



Center for Southeast Asian Studies
Kyoto University

Historical Landscape in the Context of Ancient Shrines

in Panel 2-01 (2022-07-27T14:00+0900)

*Cultural Landscapes in Emerging Digital Scholarship:
The Search of Conceptual and Computational Frameworks*

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Motivations

- It is generally thought that landscapes influence the culture and mentality of people who live there
- It is also said that ancient Japanese people could feel sacredness toward natural places or objects in which gods descended or sat down. Shrines have existed as places to worship the gods
- Thus, the landscapes around old shrines are valuable objects for studying Japanese culture and mentality
- **This research tried a quantitative (etic?) approach, including GIS, to re-think and interpret sacred places**

Backgrounds

What are Shrines (神社) ?

- Shrines are ritual facilities based on the belief in Shinto (神道), a religion peculiar to Japan. Gods, which are objects of beliefs and awes (e.g., natural phenomena, spirits of the imperial family, clans, and great and righteous men), are enshrined. According to the Ministry of Education, Culture, Sports, Science and Technology materials, there are about 85,000 shrines all over Japan, and there are more than 200,000 shrines including 摂社 (auxiliary shrine) and 末社 (subordinate shrine).
- **Position of shrines has been ambiguous and changing:**
 - In ancient times (8th century), some influential shrines were subject to the control of the Department of Worship (神祇官) as objects of national rituals. After this time, some shrines became a part of Buddhist (仏教) institutions, and some shrines were under the influence of Shugendo (修験道) and Yin-yang-do (陰陽道), but some shrines were independent of other religions
 - In modern times (before 1945), shrines were separated from all religions in principle as state Shinto
 - At present, there are various ways in which shrines should be

Backgrounds

Style of Shrines :

- In ancient times, shrines temporally existed as places to worship the gods. They did not have buildings as we know them today
 - *People could feel faith and find various meanings in natural views of the land (no permanent buildings required)*
- Later, people established altars for rituals and moreover built buildings to shelter them from the wind and rain
 - *people lost sensitivity toward gods (symbols for faith and sacred feelings required)*
- In Nara (奈良) period (710-794), the Ritsuryo-Jingi system (律令神祇) was established, which placed the Department of Worship (神祇官) to handle national rituals and shrine administration. Some shrines recognized as national gods and got offerings from the imperial court. These shrines are called government shrines (官社) and were recorded in the in “Engishiki-Jimmyocho (延喜式神名帳)”
 - *延喜式神名帳 is a part of Engishiki (延喜式) which was compiled from 907 to 915 to codify rules for court ceremonies and protocol and is considered a precious source of historical materials*
 - *式内社 (Shikina-sha) are shrines recorded in “Engishiki-Jimmyocho”*

Object of the Research

- Landscapes around shrines reflect ancient Japanese mentality
- Shikinai-sha (式内社: hereafter *Shrines*) are old and influential shrines recorded in “Engishiki-Jimmyocho (延喜式神名帳)”
- Nara Basin (奈良盆地) had been the seat of the ancient capital
- Thus, the landscapes around *Shrines* in Nara Basin indicate sacred places in ancient times

This presentation shows a preliminary quantitative research to extract necessary geographical features around *Shrines* and try to explain the location of shrines (etic approach to landscape interpretation)



Previous Researches

● Tadahiko Higuti (樋口 忠彦)

- 景観の構造 (The visual and the spatial structure of landscapes)
- Variables of Visual Structure: Visible area, distance, visual angle, invisible depth, depression angle, elevation angle, depth, Sunlight
- Classification of Spatial Structure : 水分 (Mikumari), 秋津洲やまと (Akitsushima-Yamato), 八葉蓮華 (Hachiyo-Renge), 蔵風得水 (Zoufu-Tokusui), 隠国 (Komukuri), 神奈備山 (Kamnabiyama), 国見山 (Kunimiyama)

● Satoshi Hagishima (萩島 哲)

- 名所空間の発見 (Discovery of Scenic Space)
- Categorize by surrounding features: capes, river mouths, plains, basins, mountains foots (plains), mountain foots (basins), valleys, mountain peaks
- Statistical variables: Numbers of peaks within 3km from a shrine. Presence of shore, cape, river mouth, river, peak within 200m, within 1km and without 3 km. Average distance of mountains around a shrine
- Field researches: Scenery, history, origin etc.

Procedure of the Research

1. Identify the location (longitude and latitude) of each *Shrine*
2. Read the surrounding geographical features of *Shrines* from maps, and identify their altitudes and locations
3. Apply statistical analysis to identify spatial elements that explain the locations of *Shrines*
4. Categorize *Shrines* using the above results

Data Sources

- Location of *Shrines*

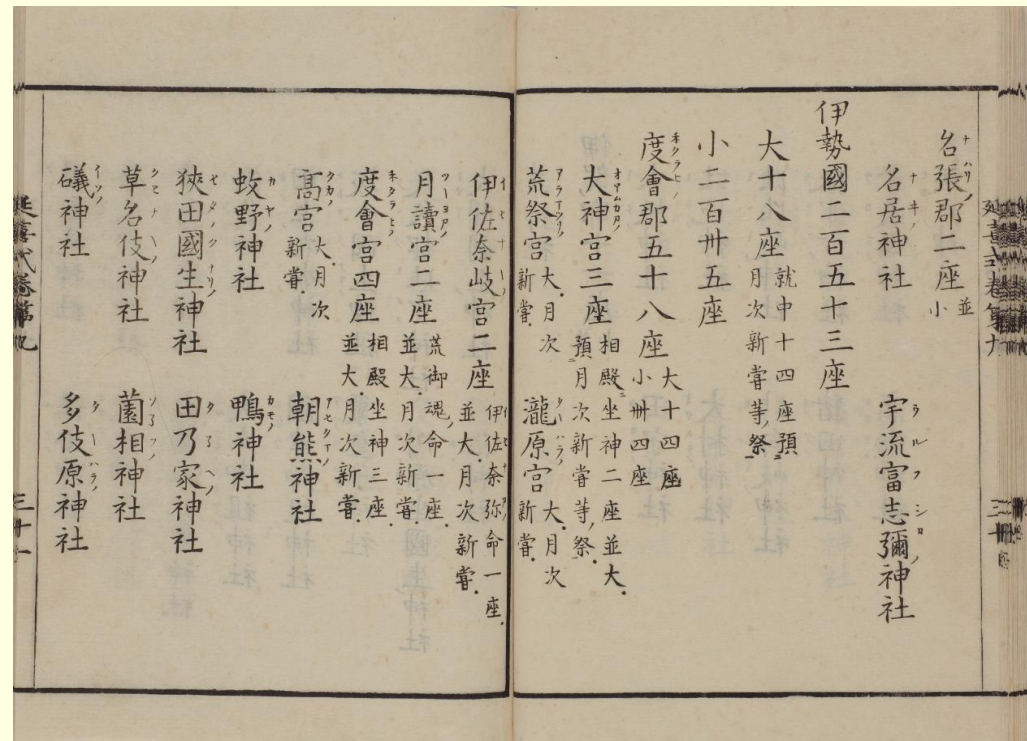
- Material: Engishiki-Jimmyocho (延喜式神名帳)

- Geographical Features

- Digital Map 25000 (Spatial Data Framework): Geographical Survey Institute (国土地理院)
- Groundwater: Ministry of Land, Infrastructure and Transport (国土交通省)

- Other Maps

- Hot springs
- Land Use
- Cultural Heritages



Location Data of *Shrines*

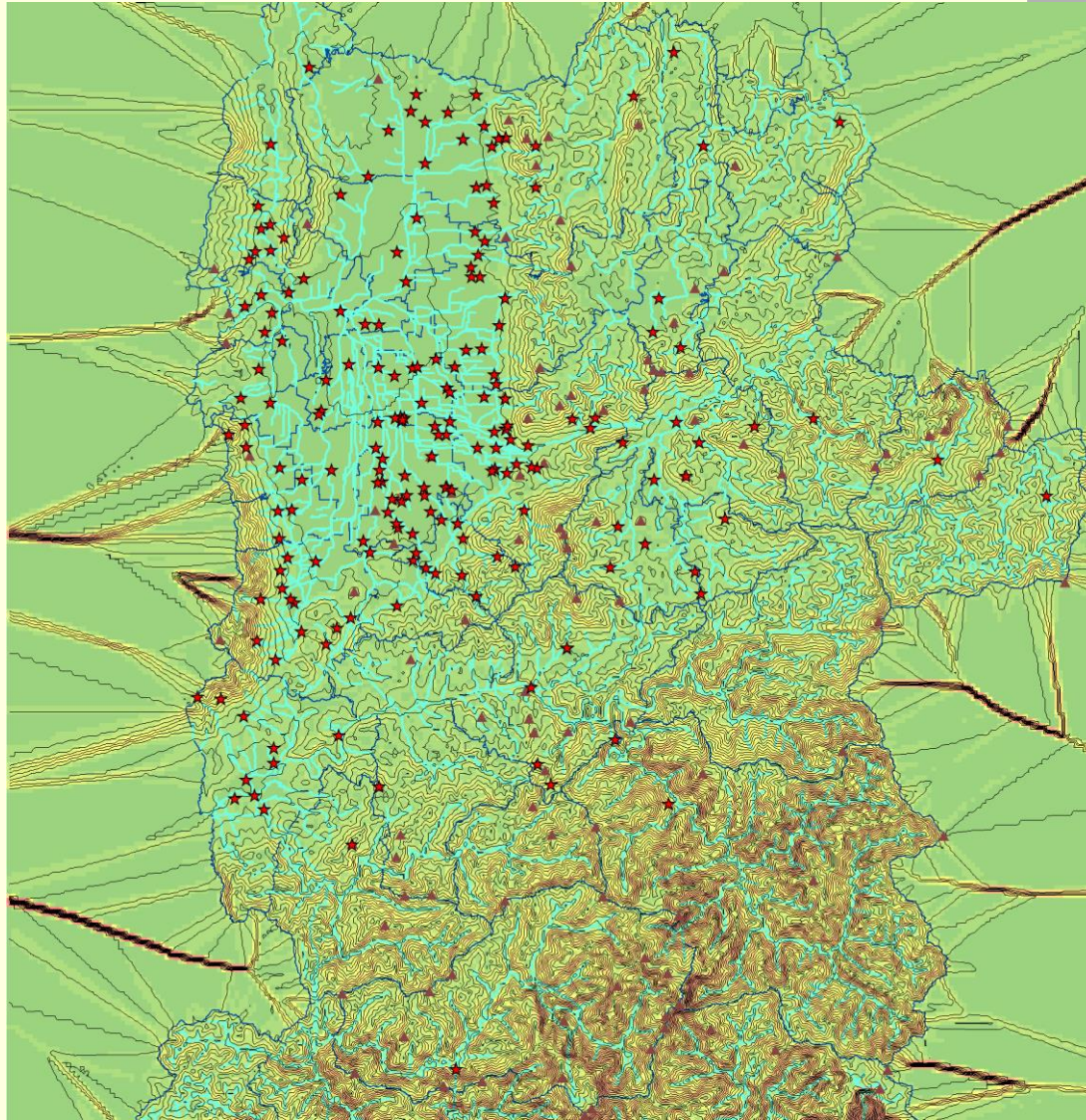
- **Extract location information of shrines**

