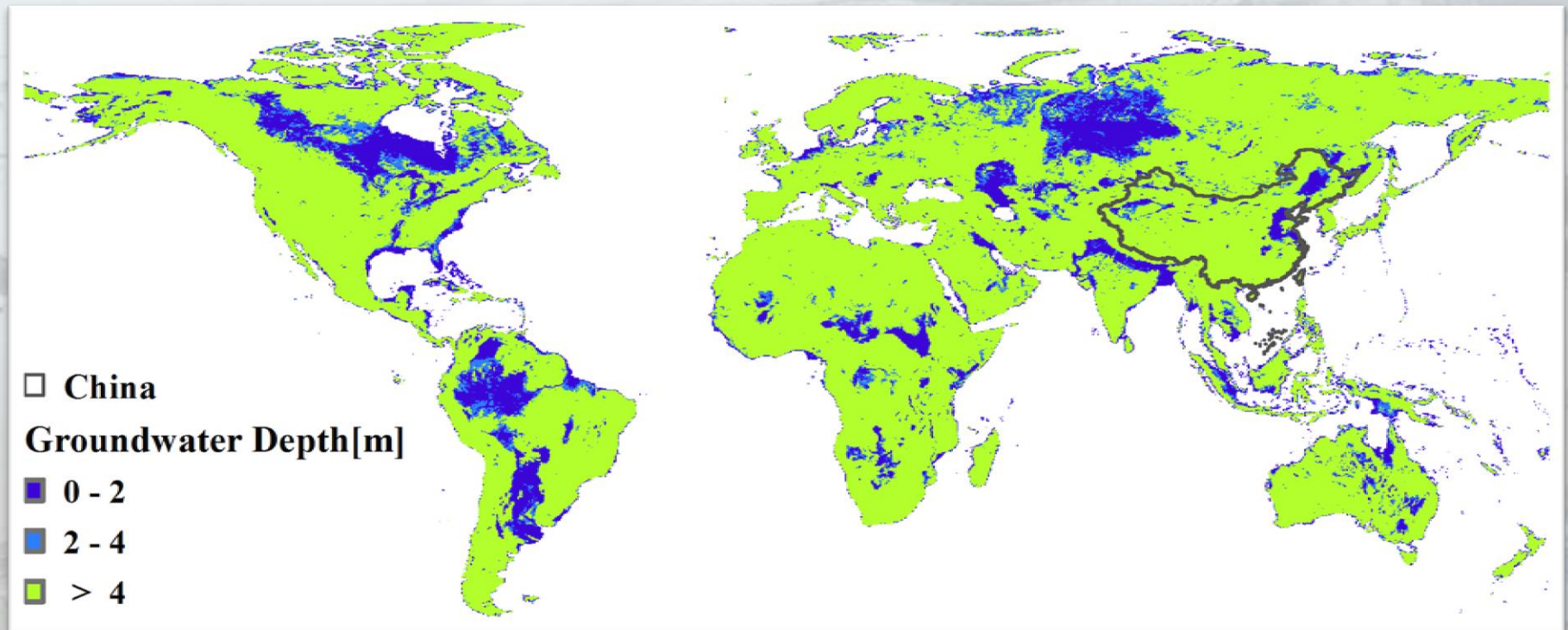
An aerial photograph showing a city area that has been completely inundated with floodwater. In the foreground and middle ground, several large, multi-story apartment buildings are visible, their lower floors submerged. The water extends to the background, covering what appears to be agricultural fields and other urban structures. The sky is overcast and grey.

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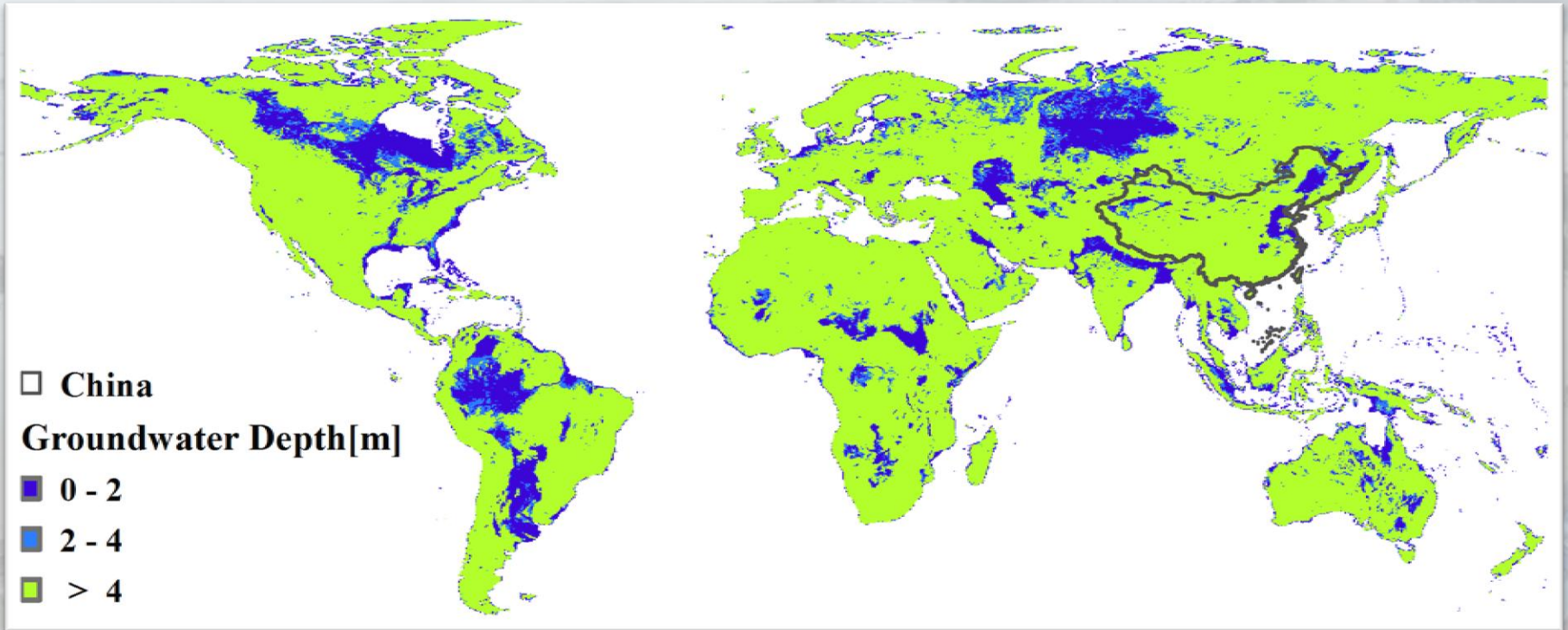
--- Proverbs 21:1(NIV)

