

Spatio-Temporal Model for Presenting and Analyzing Humanities Research Resources

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Objective

Proposal of Model Structure for sharing various research resources among various fields, toward analysis and discovery of dynamic interrelation among research data.

Background

Research resources have not fully shared caused by differences in level of view, target of research theme, terminology, etc.

- level; eg. macro (eg. sociology) vs. micro (eg. cultural anthropology)

- theme; target domain defined by each discipline

- terminology; even the same term is used in different meaning

Change of research style from intra-discipline to inter-discipline may lead to new and fruitful research results.

Initial motive to propose SpatioTemporal Model;

To *understand eco-historical dynamic interrelation* in complex system composed by political, social, economical, environmental network in time and space context.

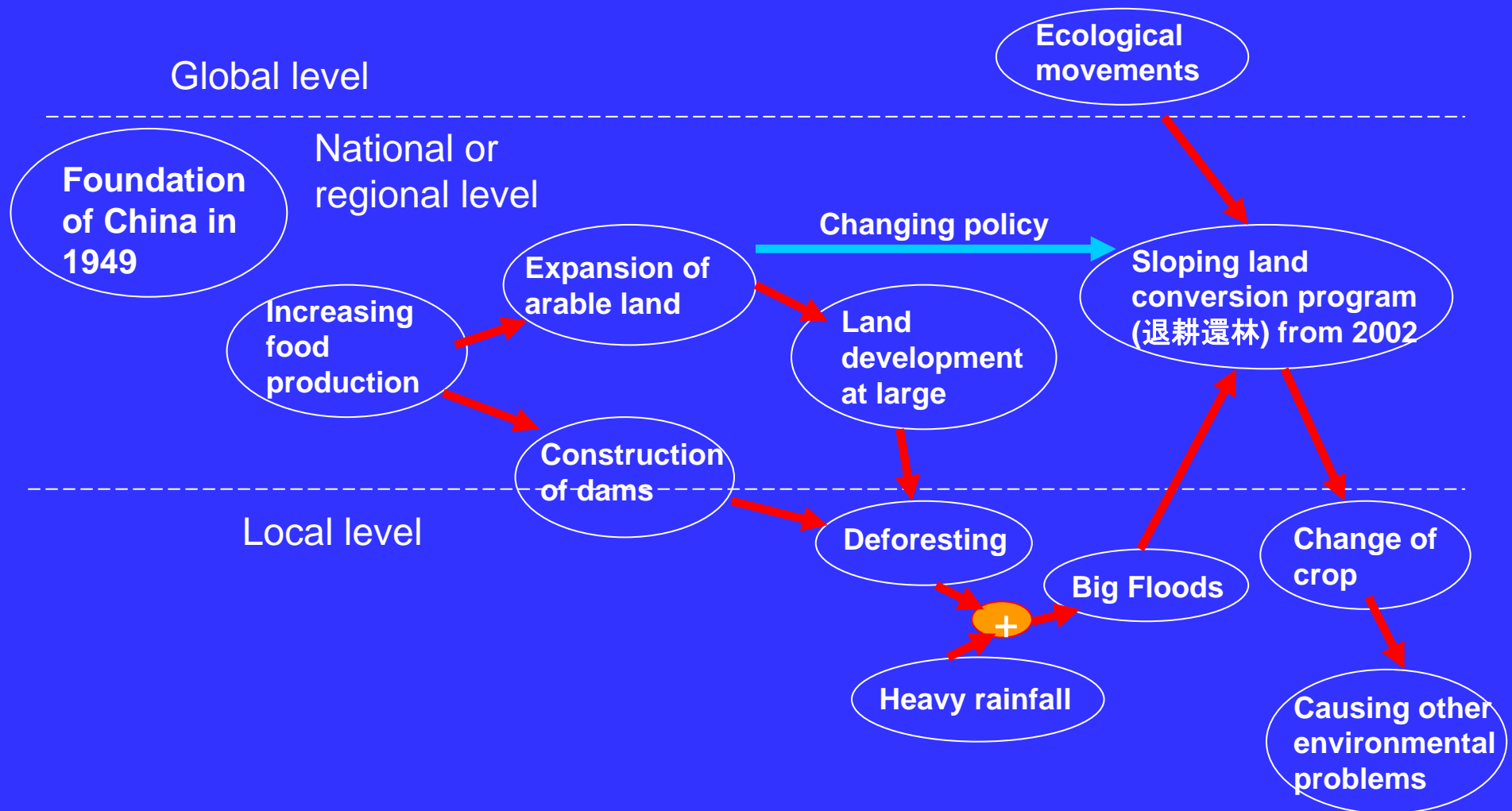
Method

Prepare standardized framework for

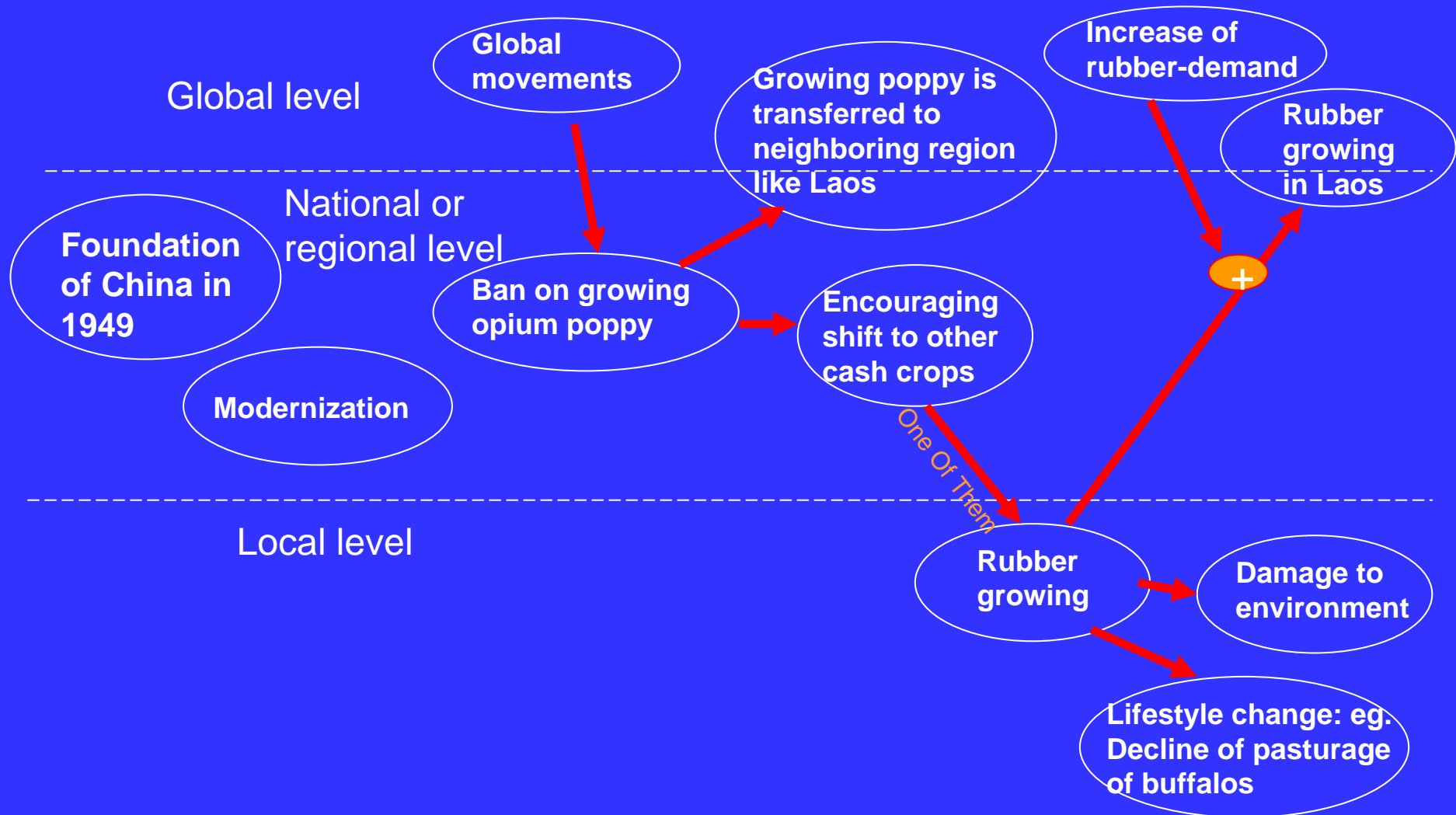
1st Stage: Archiving or making database for various research resources

2nd Stage: Visual tools for presenting and analyzing research resources

An example of dynamic interrelation among eco-historical events in Yunnan



Another example of interrelation among eco-historical events in Yunnan



- Archiving with *zoom-in and zoom-out mechanism*

Any research resources, whether the form is text, image/video, or numerical data, may contain information related to “event,” which is associated with value of “time-range” , “space-range” and “theme or subject” .

For example, as to bibliographic data, where and when the book was published on a theme is event information. As to museum objects, where and when it was produced, collected, curated or stored are events. As to image data, depicted scene or objects are also associated with “event.” Historical textual description contains mixed events. Not only action, status may also be considered as “event”.