1. Extract Original (historical) name of a *Shrine* from Enngishiki
2. Identify the original (historical) place name of the *Shrine* (country name, county name etc.)
3. Identify the present name of the shrine
4. Identify the present address of the shrine
5. Identify the longitude and latitude of the shrine

番号	国	郡名	延喜式での表記 (Old Name)	比定 (Present Name)	緯度(Lat.)	経度(Lon.)	比定住所
16	山城	乙訓郡	小倉神社	小倉神社	34.5433	135.4037	京都府乙訓郡大山崎町 円明寺鳥居前83
17	山城	乙訓郡	入野神社	入野神社	34.5658	135.4024	京都府京都市西京区大 原野上羽町192
18	山城	乙訓郡	自玉手祭來酒解神社	自玉手祭來 酒解神社	34.5405	135.4043	京都府乙訓郡大山崎町 天王46
19	山城	乙訓郡	神足神社	神足神社	34.551	135.4208	京都府長岡京市東神足 2丁目16-15
1	山城	葛野郡	葛野坐月讀神社	松尾大社撰 社月読神社	34.5947	135.4108	京都府京都市西京区松 室山添町15

Example of an Overplayed Map

- *Shrines* in Nara Basin -



★ *Shrines* (212)

Feature Data

● Mountain Peaks

- Create the shape file of place names from “the Digital Map 25000 (Spatial Data Framework)”
- Extract peak features
- Extract features whose category field is “natural features” and name field includes word of “mountain (山 or 岳)”

● Rivers

- Extract river features from “Digital Map 25000 (Spatial Data Framework)”

● Surrounding Landscapes

- Buffering from each *Shrine*
- Buffering distances: Based on Tadahiko Higuti’s *The visual and the spatial structure of landscapes* (景観の構造)
 - 300m \leq : close view
 - $< 300\text{m}$ and $3000\text{m} <$: middle view
 - $\leq 3000\text{m}$ and $5000\text{m} \leq$: distant view

Geographical Data

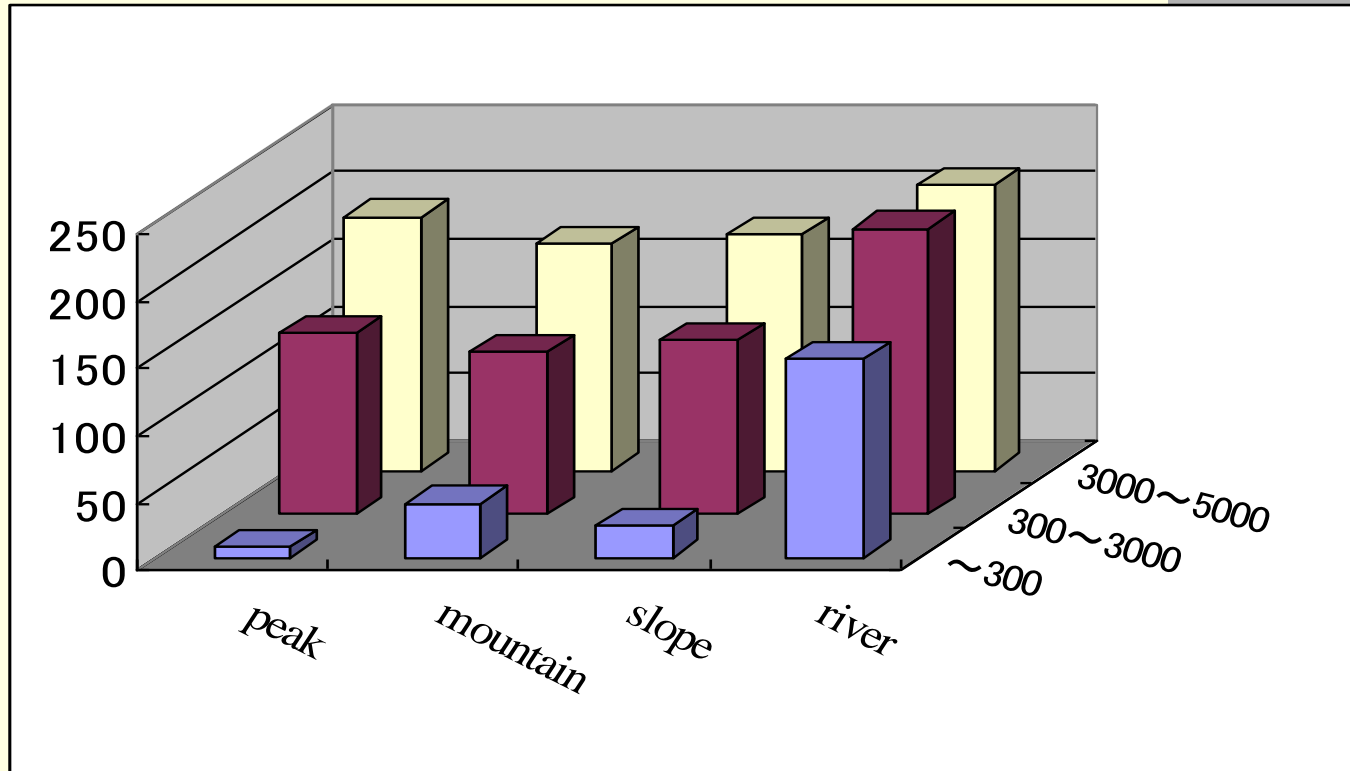
● Altitude (contour)

- Calculate 50m meshed Digital Elevation Model (DEM) by applying Inverse Distance Weight (IDW) interpolating method to meshed altitude data of “Digital Map 25000 (Spatial Data Framework)”

● Gradient

- Calculate gradient from the 50m meshed Digital Elevation Model (DEM)
- Classification of land by slope
 - 5 degree \leq : flat area
 - < 5 degree and $15 < \text{degree}$: gentle slope area
 - ≤ 15 degree : steep slope area

Macroscopic Landscapes in Nara Basin

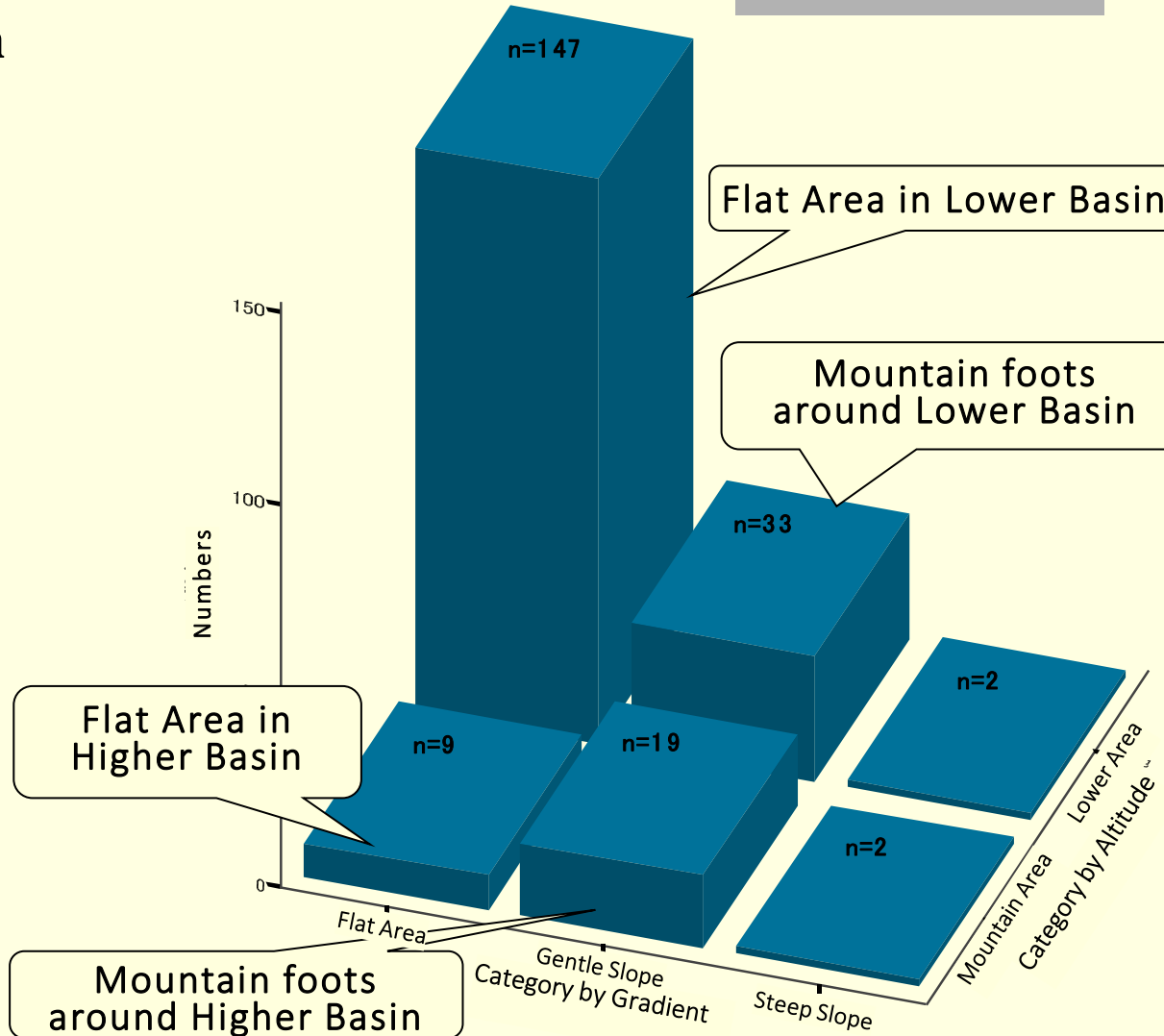


- **Most *Shrines* locates near rivers**

- About 70% of shrines locate within 300m of rivers, and 100% are within 3000m
- About 60% of shrines locate within 3000m from peaks
- Only a few geographical features (i.e., peaks, steep slopes) exist in close view (within 300m), but many in middle view (within 3000m)

Macroscopic Landscapes in NARA Basin (*cont.*)