Complex!

Background



Background



FLOODS

LAND USE CHANGE

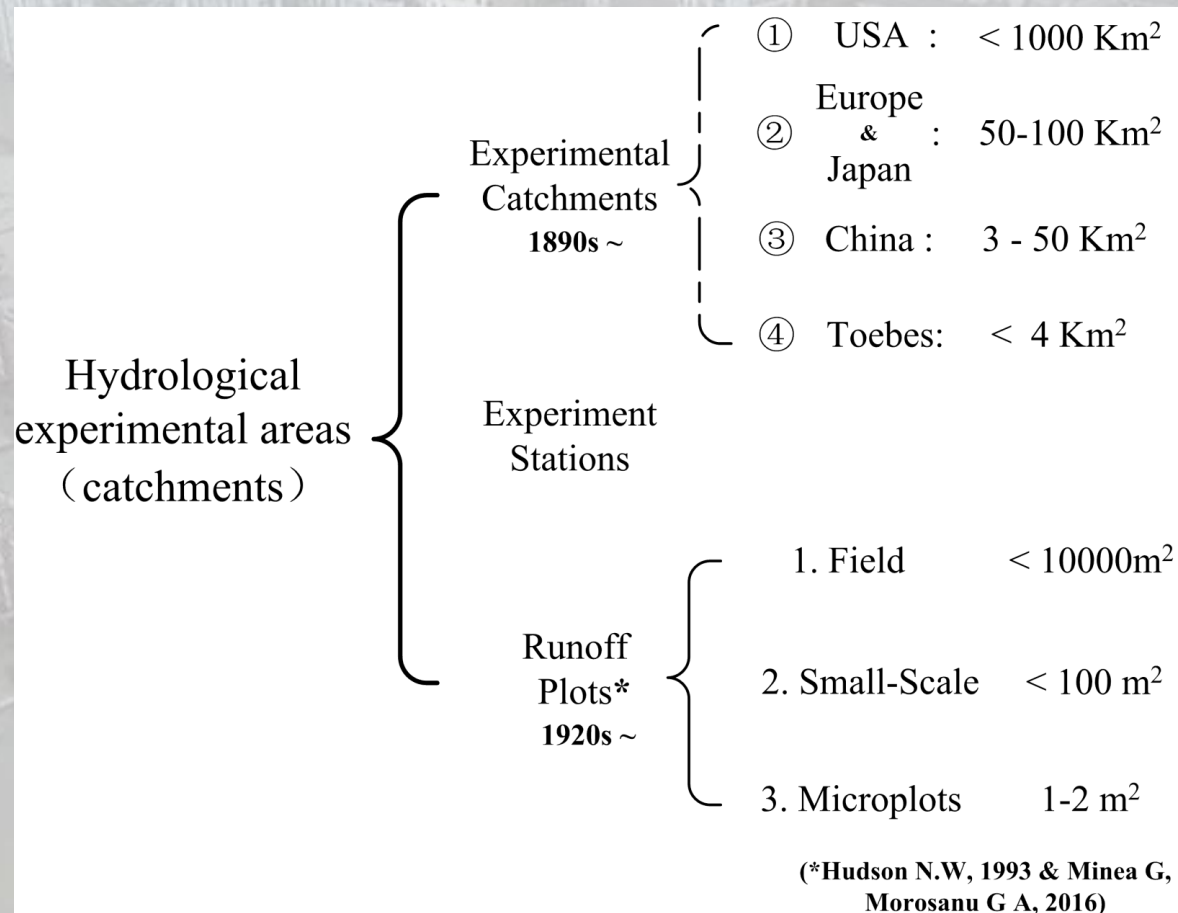
CIIMATE CHANGE

WATER QUALITY

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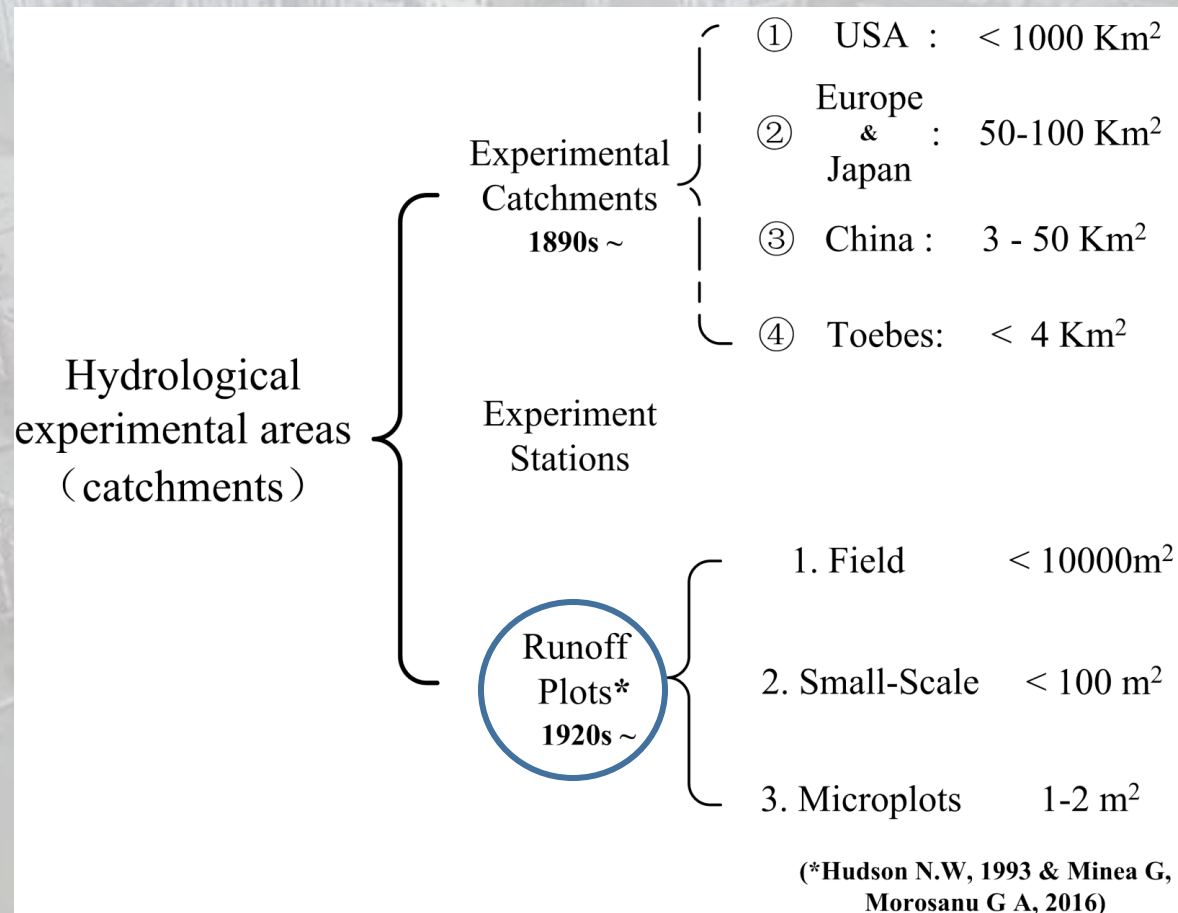