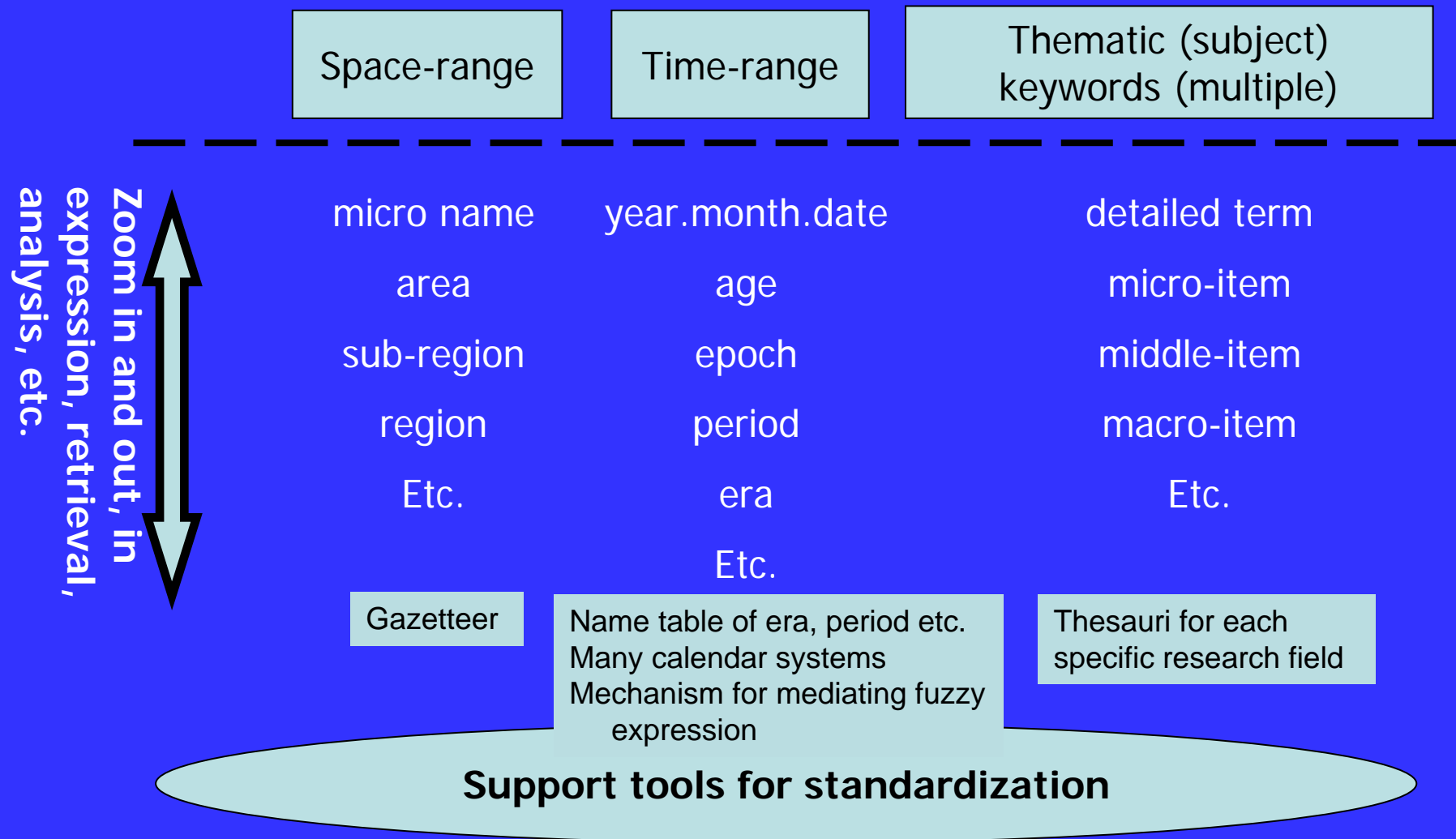
Research resource may contain a mixture of several events. Thus, “event” may have attribute of “type-of-event.”

Treating research resources in terms of time and space is essential for analyzing and finding *dynamic relationships* among research resources.

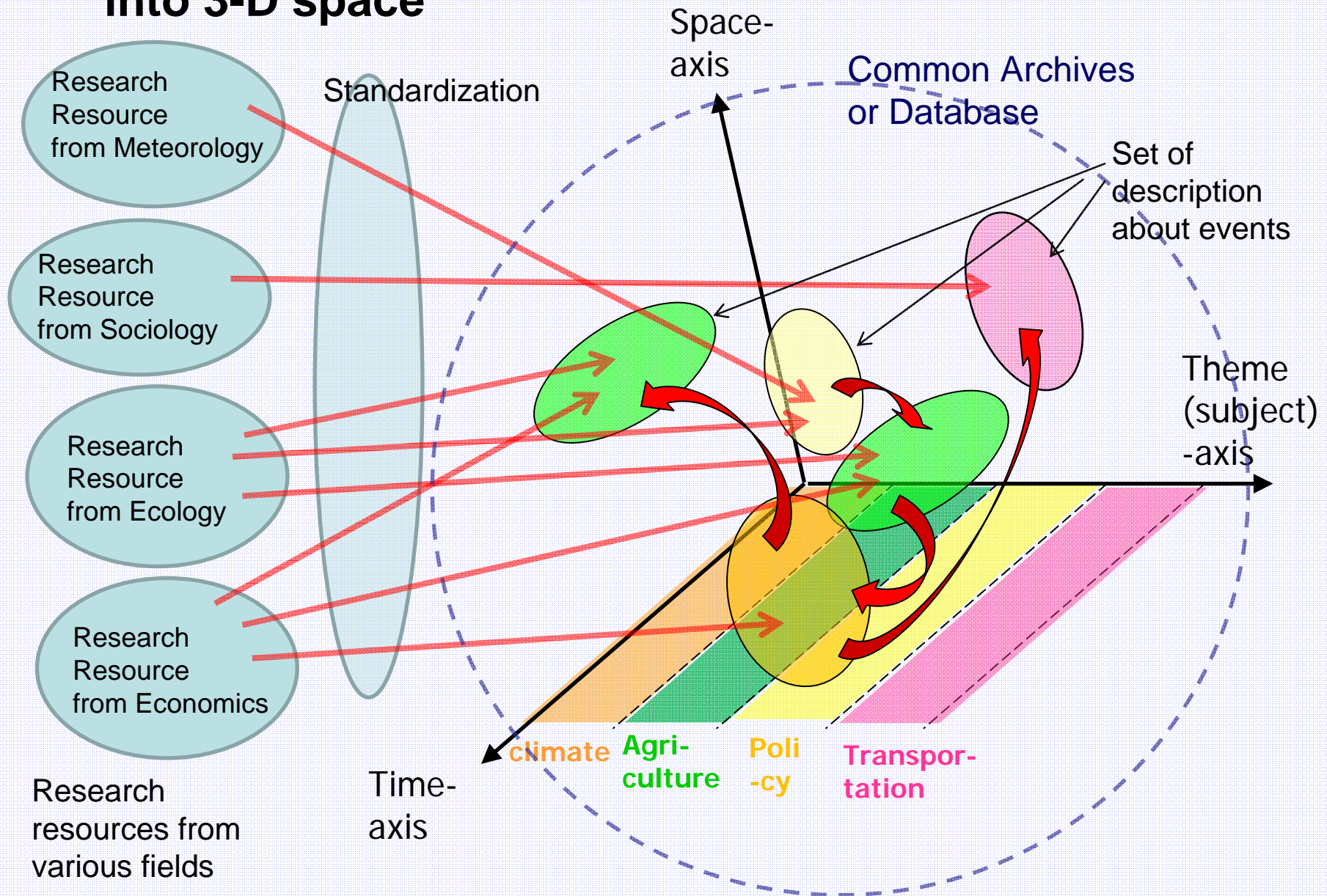
Theme value is also essential for *inter-disciplinary* data sharing and handling.

Archiving with zooming into micro and out to macro mechanism

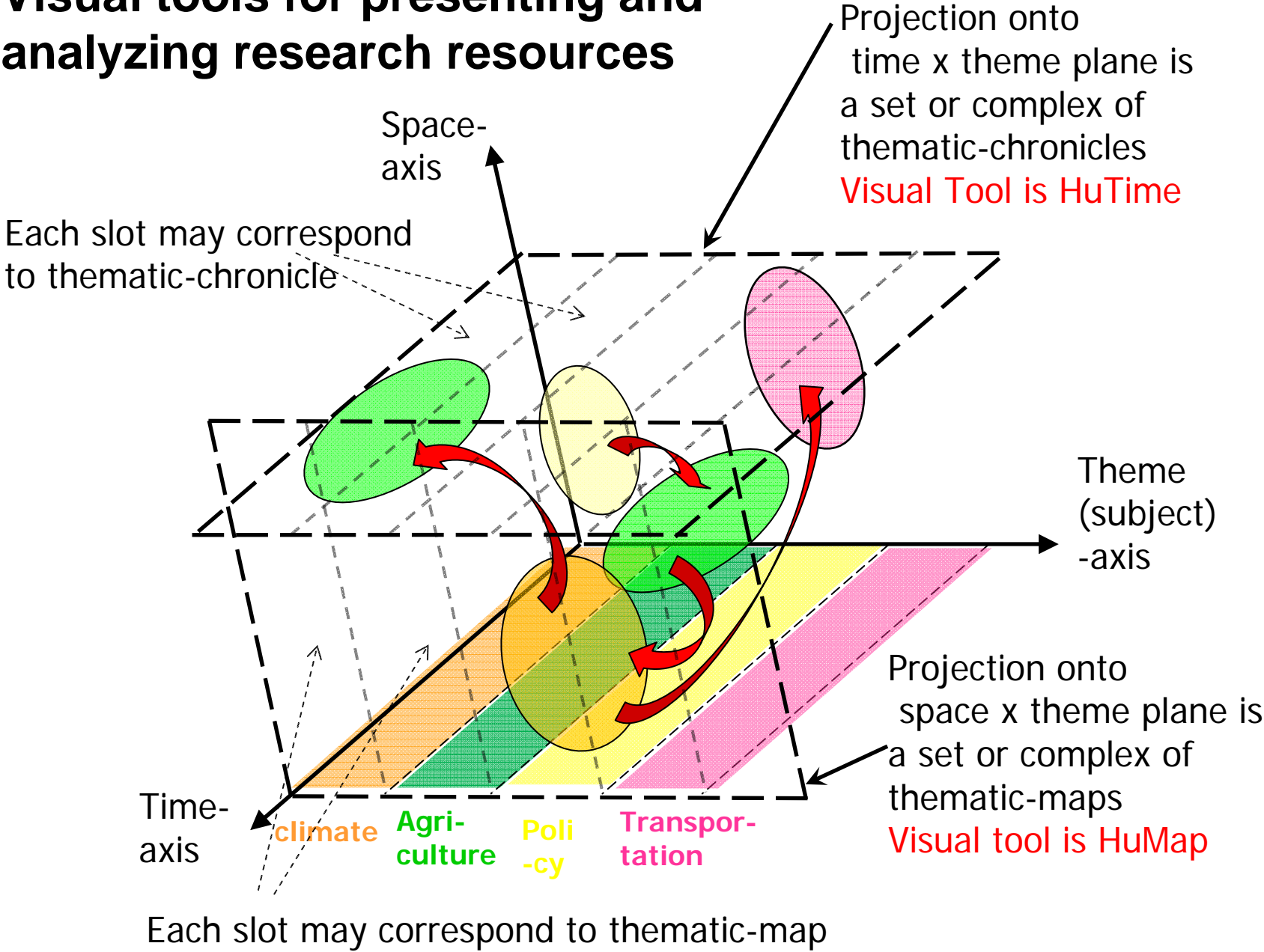
Any event data may have *standardized* triplet of time, space and theme value