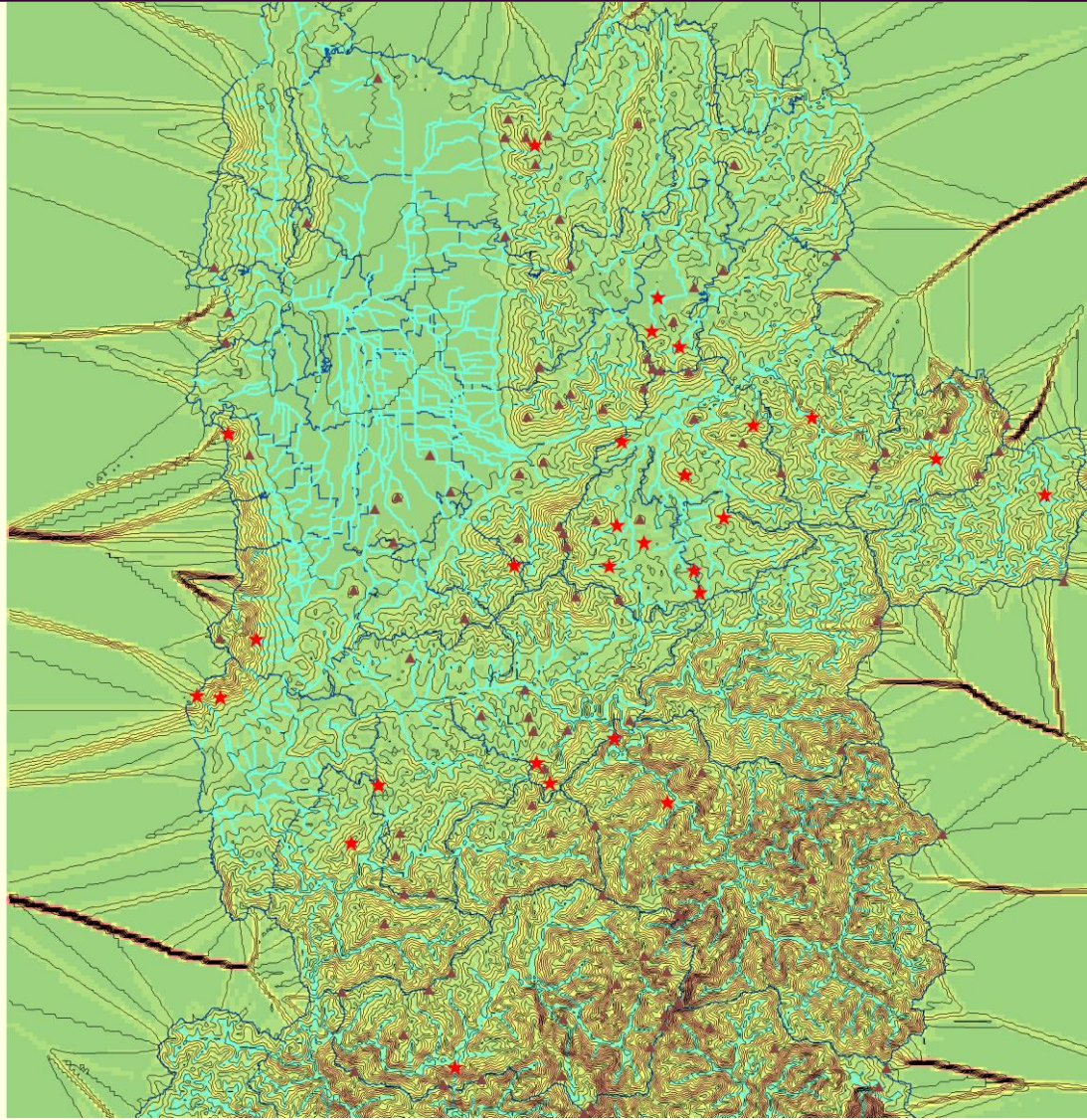
- **Most shrines locate in flat areas of lower basins (147 shrines)**
 - Mountain foot of lower basins (33 Shrines)
 - Flat areas in higher basins (19 Shrines)
 - Mountain foot of higher basins (9 Shrines)



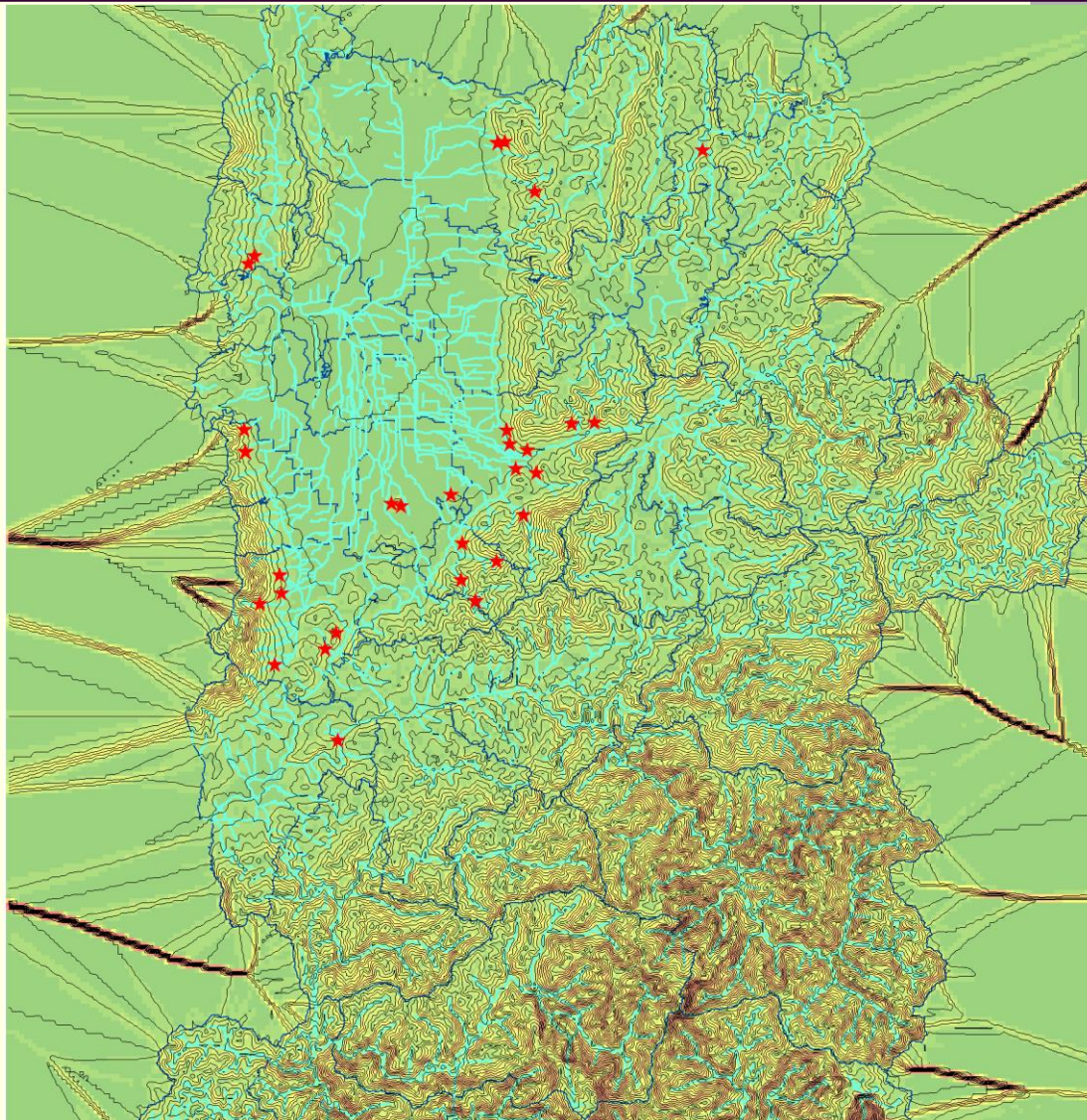
Shrines in Flat Area in Lower Basin



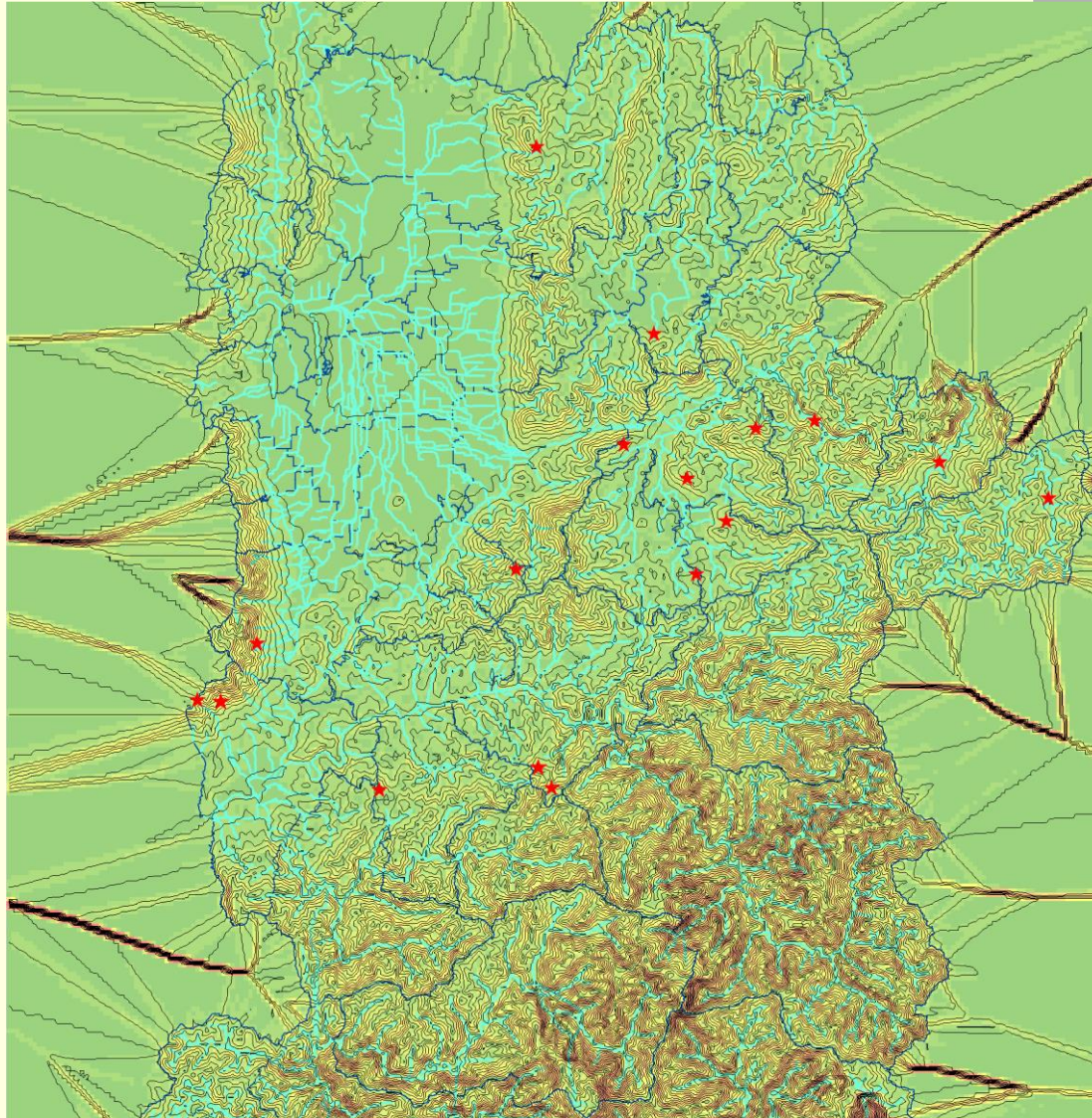
Shrines in Flat Area in Higher Basin



Shrines in **Mountain Foot around Lower Basin**



Shrines in **Mountain Foothills around Higher Basin**



Factors that Determine the Location of *Shrines*

- Variables for Statistical Analysis -

- **Altitude (site)**
 - 1:Lower area (<350m), 2:Higher area (\geq 350m)
- **Gradient (site)**
 - 1:flat (\leq 5deg.), 2:Gentle Slope (5deg.< <15deg.), 3:Steep slope (\geq 15deg)
- **0~300m (surroundings)**
 - Presence of river(s) (0: No, 1:Yes)
 - Numbers of peaks
 - Presence of mountain(s) (0: No, 1: Yes)
 - Presence of steep slope(s) (0: No, 1: Yes)
- **300~3000m (surroundings)**
 - Numbers of peaks
 - Presence of mountain(s) (0: No, 1: Yes)
 - Presence of steep slope(s) (0: No, 1: Yes)
- **3000~5000m (surroundings)**
 - Numbers of peaks
 - Presence of mountain(s) (0: No, 1: Yes)
 - Presence of steep slope(s) (0: No, 1: Yes)