Hydrological Experimental areas(catchments)

A definition of catchment in Plain?



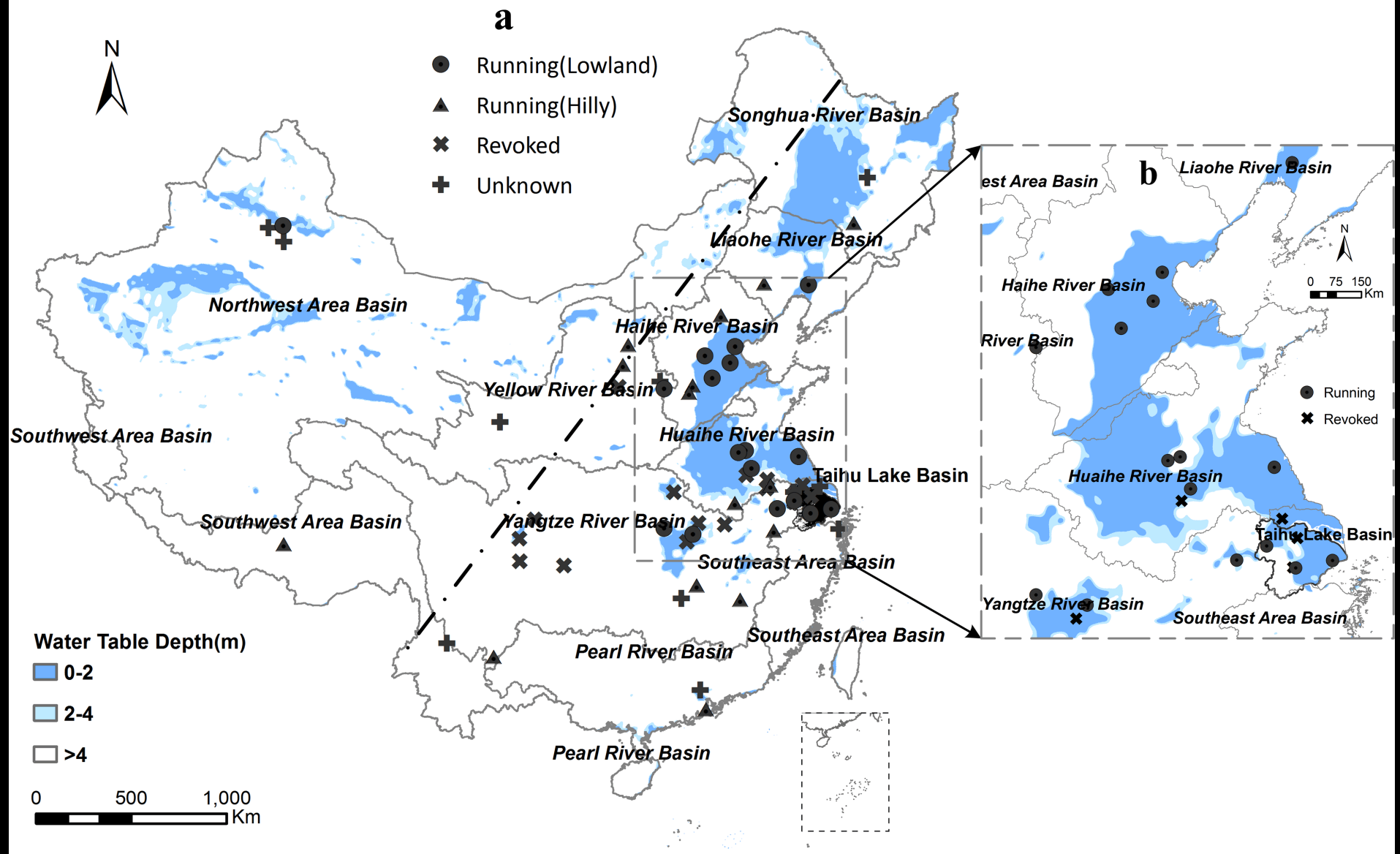
Hydrological Experimental areas(catchments)