Archiving with standardization into 3-D space



Visual tools for presenting and analyzing research resources



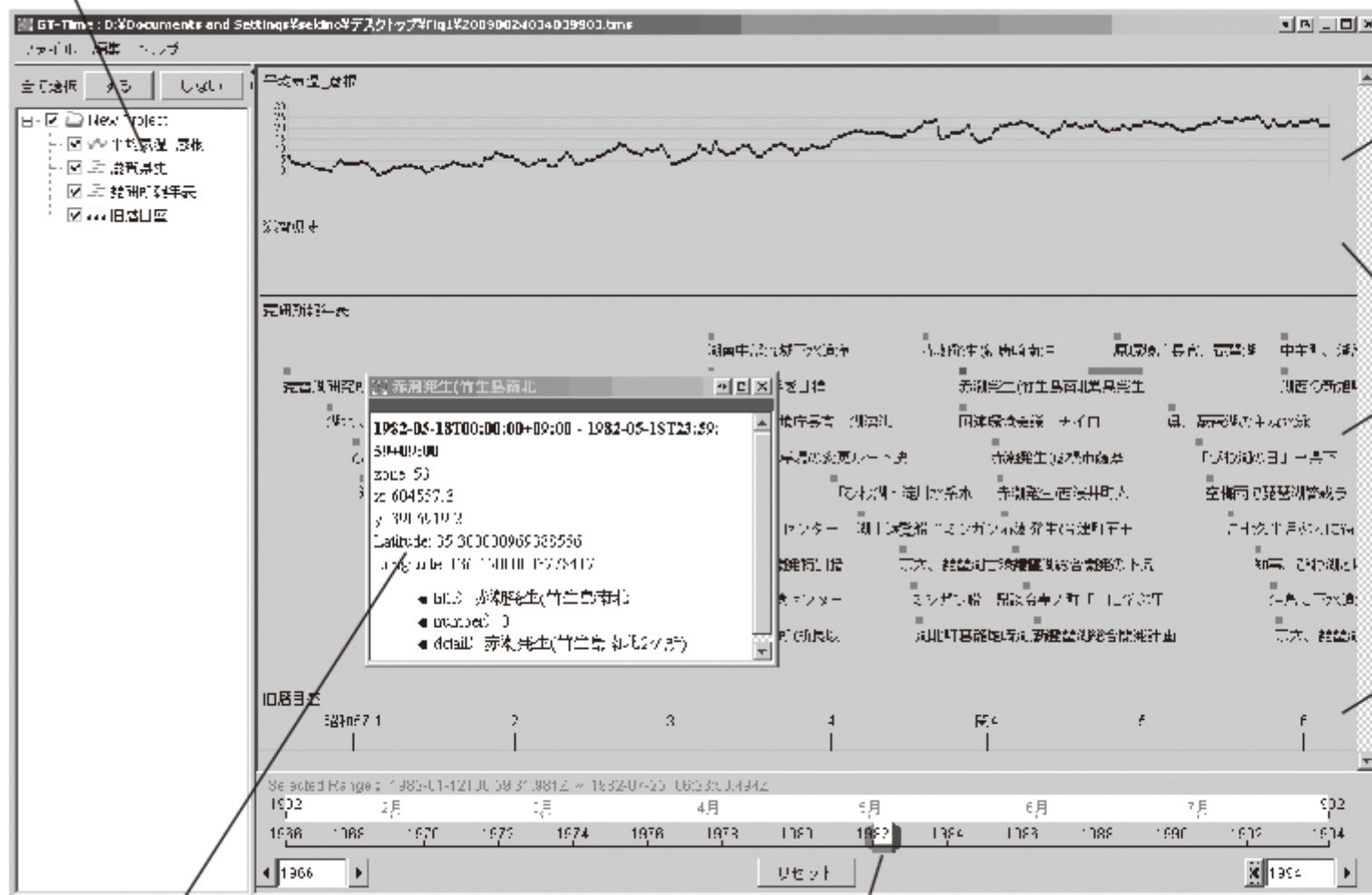
Typical View of HuMap

The screenshot displays the HuMap (20080501) application interface. The main window shows a map of Japan with several earthquake data points plotted. A 'filter' window is open, displaying a table of earthquake records. The table has columns for SID, ENAME, EID, RNA..., RID, RECID, JDATE, NDATE, ONA..., PNAME, DLAT, LAT, DLON, and LON. The selected range is 992-02-20T23:17:33.831Z to 1409-06-20T05:16:51.395Z. The map shows a network of roads and rivers, with earthquake locations marked by grey circles. A scale bar at the bottom indicates 0 to 500 km. The interface also includes a workspace panel on the left with various layers like 'Classic Earthquake Dem', 'Earthquake Sample', and 'Japan Base Maps'. A text window on the left contains Japanese text, likely a historical record or report related to the earthquake data.

SID	ENAME	EID	RNA...	RID	RECID	JDATE	NDATE	ONA...	PNAME	DLAT	LAT	DLON	LON
204	文治元...	11850...	C源平...	00000...	00001...	元暦二...	1185-0...	山城国...	京都府...	35.00.37	35.010...	135.47...	135.79...
205	文治元...	11850...	C源平...	00000...	00001...	元暦二...	1185-0...	山城国...	京都府...	35.00.54	35.015...	135.44...	135.74...
206	文治元...	11850...	C源平...	00000...	00001...	元暦二...	1185-0...	近江国...	滋賀県...	35.00.33	35.009...	135.51...	135.85...
207	文治元...	11850...	C源平...	00000...	00001...	元暦二...	1185-0...	近江国...	滋賀県...	35.04.02	35.067...	135.50...	135.84...
208	文治元...	11850...	C源平...	00000...	00001...	元暦二...	1185-0...	山城国...	京都府...	34.58.52	34.981...	135.46...	135.77...

Typical View of HuTime

List of Layers



Layer of Line Chart

Layers of Chronological Table

Layer of Time Scale

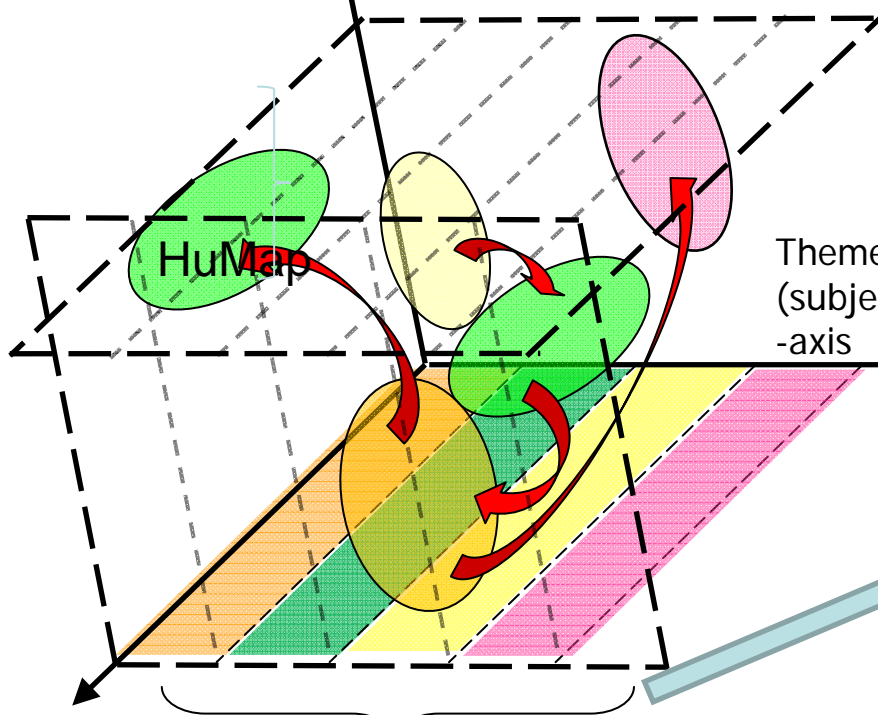
Popup Window
(to show detail of an event)

Time Slider (GUI to change displayed temporal range)

HuTime

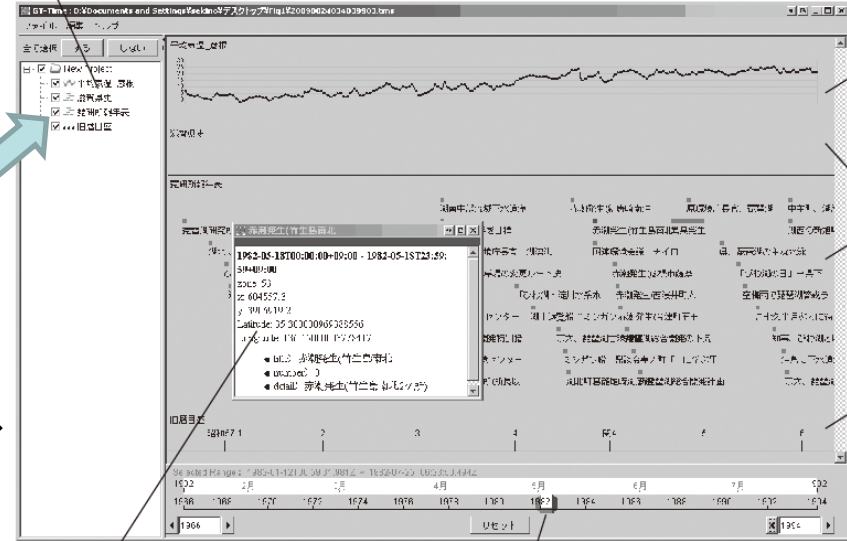
Each slot is reflected to layer of HuTime

Space-axis



Each slot is reflected to layer of HuMap

List of Layers



Layer of Line Ch

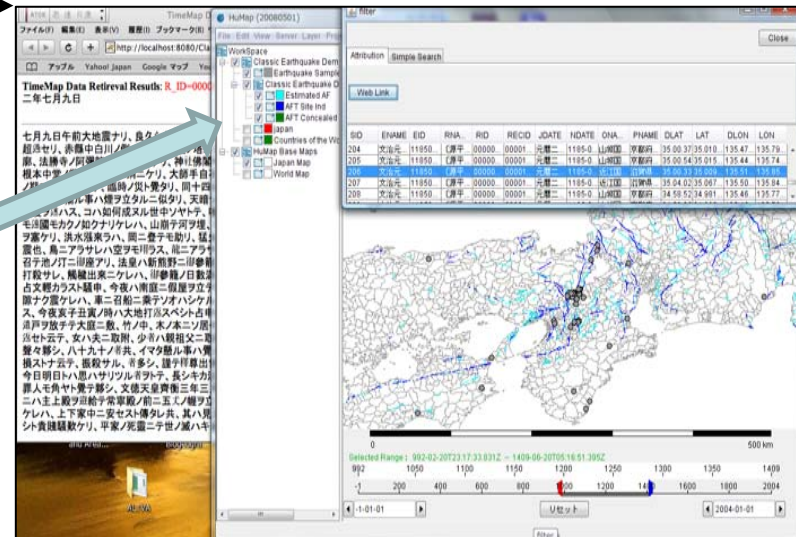
Layers Chrono Table

Layer c Time S

Popup Window (to show detail of an event)