Total 12 variables

Factors that Determine the Location of *Shrines*

- principal component analysis -

Factor Matrix

	1	2	3	4	5	6
Altitude of Shrines	0.659	-0.502	0.199	-0.050	-0.399	-0.000
Steepness of Shrines	0.628	-0.340	0.084	-0.116	0.424	-0.000
Mountain Area Exist within 300m	0.712	-0.483	0.214	-0.154	-0.273	0.000
Mountain Area Exist between 300m and 3000m	0.781	0.280	-0.017	-0.154	0.041	0.000
Mountain Area Exist between 3000m and 5000m	0.705	0.483	-0.275	0.037	-0.031	-0.000
Numbers of Peaks within 300m	0.171	-0.377	-0.133	0.743	0.072	0.000
Numbers of Peaks between 300m and 3000m	0.282	0.167	0.638	0.372	0.366	-0.000
Numbers of Peaks between 300m and 5000m	0.374	0.416	0.450	0.230	-0.386	-0.000
Steep Slopes Exist within 300m	0.564	-0.482	-0.028	-0.210	0.283	0.000
Steep Slopes Exist within 3000m	0.755	0.316	-0.117	-0.055	0.118	0.000
Steep Slopes Exist within 5000m	0.682	0.477	-0.310	0.095	-0.010	-0.000
River Exist within 300m	-0.269	0.380	0.518	-0.319	0.122	0.000

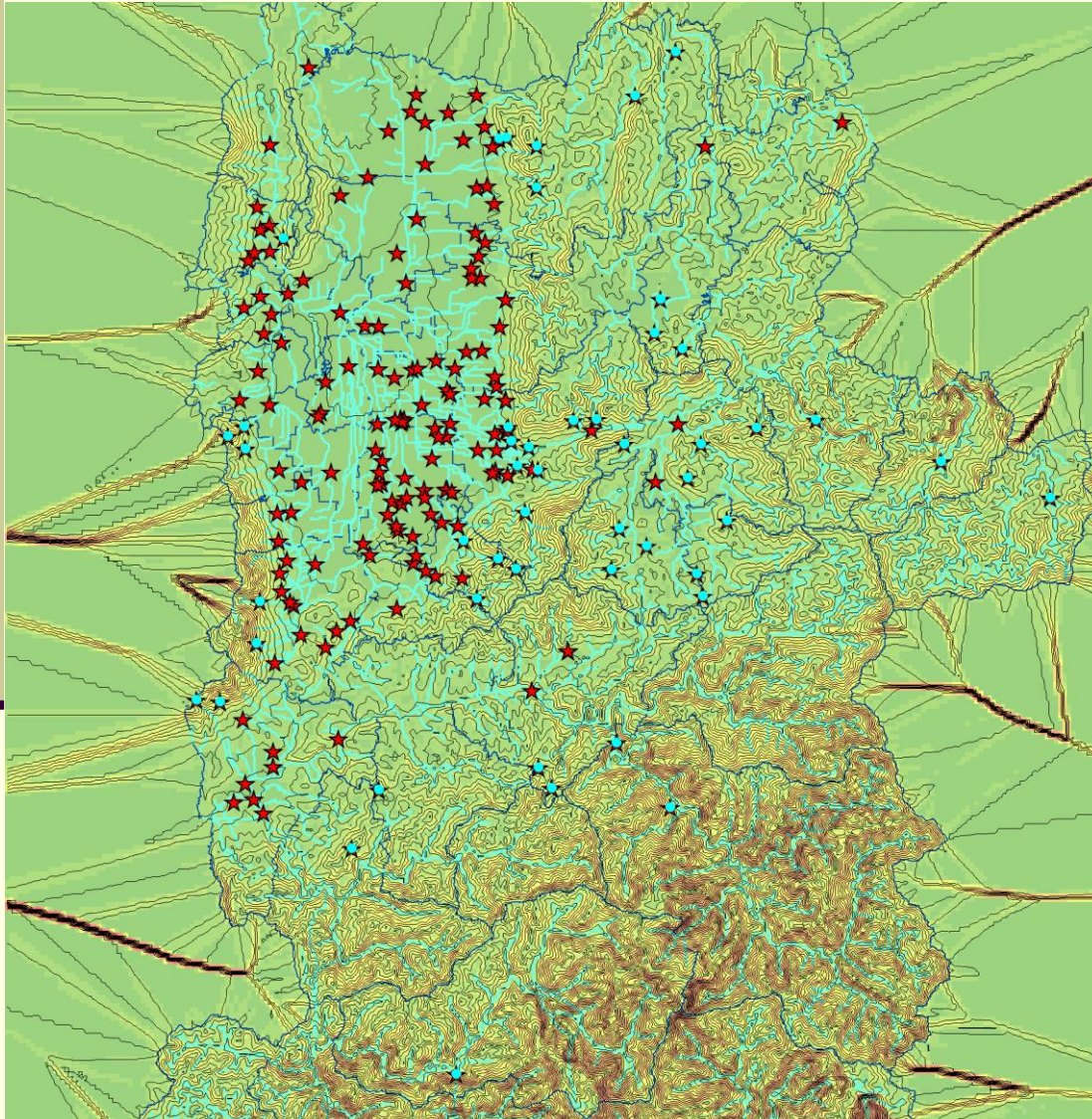
Factors that Determine the Location of *Shrines*

- Result of Principle Component Analysis -

Factor	Extraction Sums of Square Loadings		
	Total	% of Variance	Cumulative %
1	4.117	34.310	34.310
2	1.959	16.327	50.637
3	1.175	9.793	60.431
4	0.966	8.051	68.482
5	0.814	6.787	75.268
6	0.793	6.610	81.878
7	0.611	5.088	86.966
8	0.590	4.918	91.884
9	0.455	3.795	95.679
10	0.228	1.904	97.583
11	0.150	1.246	98.830
12	0.140	1.170	100.000

Factors that Determine the Location of *Shrines*

- Interpretation: 1st Factor -



If Factor1 is large (e.g., ≥ 0.5)

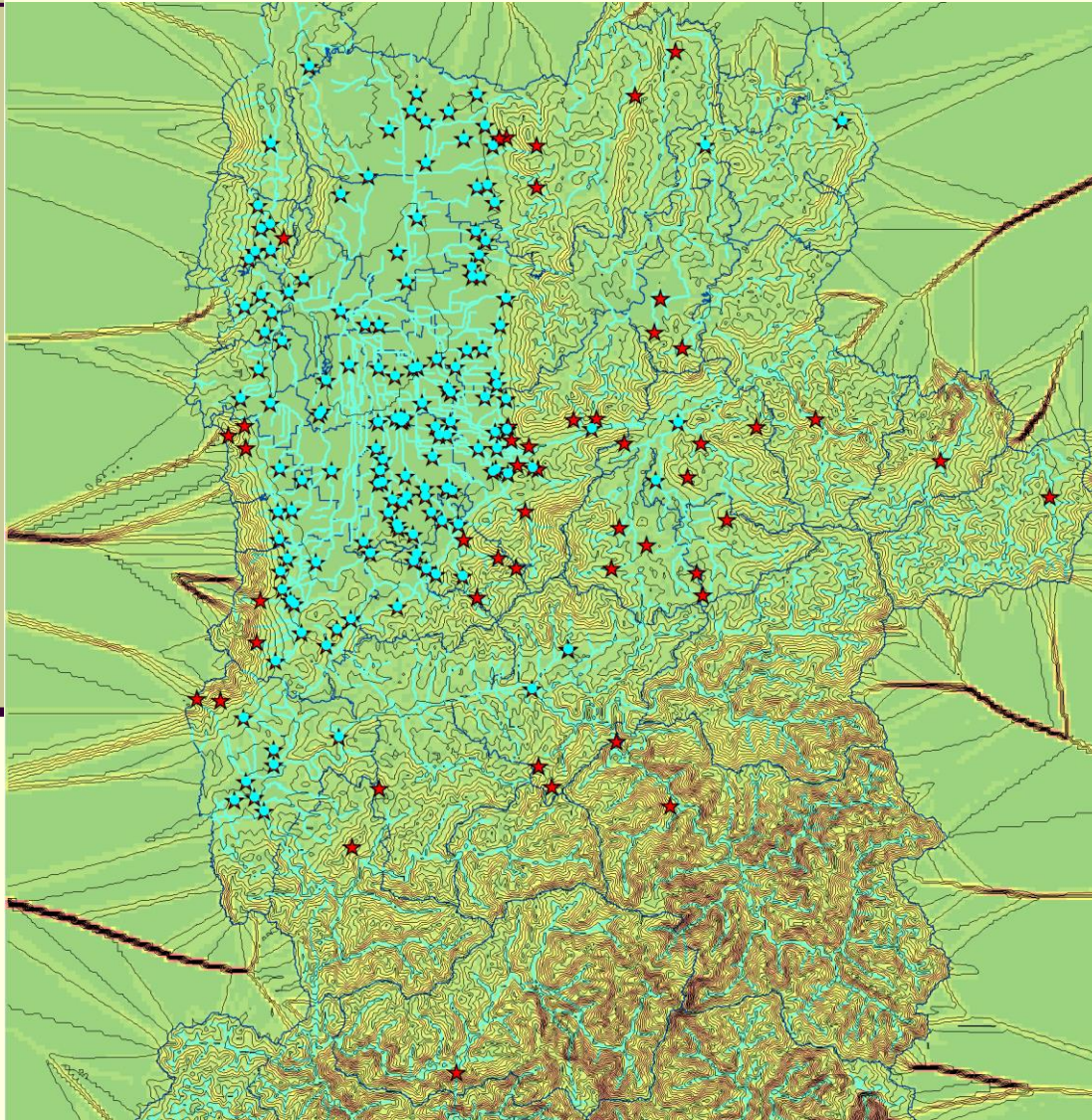
- Near mountains
- Slope area
- Higher area