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Outline

- 1. Statistic: information in China and Abroad
- +
- 2. Lessons from these collected data
- 3. A new example in China
- 4. Conclusion & suggestions



China

Tab.2 Detail description of typical hydrological experimental areas (catchments) in plain areas in China

Name	Area	Characteristics	Annual Rainfall/ mm	Observation items	Location/Plain or Basin	Running period*
Wudaogou	1.36km ² , 60000m ² , 1600m ²	GW:0.5-5m; Soybean, cotton, corn; Drainage ditches around; Silty Clay	917	●▲✱P、SR、Q、M、GW、SM、GE、PGP、PS	Huaibei	1953-
Hanchuan	8.23km ² , 2 runoff plots	GW:0-2m; Paddy, cotton; Ditches and rivers; Clay Loam & Sandy Loam	1198	●Q、WL、P、GW、M、SM	Jiangnan	1959-
Tai'an	498km ² , 7500m ²	Sand with high permeability	640.2	●P、GE、INF、SR、M	Liaoh River	1963-
Shuanglin	2.56km ² , 0.47km ² (new)	Separated irrigated area; Paddy field & dryland	1281	●P、WL、GW、Q、E、M	Taihu	1965-
Taigu	7.72km ² , 11000m ²	GW: 25m; Wheat; Grassland; Sandy Loam	412.6	●T、M、SM、P、SP、GW、Q	Taiyuan	1984-
Hengshui	30600m ²	GW:1-2.9m; Grassland; Sandy loam	522.5	●M、SE、GW、SM	North China	1985-
Hanwang	6.5km ² , 70% piedmont plain	Wheat, corn, sweet potato; Clay	800	●▲M、SM、INF、GE、SR、GW、SP、WP	Huanghuai	1986-
Ranzhuang	51.3km ² , 50m ² plot	Wheat, corn; Sand	486	●SM、SP、GW、P	North China	1987-
Chongfeng Polder	0.1km ² , 4 plots with 60m ²	GW:1-2m; Cotton, oilseed rape, corn; Fluvo-aquic soils	1000	●▲P、WL、V、PHOS	Lixia River	2009-
Jian Polder	0.106km ²	GW < 2m, Irrigation, Paddy field & dryland & ditches; Silt Loam & Clay	1082	●▲P、T、M、PD、TP	Taihu Lake	2013-
Jintan	765m ²	GW:0.1-1.5m; Oilseed rape, green soybean; Drainage ditches around, irrigation-influenced; Silty Clay	1063	●P、E、WL、DoD、Q、SM、M	Taihu Lake Plain	2013-

Abroad

Tab.3 An incomplete list of hydrological experimental areas (catchments) in plain areas abroad

Name	Area /km ²	Elevation /m	Characteristics	Observation items	Location	Running period
Hupsel Brook ^[51]	6.5	22-35	Free-drainaged; Slope:0.8%; Grassland, Corn; Sand & Clay	●▲P、E、Q、GW、SM、N、P、S	Netherlands	1960s-
Cabauw ^[6]	0.5	-1	Polder; Grassland, Corn; Clay & peat soil	●P、E、Q、GW、SM	Netherlands	2003-
Beltrum ^[52]	0.04	16.7-17.2	Corn; Ditches around, GW:0.5-1.5m, Loamy Sand	●GW、SM、SP、SR	Netherlands	2000s-
Winterswijk ^[52]	0.027	42-45	Corn & pasture; Ditches around; GW:0.25-2.0m; Loamy Sand, Gault	●GW、SM、SP、SR	Netherlands	2000s-
Ems River	0.75	0-4	Tide-influenced; Grassland; Sandy gley soil, boggy soil	●▲◆★WL、GW、SG、E&S Process、Tide、SC	Germany	2004-
Kielstau	49.3	27-78	Shallow groundwater depth; Tillage, Grassland; poorly drained soil & Alfisol	●▲WL、Q、NO ₃ 、NH ₄ 、pH、T、O ₂ 、WQ、P、Interaction of GW and SW	Germany	1985-
Warnow-Peene	15.5	34.5-50.6	Artificial-drainaged; Tillage, Grassland, forest; Alfisol, gley soil	●▲Q in ditches、P、T、H、WV、GW、SWQ、GWQ、-NO ₃ isotope	Germany	2001-
Skuterud	4.5	91-146	Low permeability; Tillage, forest; Silty Loam, Silty Clay Loam	●▲Q、P、T、WV、ST、SD、WQ	Norway	1993-
Pozary	20.17	71.7-103.7	Forest, bog, Grassland; Peat soil, boggy soil	●▲WL、GW、P、M、PC、RC、GWC	Poland	1993-
Czarna	23.4	148-185	Tillage, forest; Loamy Sand & Loam	●WL、Q、P、T、SM、ST、GW、WV	Poland	1980-
Butenya	70.3	130-219.1	Runoff Plots; Tillage & Residence, Ashing Chernozem	●RO、WL、P、GW、T、H、WV、SM、SE	Ukraine	1947-