Time Slider (GUI to change displayed temporal range)

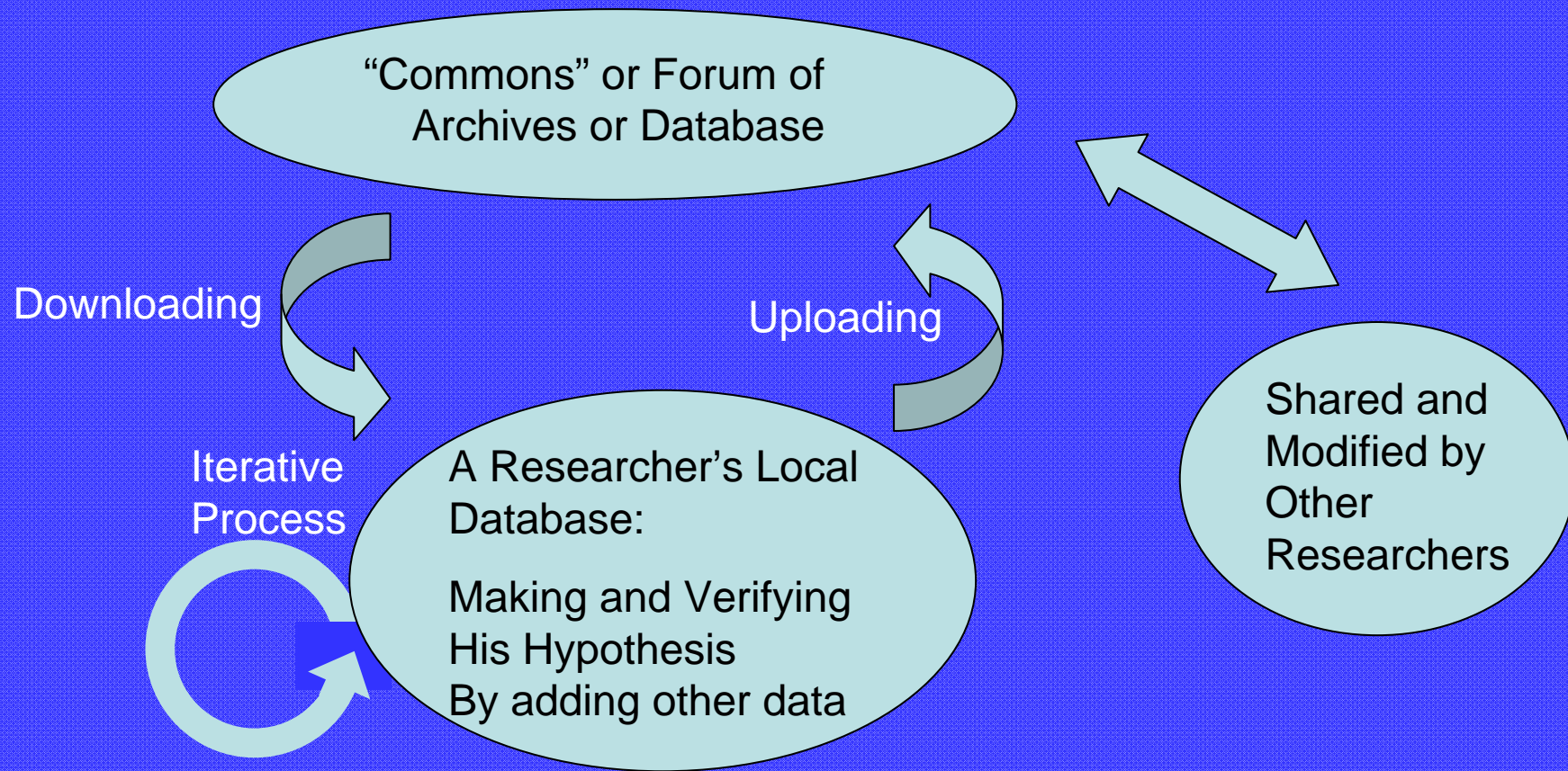
HuMap



Time-axis

Theme (subject)-axis

Data *Sharing with Iteration*: among researchers for promoting inter-disciplinary research



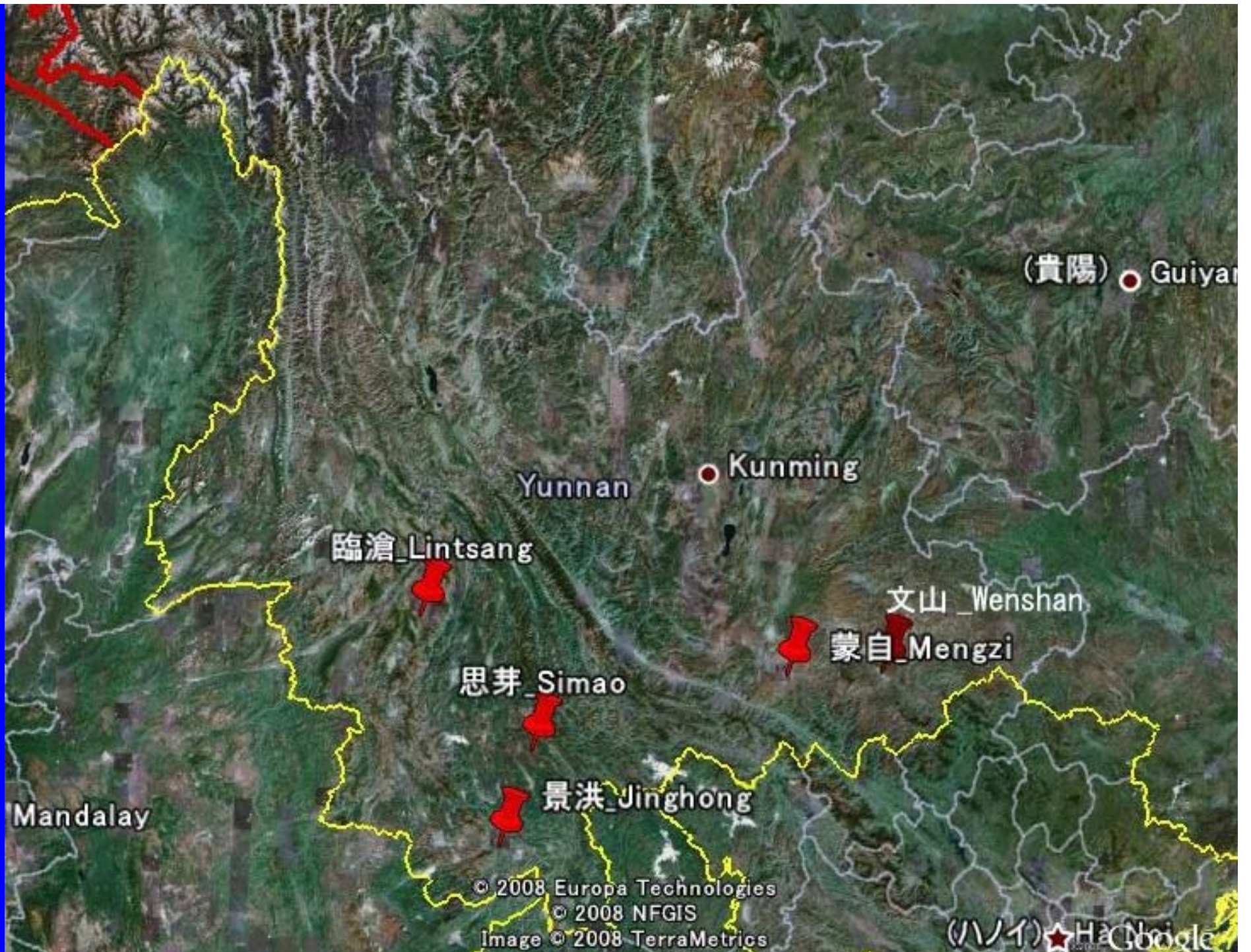
Yunnan Province Chronicles Database Project

- Sub-project of the Project “A Trans-disciplinary Study on the Regional Eco-History in Tropical Monsoon Asia : 1945—2005” (Leader: Dr. Tomoya Akimichi, Research Institute for Humanity and Nature Research Institute for Humanity and Nature)
- A collection of Historical Record in each County of Yunnan Province is adopted as a base for making eco-historical chronicle; see below (<http://www.chikyu.ac.jp/ecohistory/annualreport2004/9chronicle2004pr.pdf>)

Chinese National Project of Publishing Chronicle

Governmental Unit	Number	Number of chronicles planned	Number of chronicles already published by 2000
Province 省	34	2490	1583
Prefecture 市/地級	333	944	604
County 県	2861	2447	2100

Yunnan Province has 16 prefectures and 128 counties



Yunnan Province Chronicles:

for eco-historical analysis and description

- Important events in each hierarchical governmental unit (province, prefecture or city, county) are described in plain text form in chronological order.
- Time-Coverage: historic times, especially from 1949 of foundation of China, until 1990s.

Problem: Level of details, and selection of events are varied in each county depending on editorial policy.