→ Mountain foots or Valley

★ Corresponding *Shrines*

Factors that Determine the Location of *Shrines*

- Interpretation: 1st Factor (*cont.*) -



If Factor1 is small (e.g., <0.5)

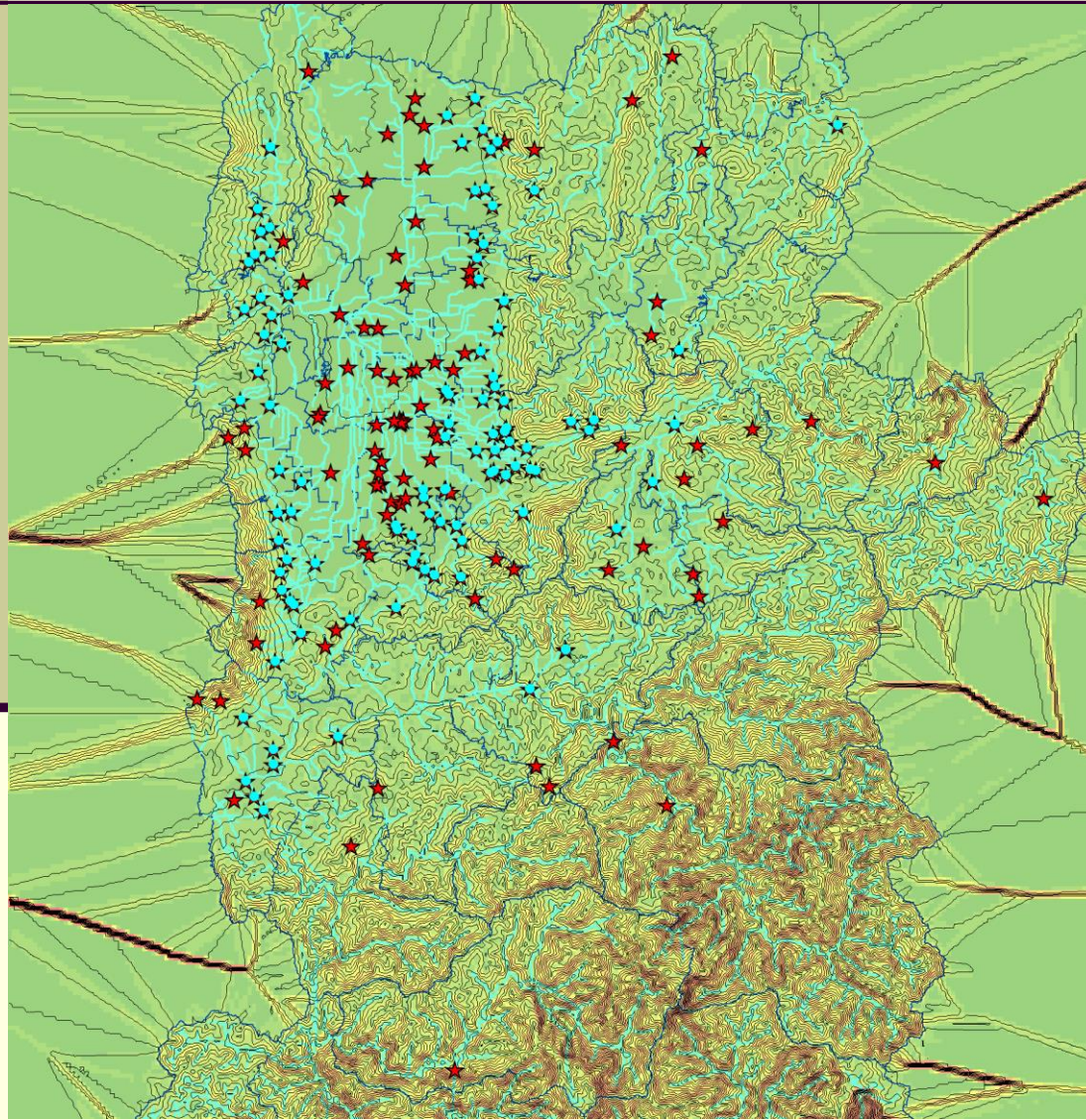
- Lower area
- Flat area

→ Lower Basin or Flat Area

★ Corresponding *Shrines*

Factors that Determine the Location of *Shrines*

- Interpretation: 2nd Factor -



If Factor2 is large (e.g., ≥ 0.0)

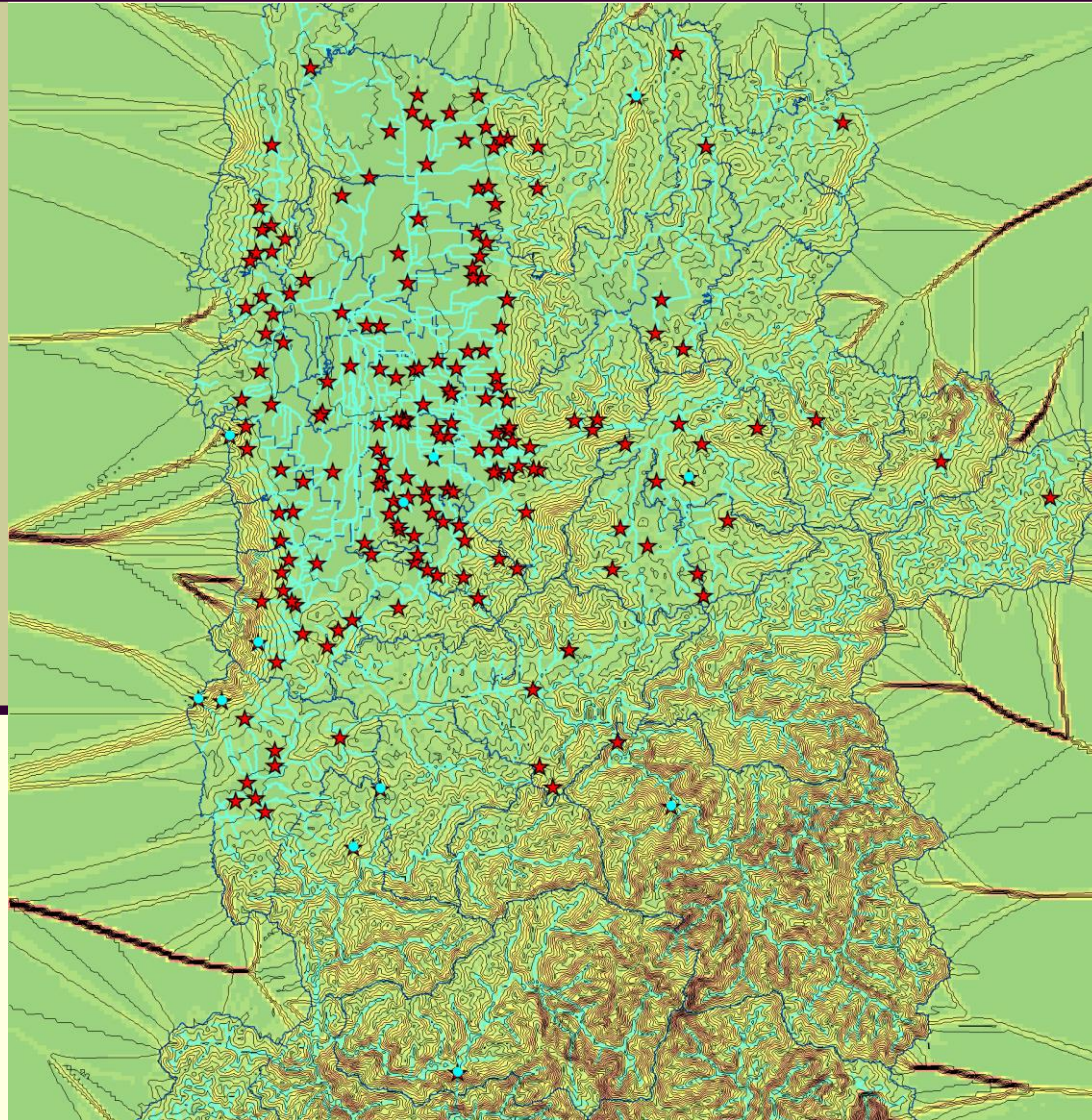
- Lower area
- A little bit far from mountains and steep slopes

→ Mountain foot

★ Corresponding *Shrines*

Factors that Determine the Location of *Shrines*

- Interpretation: 2nd Factor (*cont.*) -



If Factor2 is small (≤ -1.6)

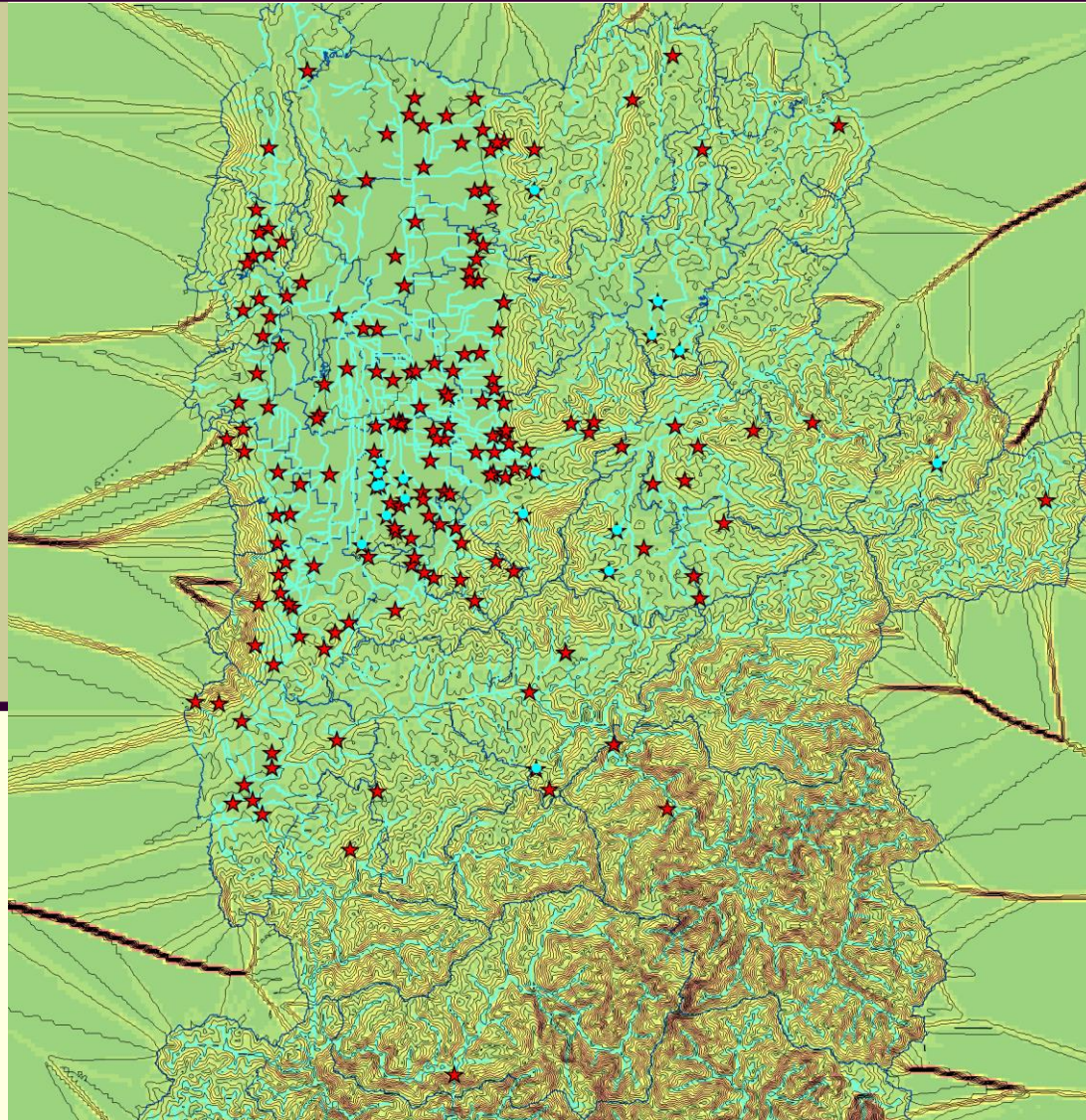
- Higher area
- Near mountains and steep slopes