● Water Quantity, ▲ Water Quality, ✱ Plant Growth, ◆ Sediment, ★ Ecology, * starting year might with 1-3 years bias

China

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Name	Area	Characteristics	Annual Rainfall/ mm	Observation items	Location/Plain or Basin	Running period*
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Abroad

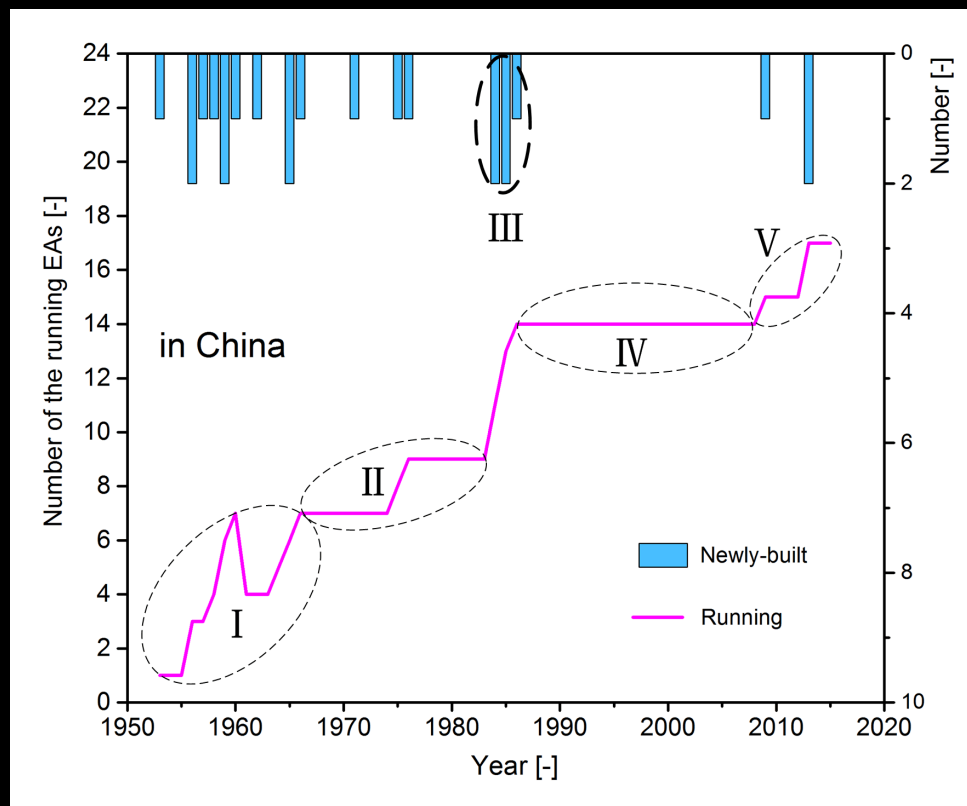
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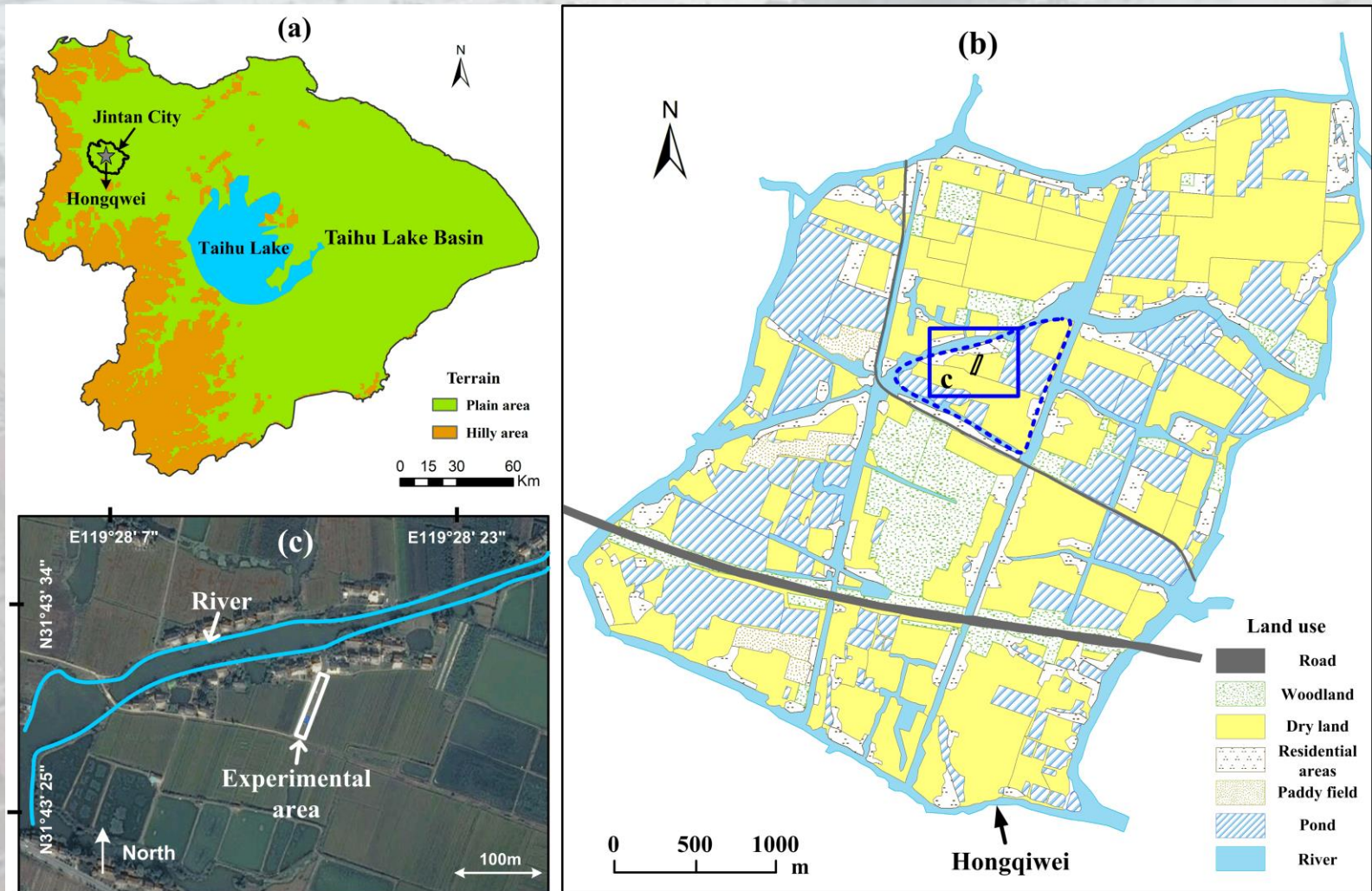
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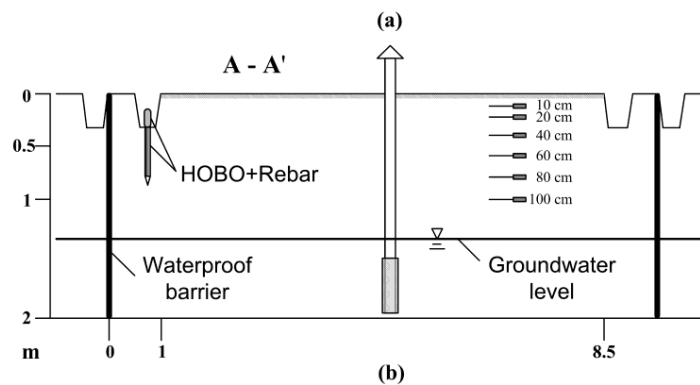
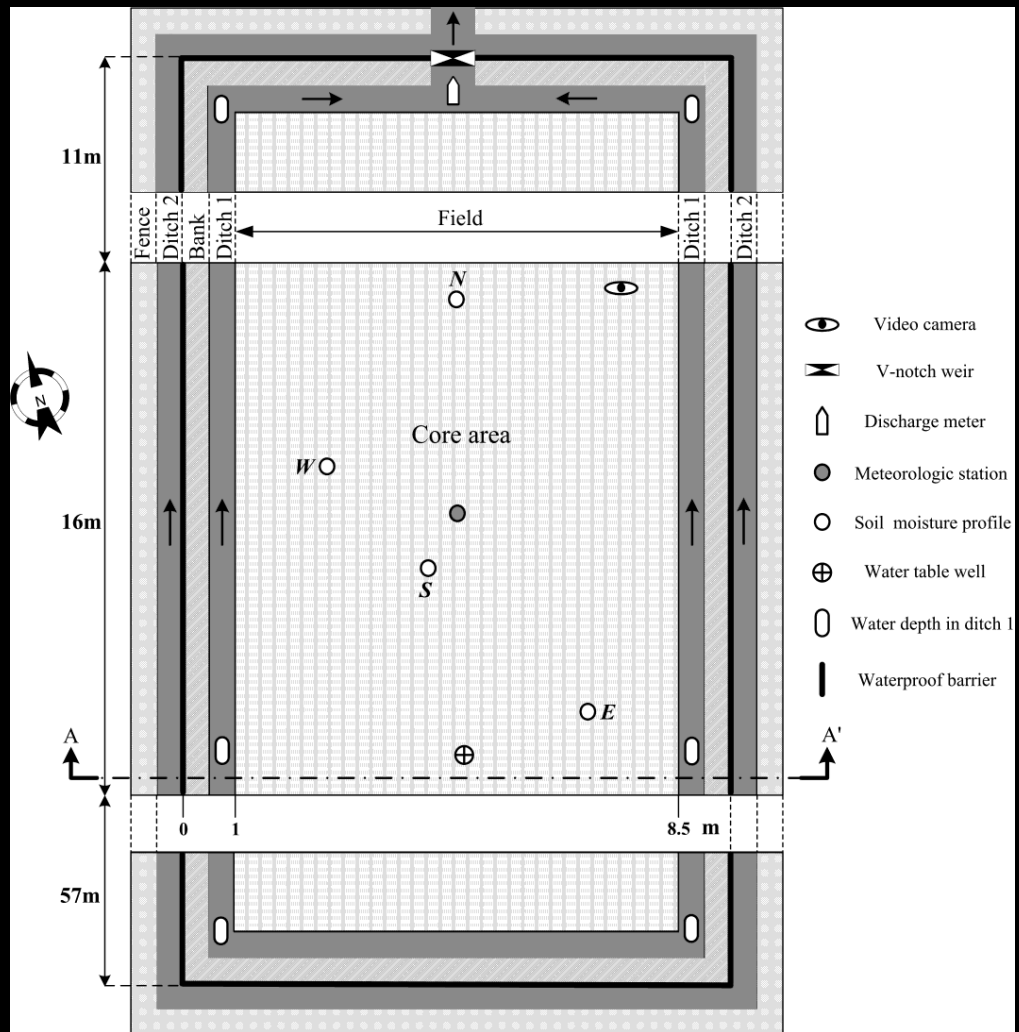
Tab.1 An incomplete table of the number of hydrological experimental areas (catchments) in China