However, when data in chronicles are verified by referring other documents and data, chronicles may be useful to get the global picture of dynamism in terms of eco-history, **including environment, agriculture, trading, economics, politics, social issues, cultural issues, international relations, etc..**

So that, we tried to translate the “general summary part” of each chronicle into Japanese for the first stage, then archive them.
Now **49** counties out of **128** are accumulated into GT-Time

Yunnan Province Chronicles



Purchase of County Chronicles at
Kunming, Jan. 2005



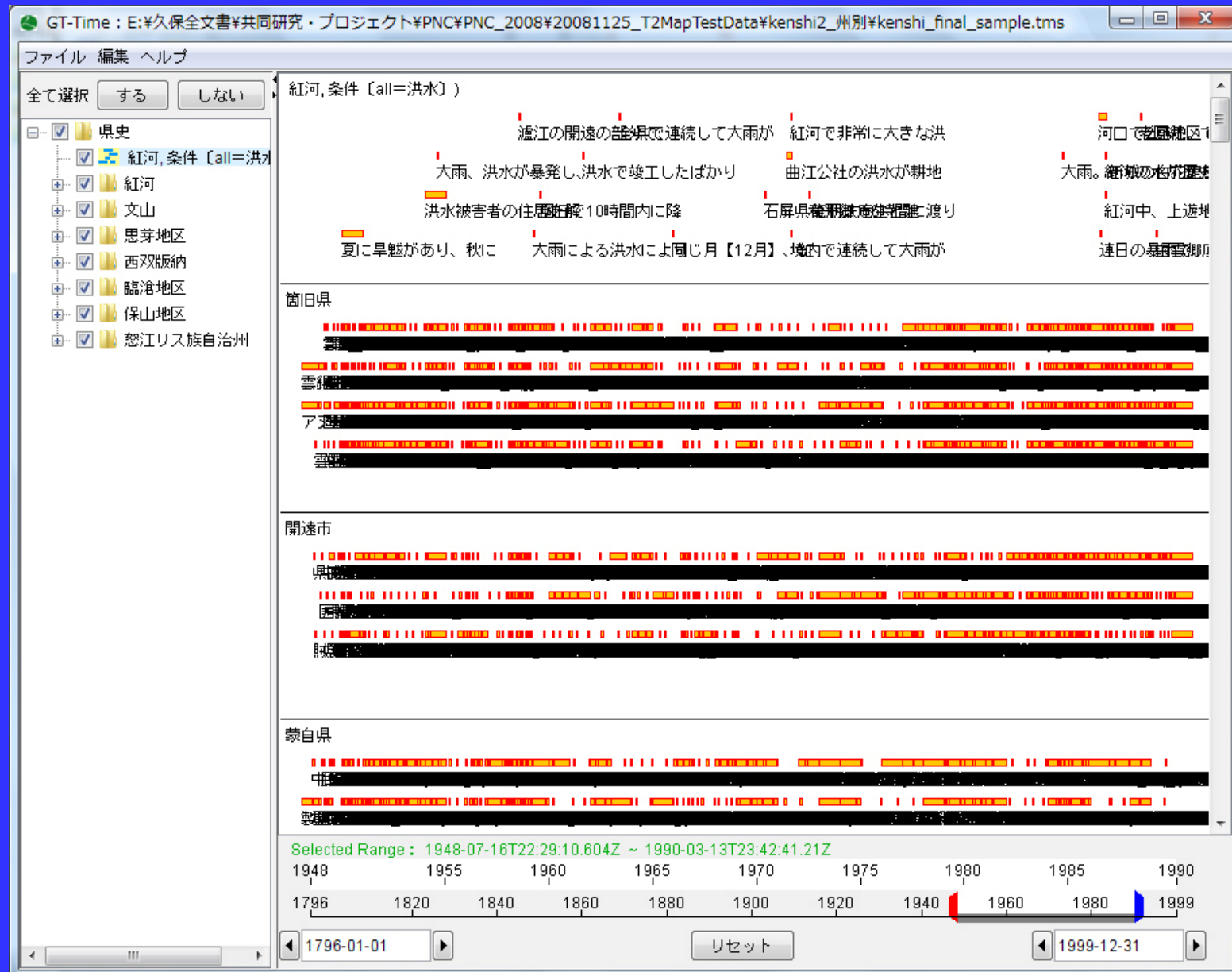
County Chronicles at Research Institute for
Humanity and Nature , Apr. 2005

Normalized form of County Chronicles “of the General Summary Part”

County Name	Year	a	month	additional	date	additional	Text	Begin Date	End Date	Date Displayed
劍川県	1912		9		9		“重九”の蜂起のあと、11月初旬、大理の官、地方豪族、軍、民が一つになって反抗し、“迤西自治機関部”を成立し、趙藩出が総理に推薦される。	1912/01/01	1912/12/31	1912年
劍川県	1912		12		9		劍川籍の昆明の学生、趙蠡象ら十数人が故郷に戻り、“辛亥革命”を宣伝し、県役所へ突入して刑具が燃やされ、無辜の数十人の住民が解放される。	1912/12/01	1912/12/31	1912年12月
劍川県	1913		9		9		劍川州が劍川県に改称する。	1913/01/01	1913/12/31	1913年
劍川県	1913		4		9		県蚕桑伝習所が設立され、湖桑【??】、ユーカーなどの種が県境に植えられる。	1913/04/01	1913/04/30	1913年4月
劍川県	1913		5		9		県城に郵政代辦所が作られる。	1913/05/01	1913/05/31	1913年5月
劍川県	1918		3		15	昼	県内の金華、沙溪などで強風が吹き、樹木や家屋が倒れ、砂埃が天を覆う。	1918/03/15	1918/03/15	1918年3月15日昼
劍川県	1918	冬	9		9		傷寒病【チフス】が大流行し、多数の死者が出る。	1918/12/01	1919/02/28	1918年冬
劍川県	1919		12		9		劍川ペー族青年の張伯簡が、広州からフランスへ苦学での留学へ行く。フランス滞在期間中、張伯簡は積極的に共産主義組織の活動に参加する。1922年に“旅欧中国少年共産党”が成立し、張伯簡は組織委員に選出される。	1919/12/01	1919/12/31	1919年12月

Viewing Yunnan Chronicle using HuTime

with horizontal time-axis using both “Begin” and “End” date of the event



Example: International Relation with Vietnam

GT-Time : E:\久保全文書共同研究・プロジェクト\PNC\PNC_2008\20081125_T2MapTestData\ベトナム・ラオス検索結果\ベトナム_1945以降検索結果.tms

ファイル 編集 ヘルプ

全て選択 する しない

県史

- 紅河, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 107 records
- 文山, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 136 records
- 思茅地区, 時間範囲 [1945-09-01~1999-12-31], 条件 [all=ベトナム|中越] 14 records
- 西双版纳, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 4 records
- 臨滄地区, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 4 records
- 保山地区, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 4 records
- 怒江リス族自治州, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 1 record

Selected Range : 1945-01-01T00:00:00Z ~ 1996-07-22T23:59:59Z

1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1996
1945										1996

1945-01-01 リセット 1996-07-22

紅河, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 107 records

文山, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 136 records

思茅地区, 時間範囲 [1945-09-01~1999-12-31], 条件 [all=ベトナム|中越] 14 records

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臨滄地区, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 4 records

保山地区, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 4 records

怒江リス族自治州, 時間範囲 [1945-01-01~1999-12-31], 条件 [all=ベトナム|中越] 1 record

Example: International Relation with Laos

GT-Time : E:\久保全文書\共同研究・プロジェクト\PNC\PNC_2008\20081125_T2MapTestData\ベトナム・ラオス検索結果\ラオス_検索結果...

ファイル 編集 ヘルプ

全て選択 する しない

県史

- 紅河, 条件 [all=ラオス]
- 文山, 条件 [all=ラオス]
- 思茅地区, 条件 [all=ラオス]
- 西双版纳, 条件 [all=ラオス]
- 臨滄地区, 条件 [all=ラオス]
- 保山地区, 条件 [all=ラオス]

紅河, 条件 [all=ラオス]) 6 records

- 蒙自の専員公署委が李
- 大果馬一帯のイ族 (相
- 民兵300人を引き抜
- 陶器製造技術労働者の雲錫が共同で
- 紅河州飲料工場と上海

文山, 条件 [all=ラオス]) 1 record

- ラオス民主共和国の6

思茅地区, 条件 [all=ラオス]) 10 records

- フランス軍と陸軍が匪
- ラオス駐軍第九五師
- 県に40名の民衆を派楚雄
- 県道建設隊の梅田の功
- 中国、タイ、ミャンマー
- 県人大【県級人民代表

西双版纳, 条件 [all=ラオス]) 19 records

- 国民党軍九十三師が匪の指示を無償で提供し、匪の活動を支援した。この結果、匪は雲南の各地に進出し、昆明を占領した。この結果、国民党軍は雲南を失った。
- 日軍がベトナムとラオス国境を越え、中越国境防衛部隊民24名を捕らえた。この結果、日軍は中越国境防衛部隊民24名を捕らえた。

臨滄地区, 条件 [all=ラオス]) 1 record

- 京劇表現芸術家の関庸

保山地区, 条件 [all=ラオス]) 4 records

- 本県の観光資源を積極的に活用

Selected Range : 1940-08-15T10:16:12.761Z ~ 1999-11-06T21:32:57.453Z

1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 1999

1923 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2006

1923-01-16 リセット 2006-01-30

About Agriculture: Learn Dazhai (大寨に学べ) campaign

GT-Time : E:\久保全文書\共同研究・プロジェクト\PNC\PNC_2008\20081125_T2MapTestData\kenshi2_州別\kenshi_final_sample.tms

全市で工業は大慶を学

1964-01-01T00:00:00Z - 1964-12-31T23:59:59Z

zone: 15
x: 123456.125
y: 123456.125
Latitude: 1.1149863365696082
Longitude: -96.38256290571945

- title) 全市で工業は大慶を学
- detail) 全市で工業は大慶を学び、農業は大寨を学び、全国で人民解放軍及び毛沢東著作を学ぶ高潮が沸き

県級人民代表大会が開

1963-10-26T00:00:00Z - 1963-10-26T23:59:59Z

zone: 15
x: 123456.125
y: 123456.125
Latitude: 1.1149863365696082
Longitude: -96.38256290571945

- title) 県級人民代表大会が開
- detail) 県級人民代表大会が開催さ

県城において“農業は

1978-12-24T00:00:00Z - 1978-12-29T23:59:59Z

zone: 15
x: 123456.125
y: 123456.125
Latitude: 1.1149863365696082
Longitude: -96.38256290571945

- title) 県城において“農業は
- detail) 県城において“農業は大寨に学べ”先進代表大会を開き、92の先進団体の200人の先進団体の表

紅河, 条件 (all=農業, all=学ぶ/学べ, all=大)

县委、县人委は研究の
全市で工業は大慶を学
県で4級幹部会議を開県で3級幹部会議を開
全县で農業は大寨に学
县委委員、县委各級幹部、供用路

文山, 条件 (all=農業, all=学ぶ/学べ, all=大)

全县において“農業は
県級人民代表大寨開大寨に
县委委員、县委各級幹部、供用路
县委委員、县委各級幹部、供用路
县委委員、县委各級幹部、供用路

思茅地区, 条件 (all=農業, all=学ぶ/学べ, all=大)

全县で改めて毛主席の
县委、县委各級幹部、供用路
县委、县委各級幹部、供用路

西双版纳, 条件 (all=農業, all=学ぶ/学べ, all=大)

233名の県選県は初回“農業学

保山地区, 条件 (all=農業, all=学ぶ/学べ, all=大)