→ Near peaks

★ Corresponding *Shrines*

Factors that Determine the Location of *Shrines*

- Interpretation: 3rd Factor -



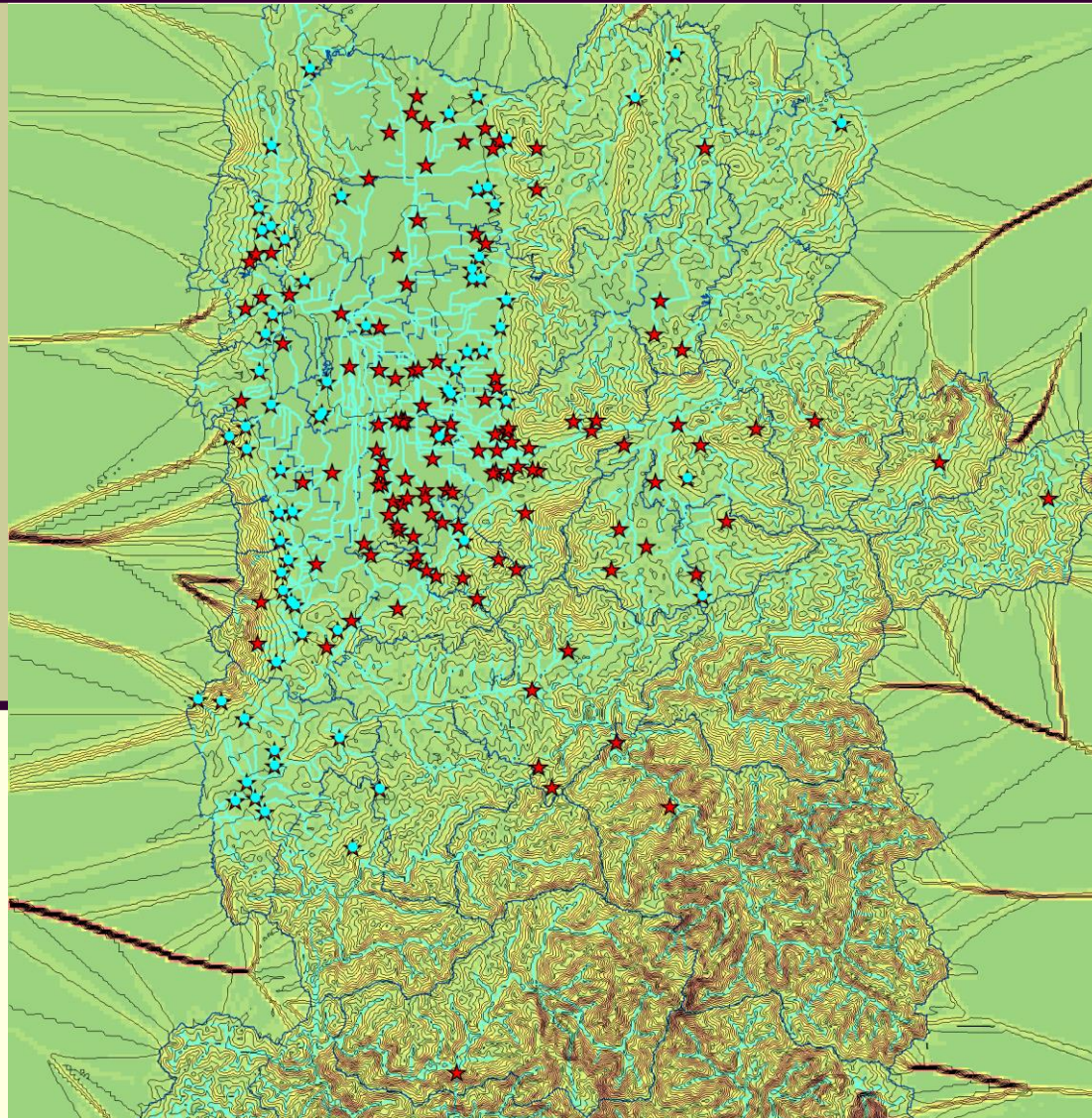
If Factor3 is large (e.g., ≥ 1.5)

- Near rivers
 - Near peaks
- Upstream of valley or very near to river

★ Corresponding *Shrines*

Factors that Determine the Location of *Shrines*

- Interpretation: 3rd Factor (*cont.*) -



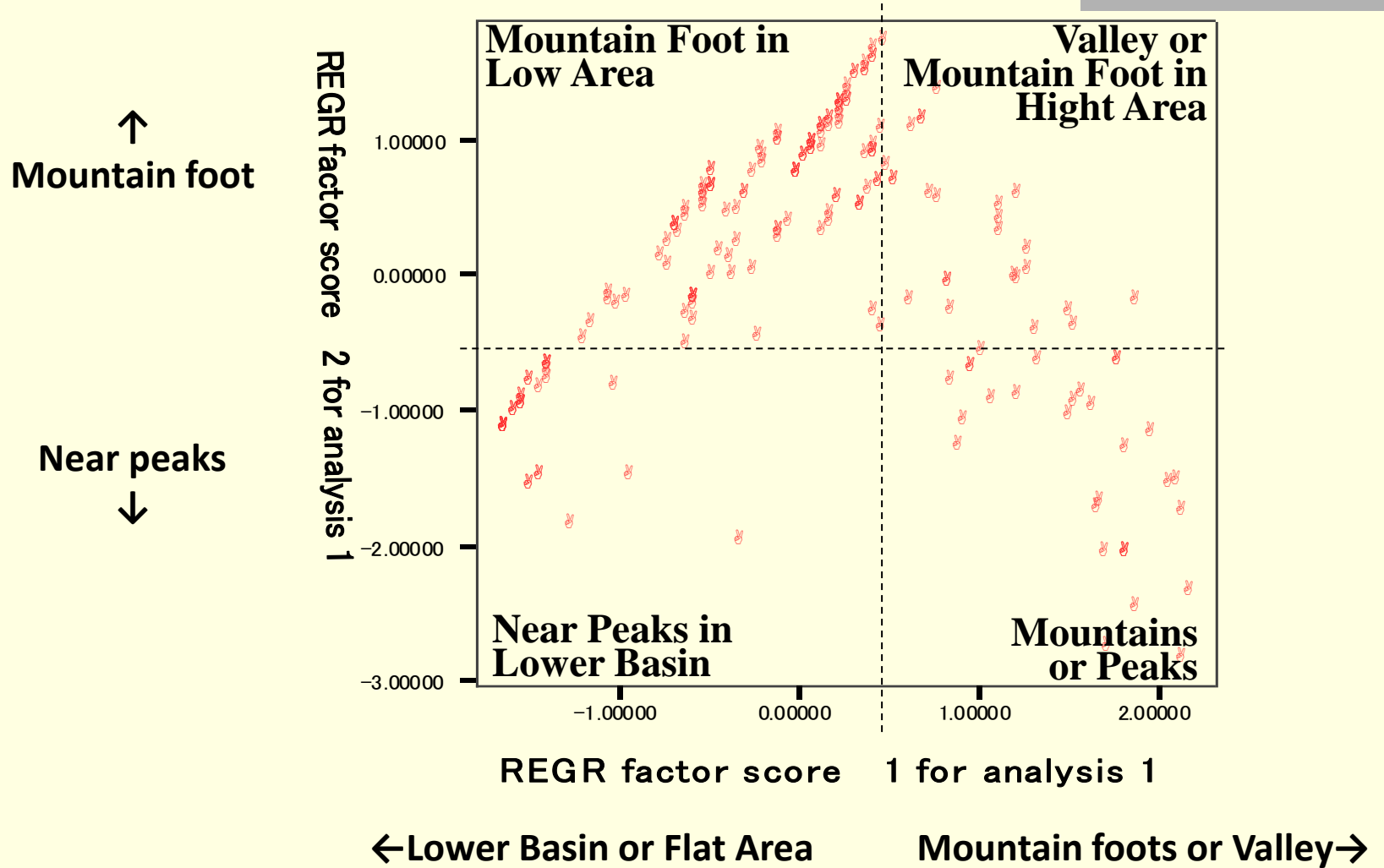
If Factor3 is small (e.g., ≤ -0.5)

- Far from rivers
- Far from peaks

→ ???