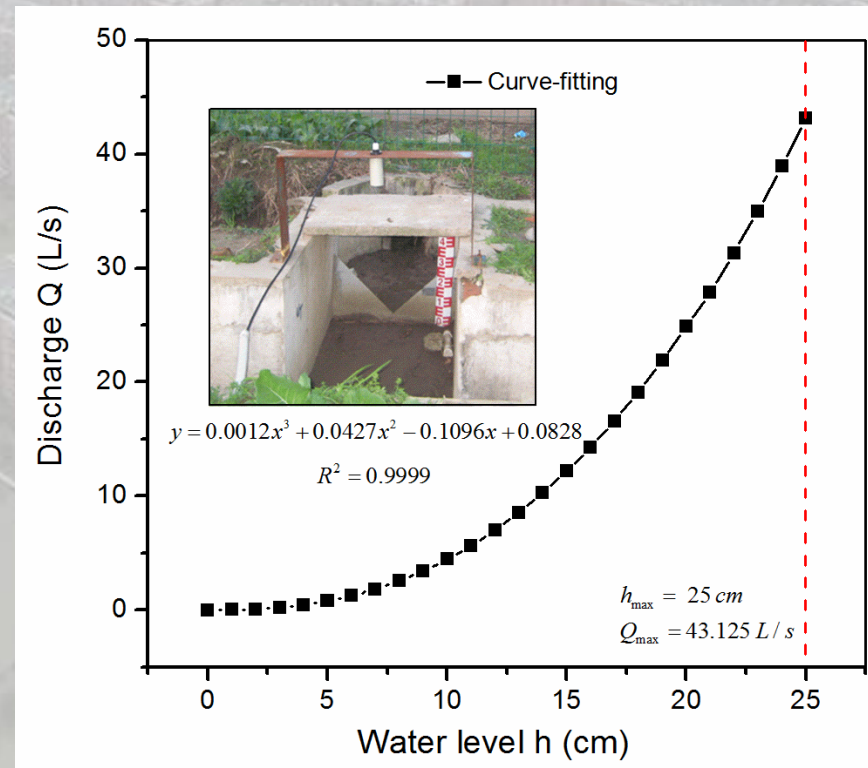
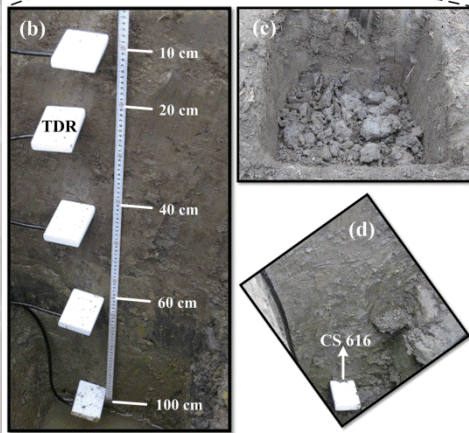
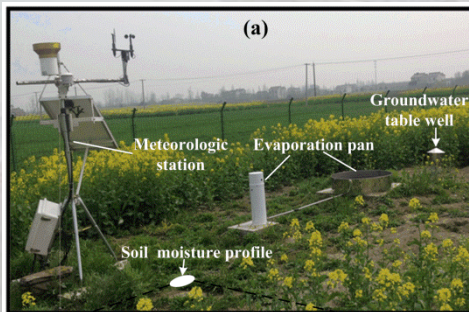
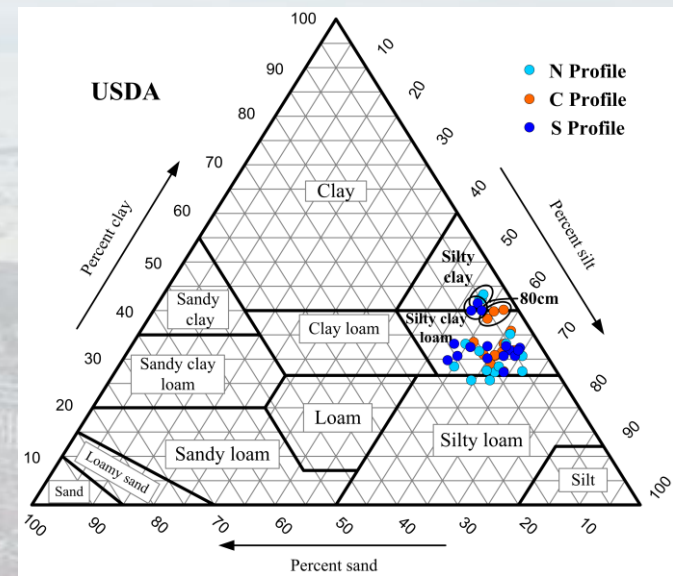
	Running	unknown	Revoked	Total
Plain	17	2	5	24
Hilly	15	9	11	35
Total	32	11	16	59