县委が3級幹部・省下
本県の3名の幹部が保
县委委員、县委各級幹部、供用路
县委委員、县委各級幹部、供用路

怒江リス族自治州, 条件 (all=農業, all=学ぶ/学べ, all=大)

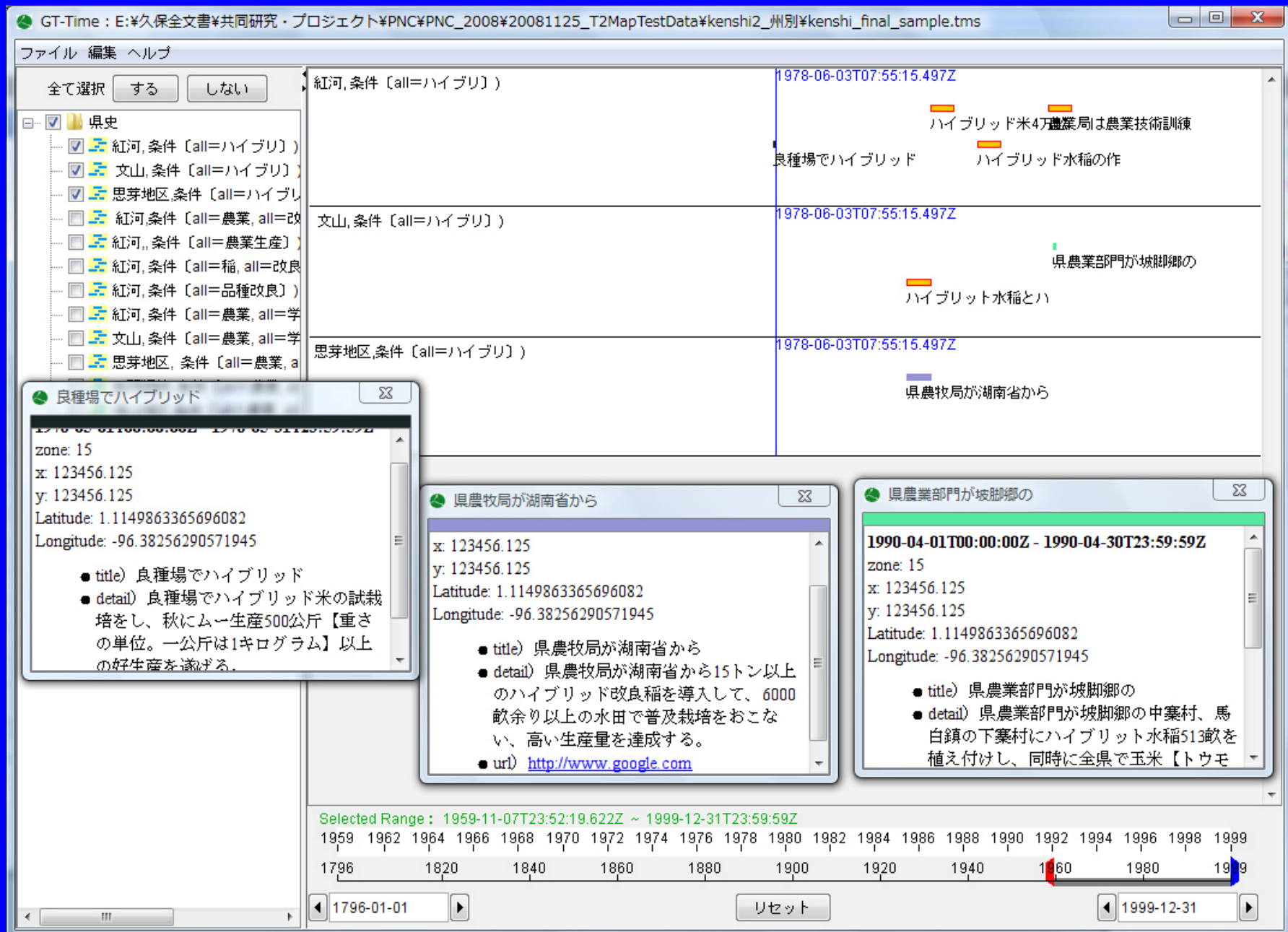
325人参加の県、公
省委農業、県城、大寨
县委委員、县委各級幹部、供用路
县委委員、县委各級幹部、供用路

Selected Range : 1959-11-07T23:52:19.622Z ~ 1985-01-29T12:55:30.988Z

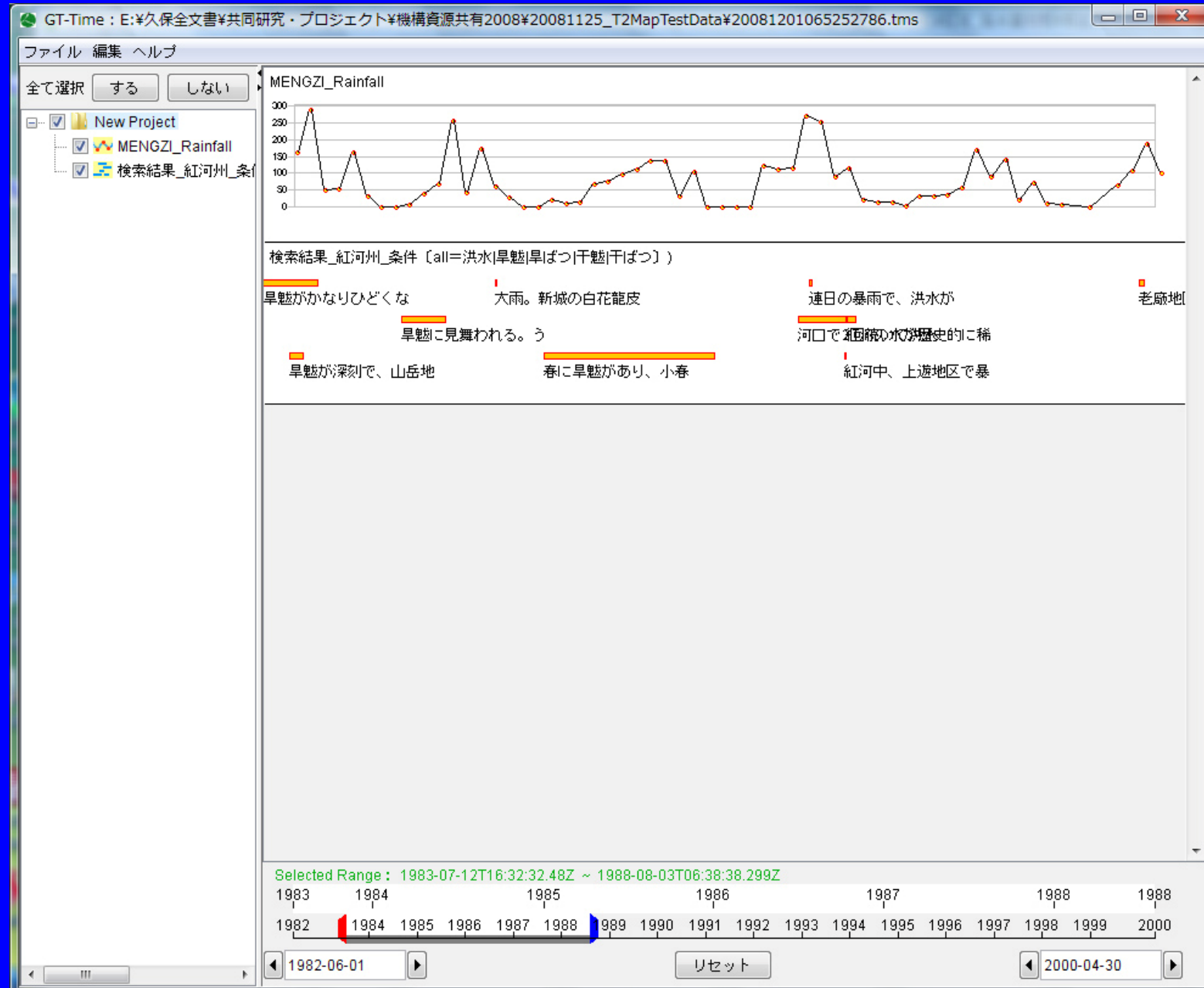
1959 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1985
1796 1820 1840 1860 1880 1900 1920 1940 1960 1980 1999

1796-01-01 リセット 1999-12-31

About Agriculture: Movement of Introducing Hybrid Rice



About Rainfall

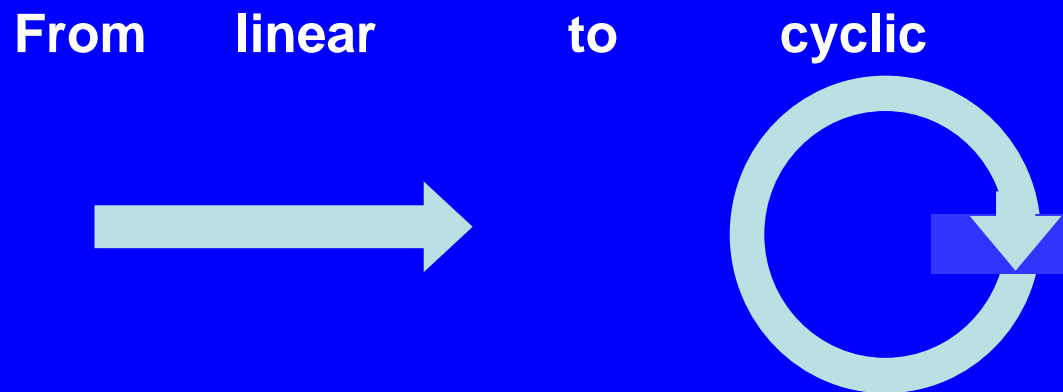


Another Idea of *Cychronicle* ; “Cyclic chronicle”