★ Corresponding *Shrines*

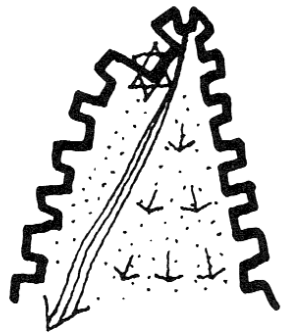
Categorizing *Shrines* by First and Second Factors



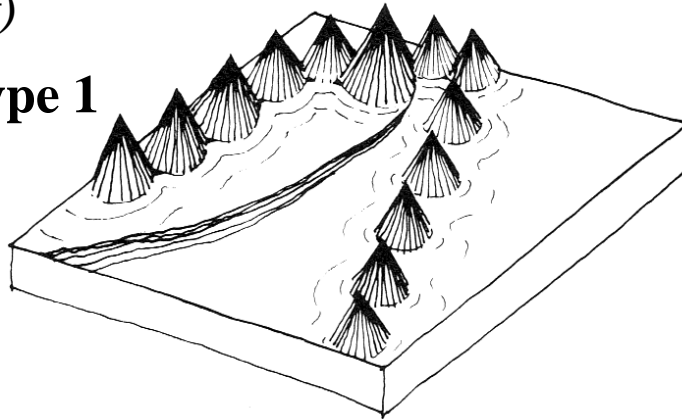
Trial: Finding Mikumari (水分) Type *Shrines*






- Definition of Mikumari Type -

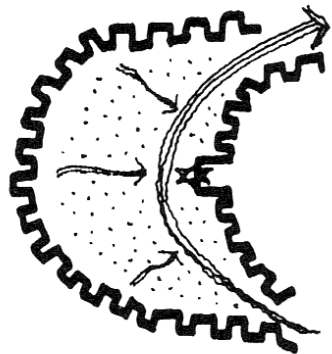
Tadahiko Higuti (樋口 忠彦): 景観の構造 (The visual and the spatial structure of landscapes)
The site of a mountain edge where river water from the mountain is firstly introduced into rice paddies, or site of mountain-side hill edge where the gradient changes from steep (mountain) to gentle (mountain foot)



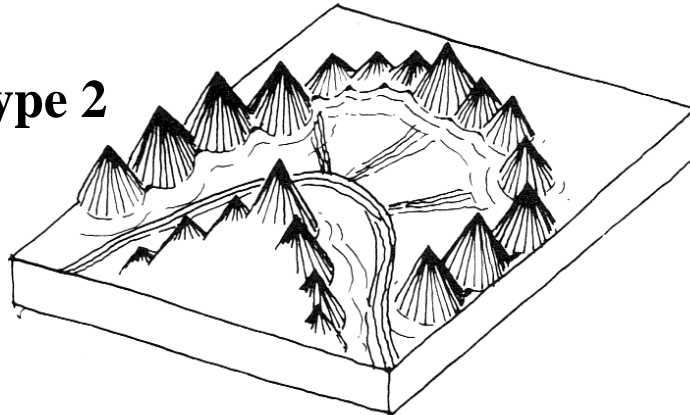
Type 1



-  Focus: shrine
-  Boundaries: mountains hills
-  Boundaries, directions: rivers
-  Directions: Ground surface slope
-  Area: rice field, flat ground



Type 2



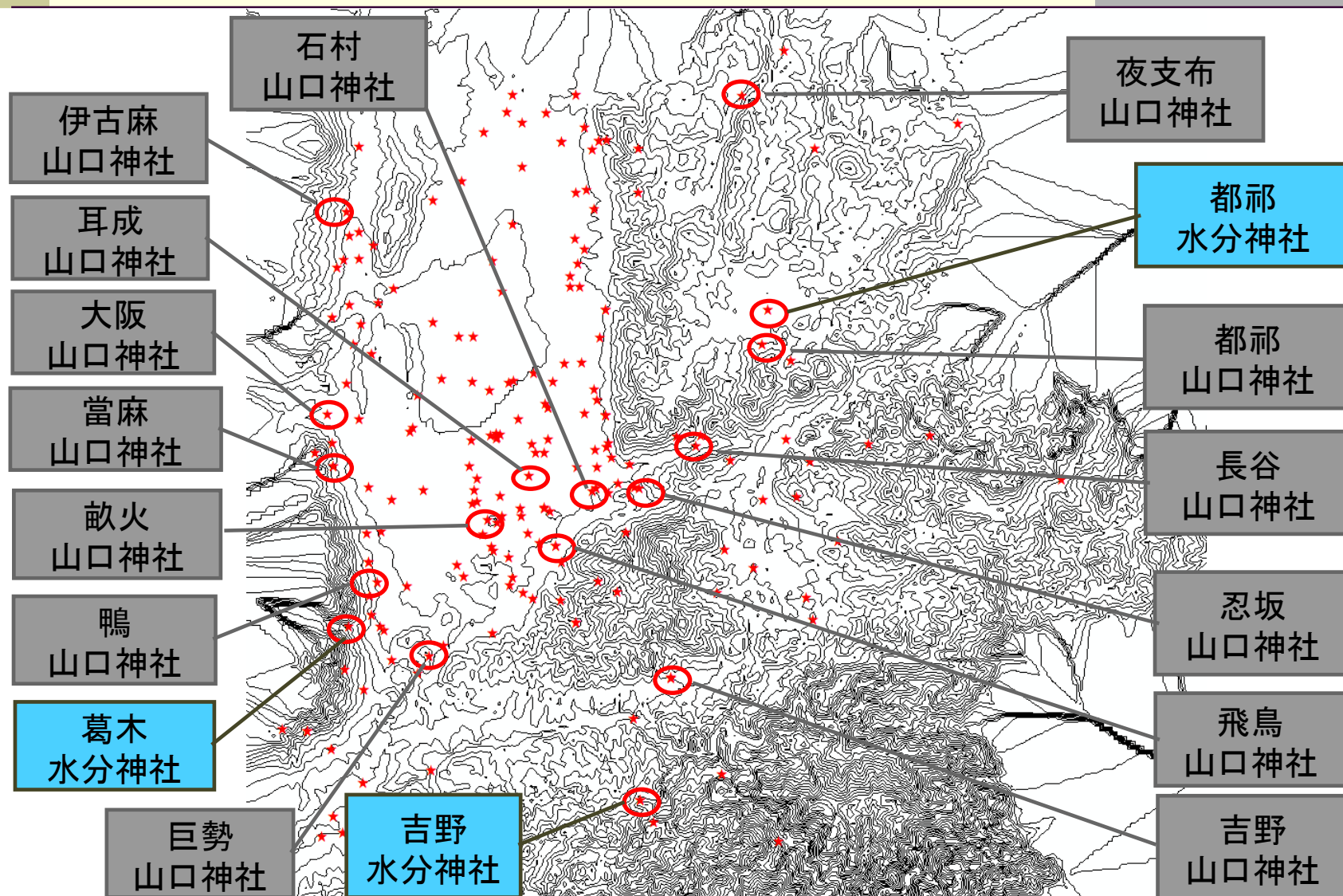
- Mountain foots
- Near rivers
- Near mountain or peaks

↓
**Higher value of
 Factor1 or Factor 3?**

Tadahiko Higuti (樋口 忠彦): 景観の構造 (The visual and the spatial structure of landscapes)

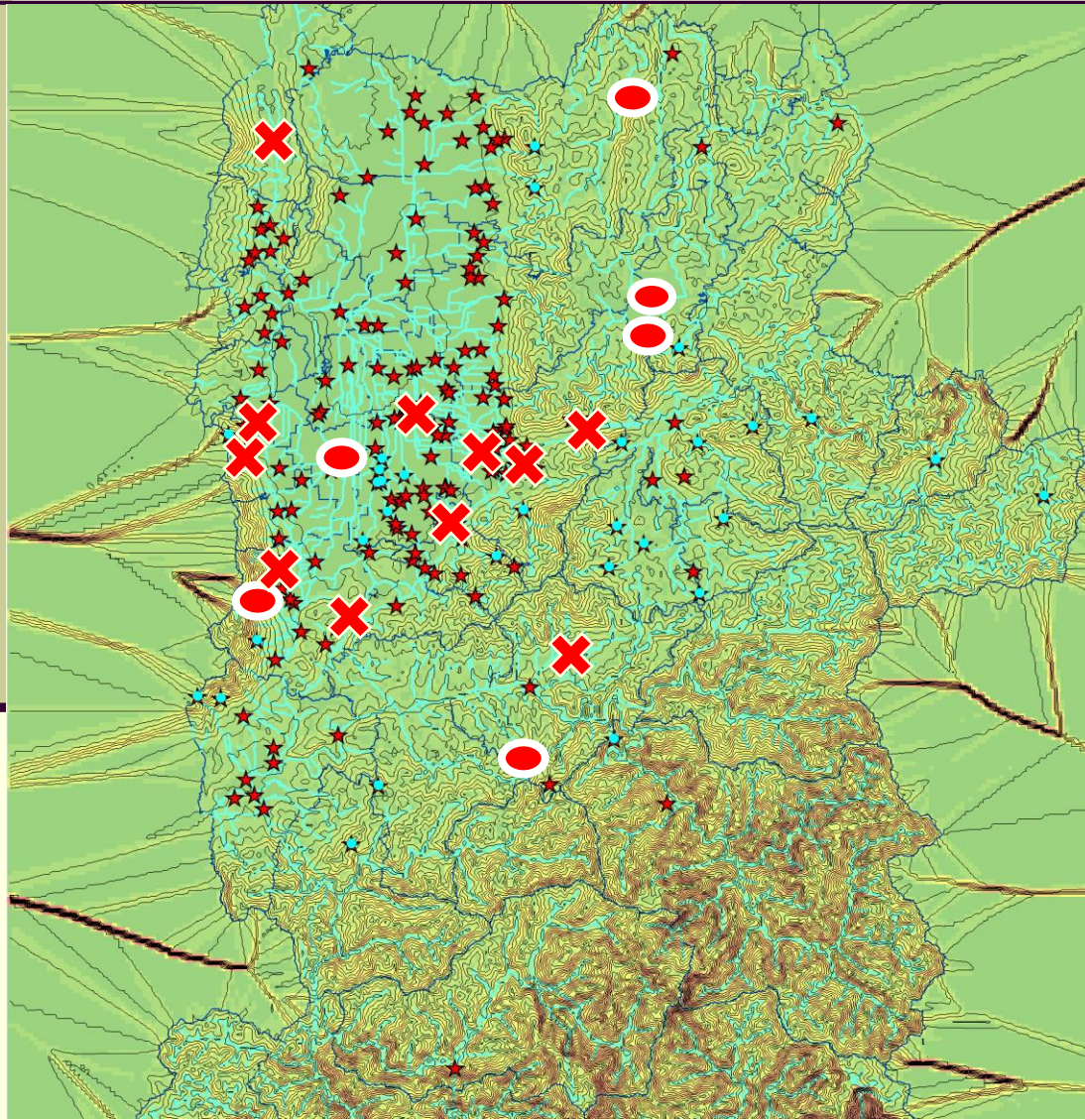
Trial: Finding Mikumari (水分) Type *Shrines*

- Search on Maps -



Trial: Finding Mikumari (水分) Type *Shrines*

- Search by Statistics -



If Factor3 is large ($1.7 < \leq 2.1$)

- Near rivers
- Near peaks

→ Upstream of valley or very near to river

OR

If Factor1 is large ($1.0 < < 2.0$)