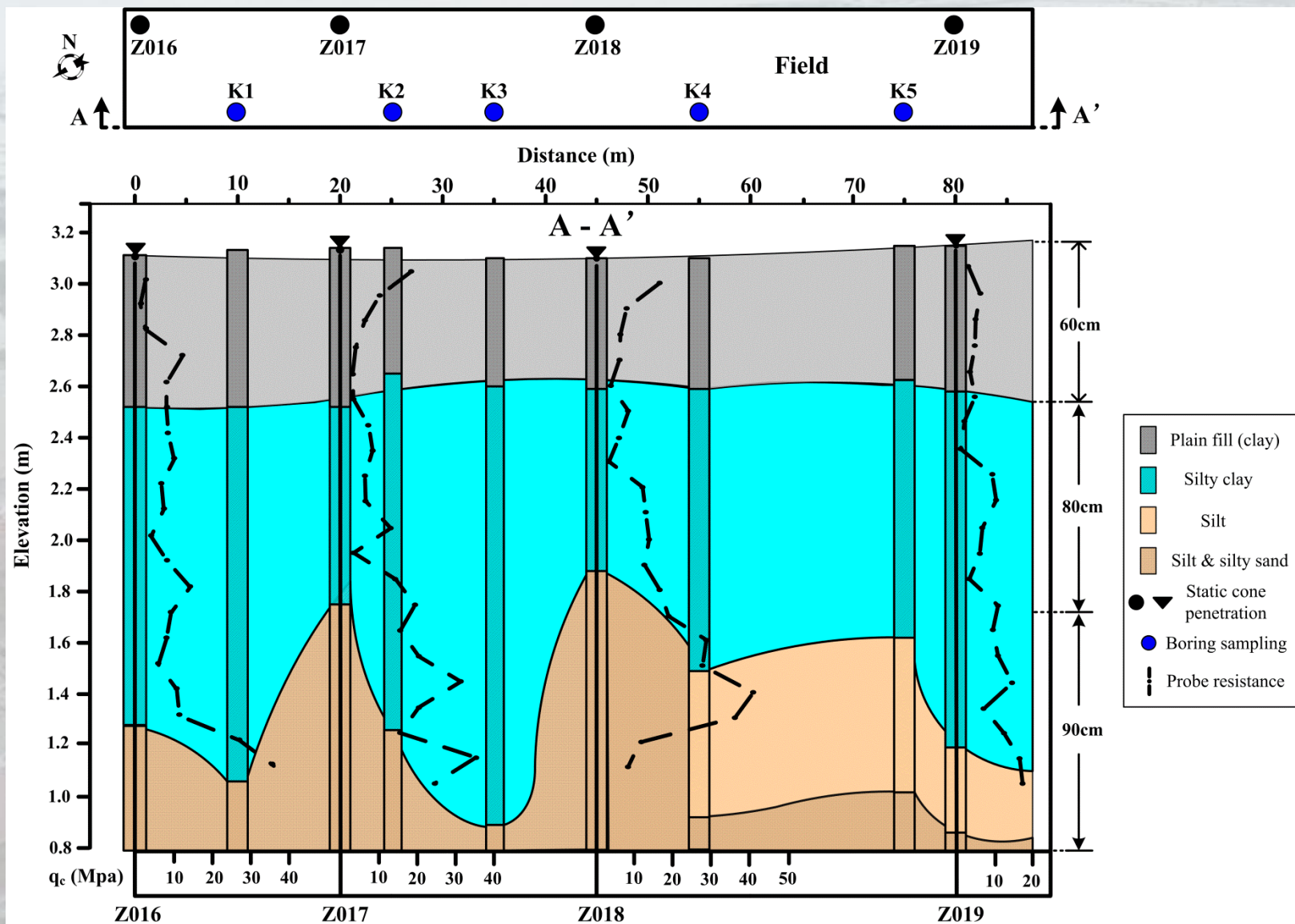
3. A new one: Jintan







Type	Item	Sensor	Measuring range	Resolution	Period	Interval (min)
Meteorology	Rainfall	Campbell TE525MM & SL3-1	< 120mm/h	0.1mm	2012.09 -	10
			< 144mm/h	0.2mm	2016.01 -	5
	Wind	R.M Young 03002	0~50m/s	±0.5m/s	2012.09 -	10
	Air Temperature	Campbell 109-L	-50~70℃	±0.2℃	2012.09 -	10
	Evaporation	Campbell 255-100	0~254mm	0.76mm	2012.09 -	10
Soil water	Soil moisture	Campbell CS616	-	±2.5%VWC	2012.09 -	10
Ground water	Groundwater table	JH2400	70m	±2mm	2014.02 -	5
		HOBO U20	9m	±5mm	2015.09 -	5
Surface water	Water level	Vegapuls WL6	15m	±2mm	2016.01 -	5
	Water depth of ditches	HOBO U20	9m	±5mm	2015.10 -	5
	Discharge of the weir	Vosonda-OS200	< 43.1L/s	-	2015. 11 -	5
Experiment	Rainfall Simulator	QYJY-501	10-200mm/h; < 4m ²	-	2015.10 -	-



CONCLUSION & SUGGESTIONS

- Politics in China greatly influenced the process in establishing the experimental areas in plains.
- Netherlands and Germany have more continuous history and abundant experience.
- Scale issues need to be included and strengthened in the design in establishing experimental areas in plains.
- Cooperation with many fields, such as soil experts, geologist, water power engineers ...