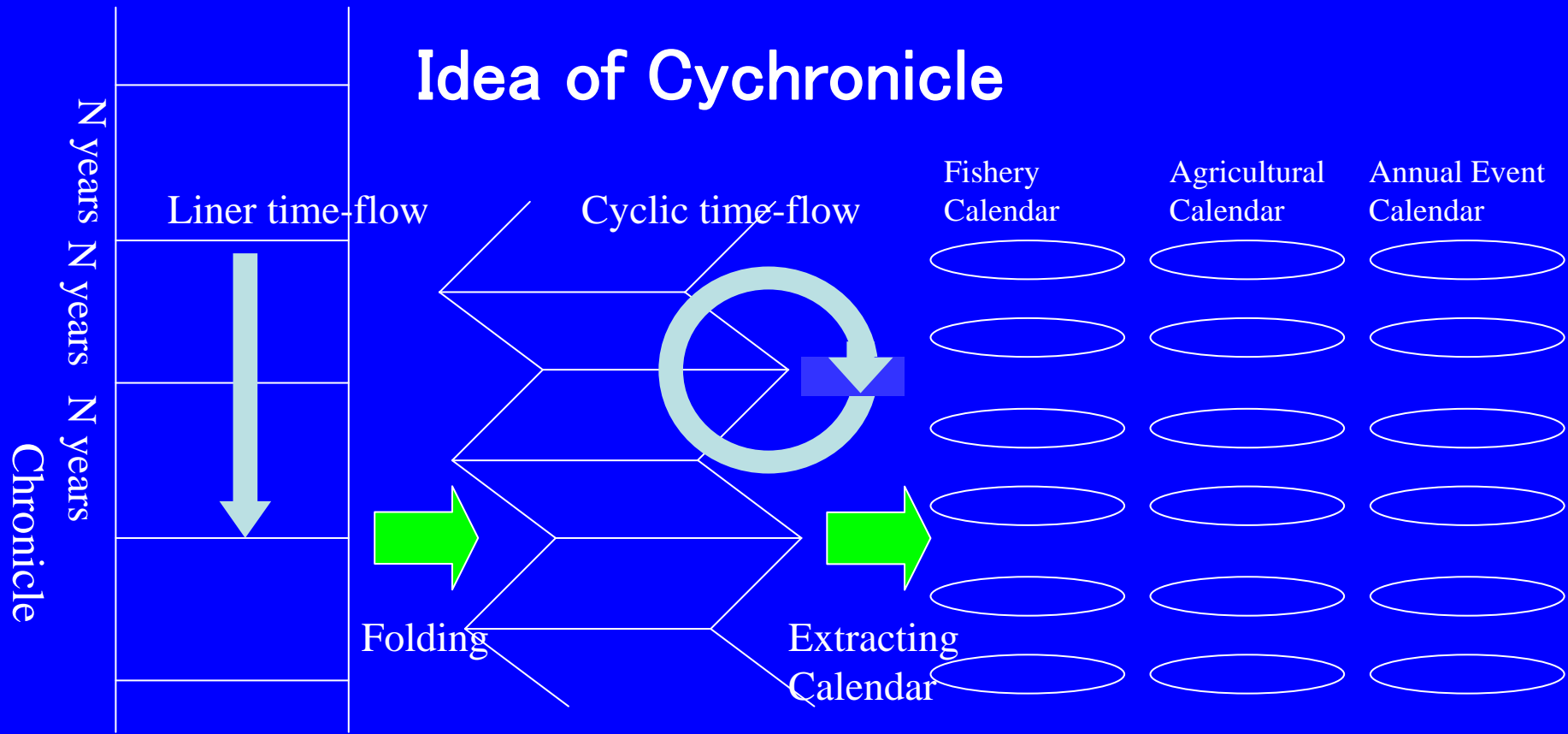
How people conceive time-flow;
(1) linear, (2) cyclic, (3) arbitrary

“Cycle” may be a **key** to manage and analyze culture in
Monsoon Asia.

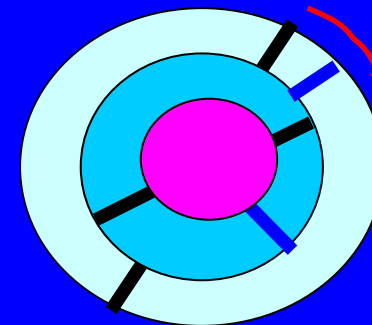
For this reason, conversion of linear chronicle into cyclic
chronicle, “Cyclonicle”, may help to analyze cultural events.



Idea of Cychronicle



- $N = 1$ is the case of annual calendar
- when N is set longer, long-term change may be treated
- special event like “the beginning of rainy season”, “the ritual for seeding rice”, could be chosen for the indices
- inversely, analysis of chronicle may lead to discovery a hidden “cycle”.



To find out time-oriented, or space-oriented changes from the viewpoints of *cycle*

Idea of Cychronicle

Extension of Hu-Time to *Cychronicle*

Secondary step for analysis; re-organization by time and space

Chronological data with (time, space, theme (keywords, or category terms)) are archived.

Make T2-map, or chronicle: make layers with space, theme, or (space X theme).

Further retrieval by specified term like the beginning of rainy season, water flood, ritual for seeding rice, or condition of numerical value, etc.

Clip-out layers into pieces by a “Mask”, which may correspond to year-cycle, or fixed period like from July to next June, etc.

For making a seasonal calendar

(1) To find out space-oriented change in a period;

Select with a fixed period

Then heap pieces in the space-order

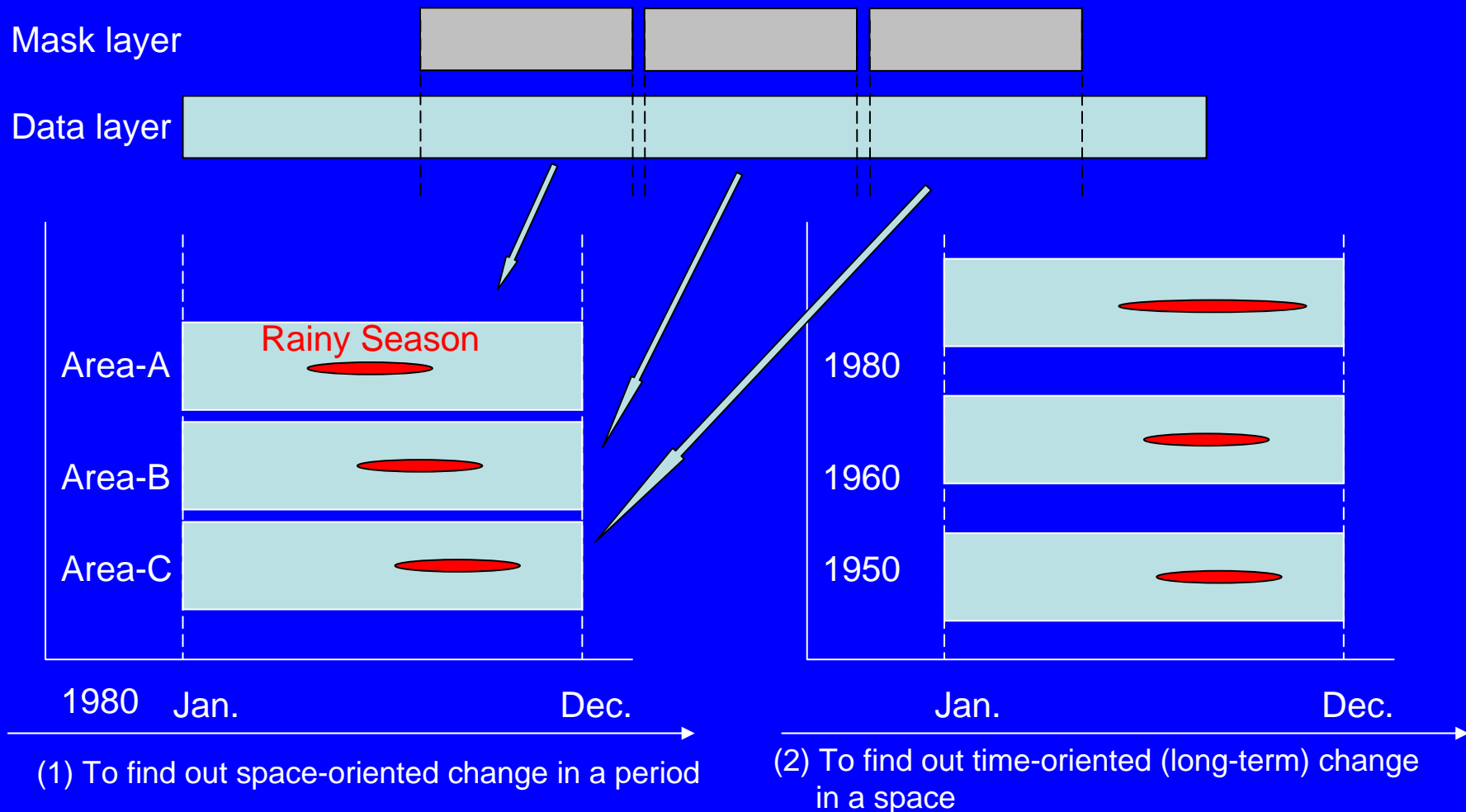
(2) To find out time-oriented (long-term) change in a space;

Select with a fixed space

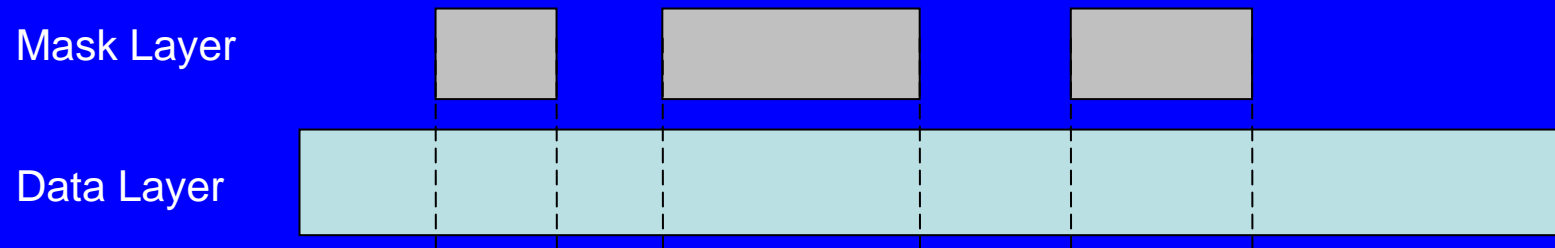
Then heap pieces in the period-order

Cychronicle: clip by mask, heap to compare

Clip-out layers into pieces by a “Mask”, which may correspond to year-cycle, or fixed period like fiscal year, etc.