- Near mountains
- Slope area
- Higher area

→ Mountain foots or Valley

★ *Shrines*

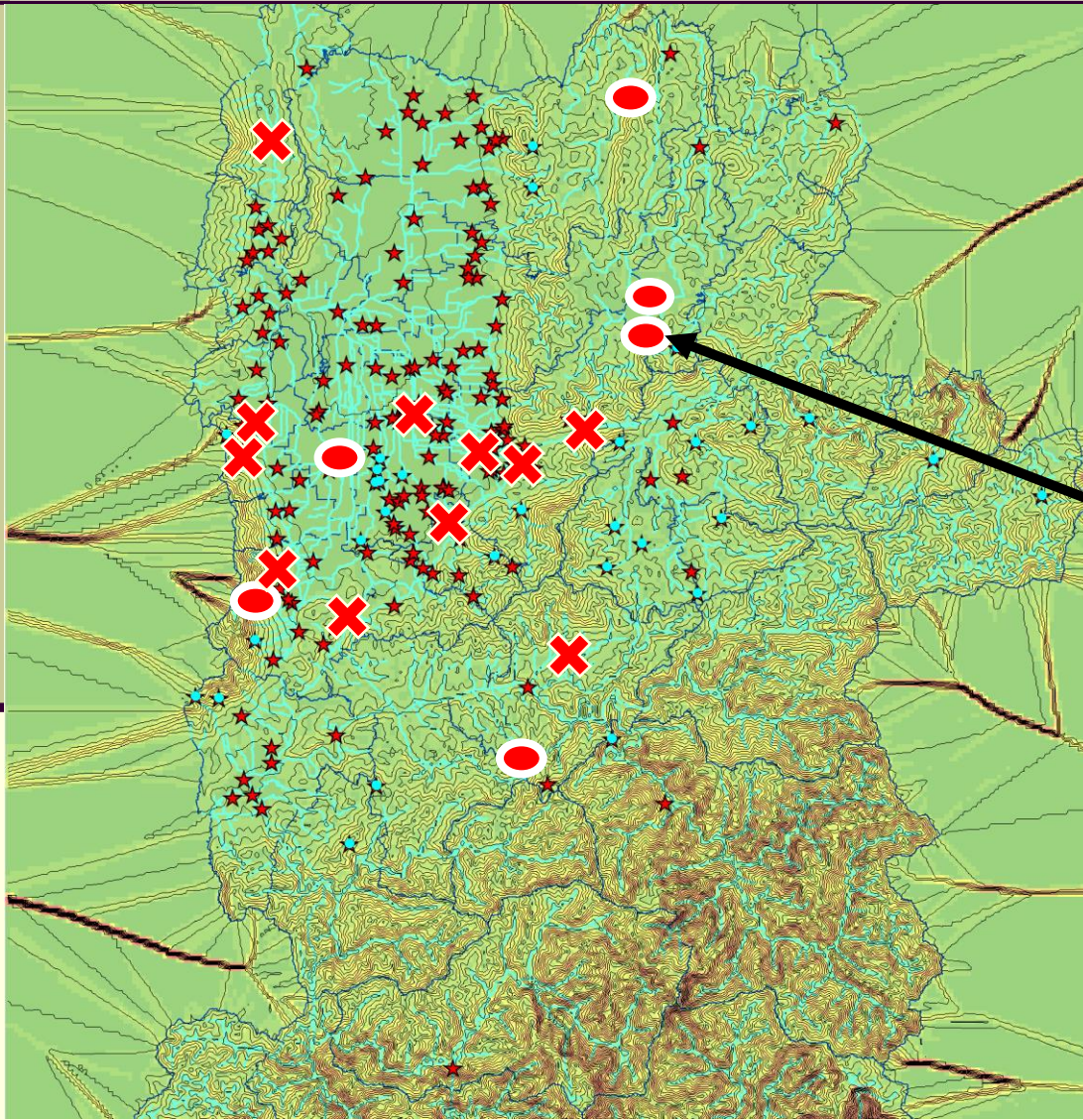
● *Shrines* succeeded to extract

✕ *Shrines* failed to extract

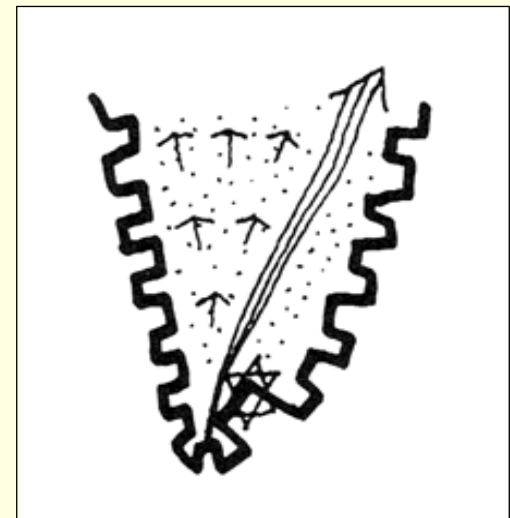
● *Shrines* false extraction

Trial: Finding Mikumari (水分) Type *Shrines*

- Some Examples (*cont.*) -

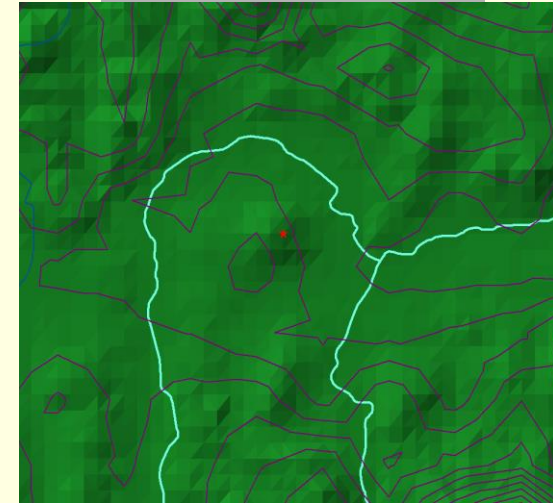
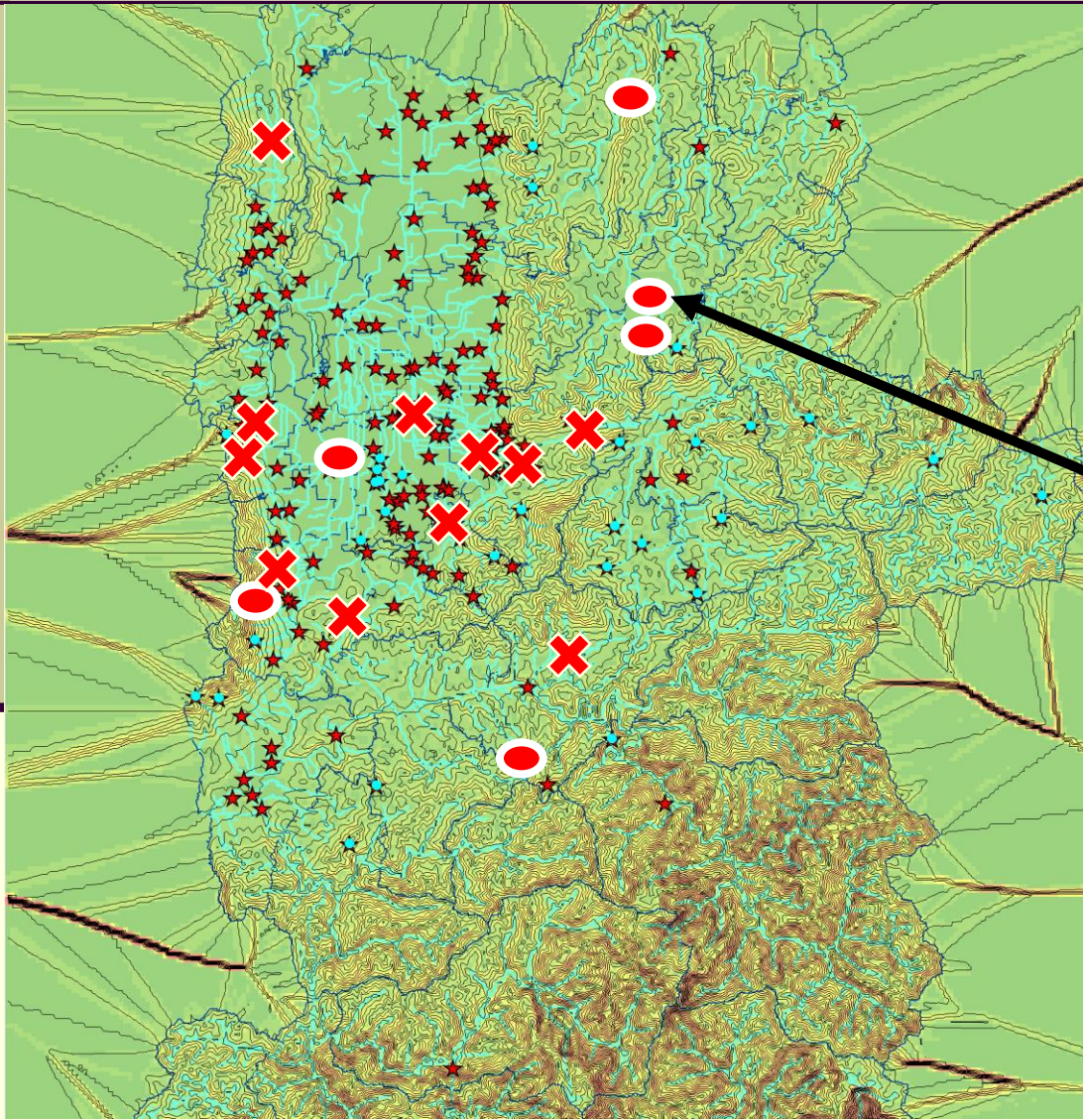


都祁 (Tsuge) 山口神社

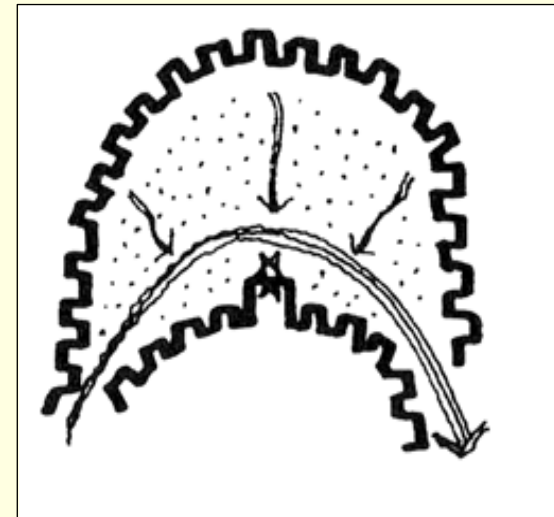


Trial: Finding Mikumari (水分) Type *Shrines*

- Some Examples (*cont.*) -



都祁 (Tsuge) 水分神社



Results and Considerations

- This presentation is a preliminary study conducted to extract necessary geographical features around *Shrines* and to try to explain the location of shrines (etic approach to landscape interpretation)
- Some analyses show the possibilities of computational (quantitative) interpretation of historic landscapes
- Immediate works
 - Data correction (longitudes and latitudes of some Shrines are not correct)
 - Examination of parameters to improve identification accuracy (visible direction, etc.)
 - Data refinement (refine altitude, estimation of river channel, etc.)
 - Additional data (land use, remains/ruins, soil, strata, festivals etc.)
- **Future works: Integration with text (qualitative) data**
 - Documents about *Shrines* (history, shrined gods etc.)
 - Evaluation of the Model
 - Classification of *Shrines* (other area)
 - Application to other area (e.g., Thailand)