Cychronicle: clip by more general mask, heap to compare



MASK Layer will be made by several conditions like
Keyword-type

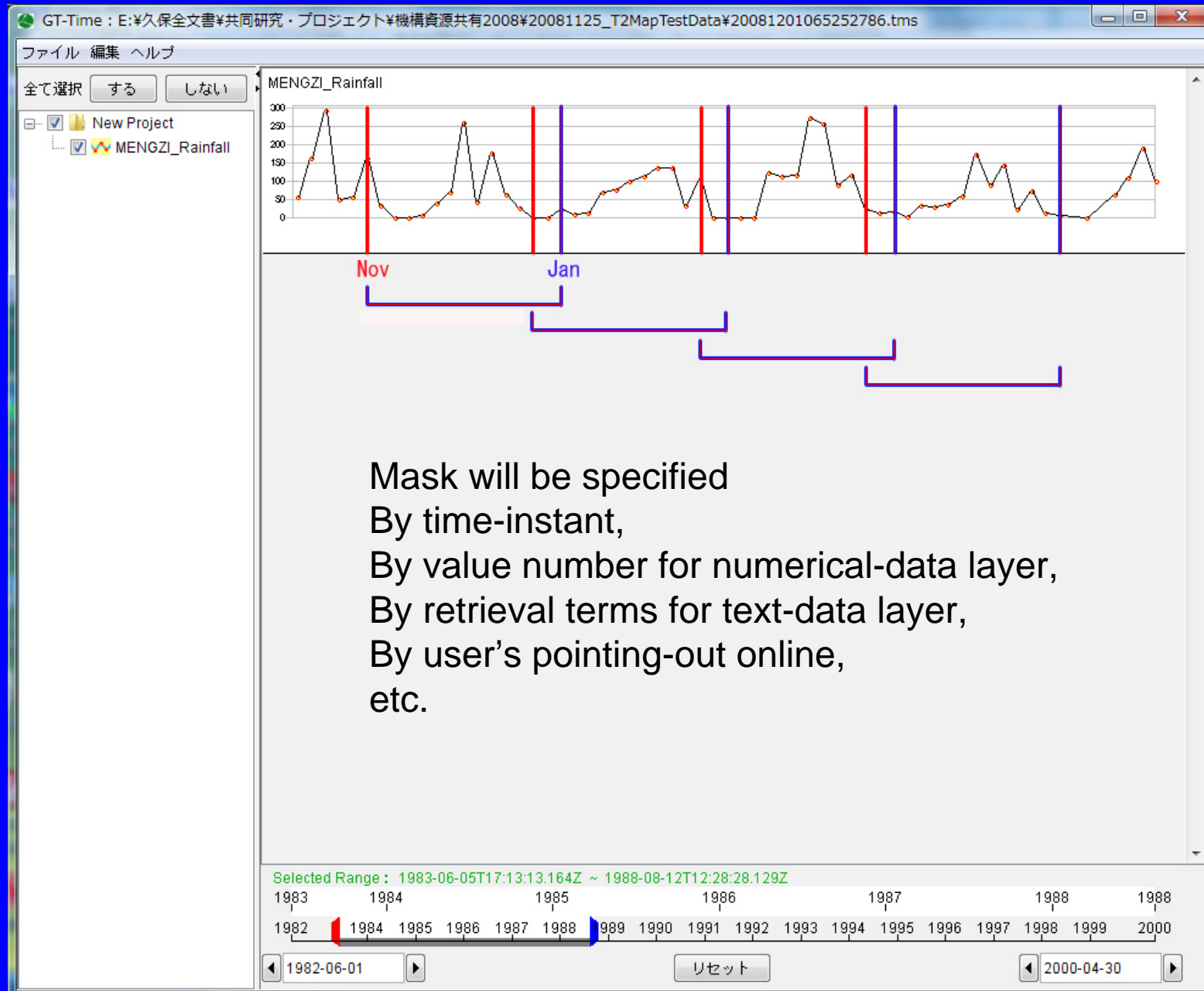
eg. From: "sowing"
To: "harvest"

Value-type

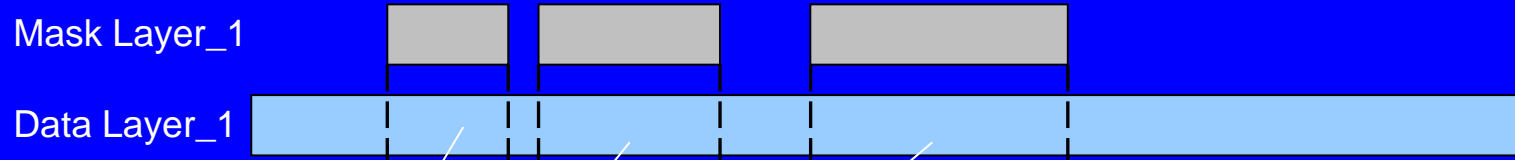
eg. From: the value of X exceeds A,
To: the value of X falls below B

By User's pointing-out type

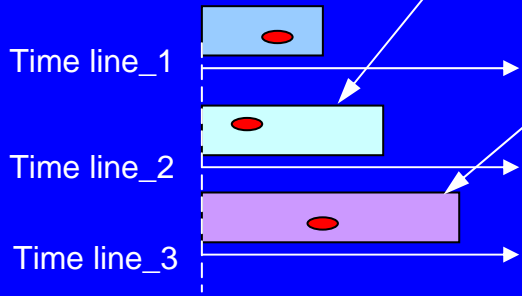
Clipping by Mask



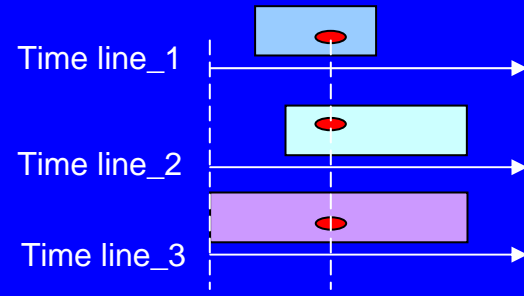
Clip and Heap to discover a hidden "cycle-like" change from chronicle



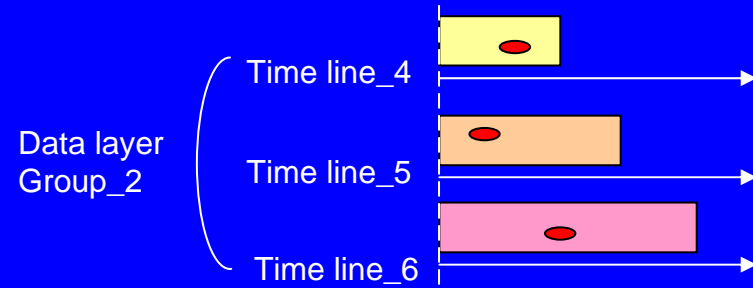
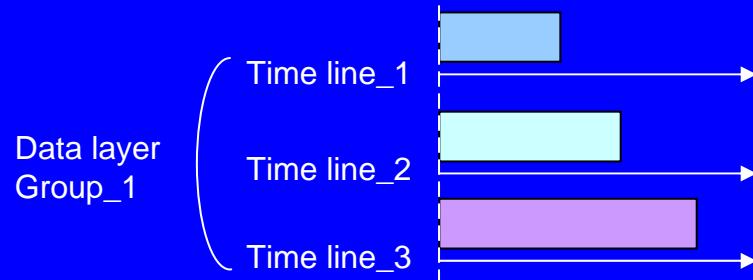
Align by Clip



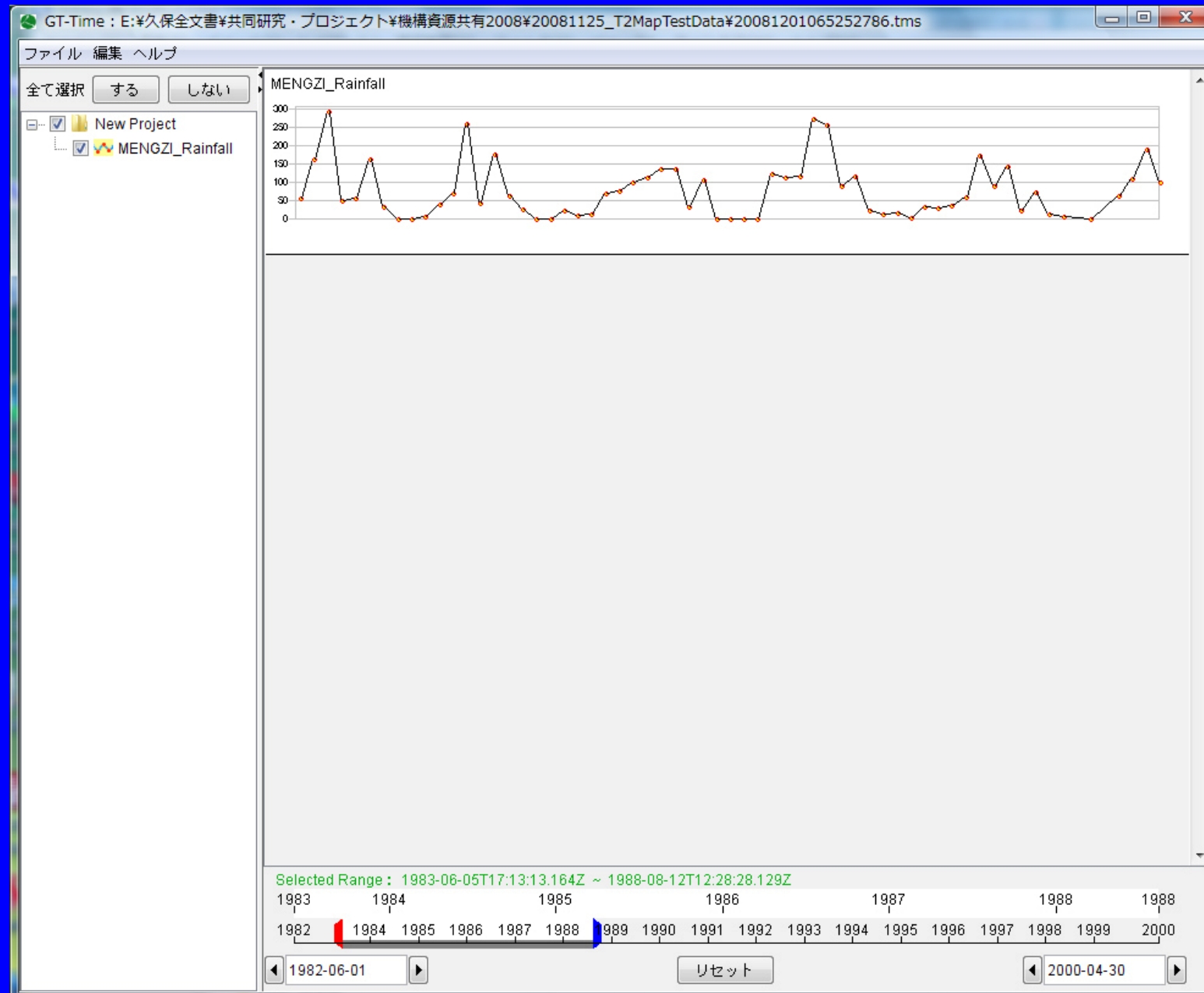
Align by an "anchor"



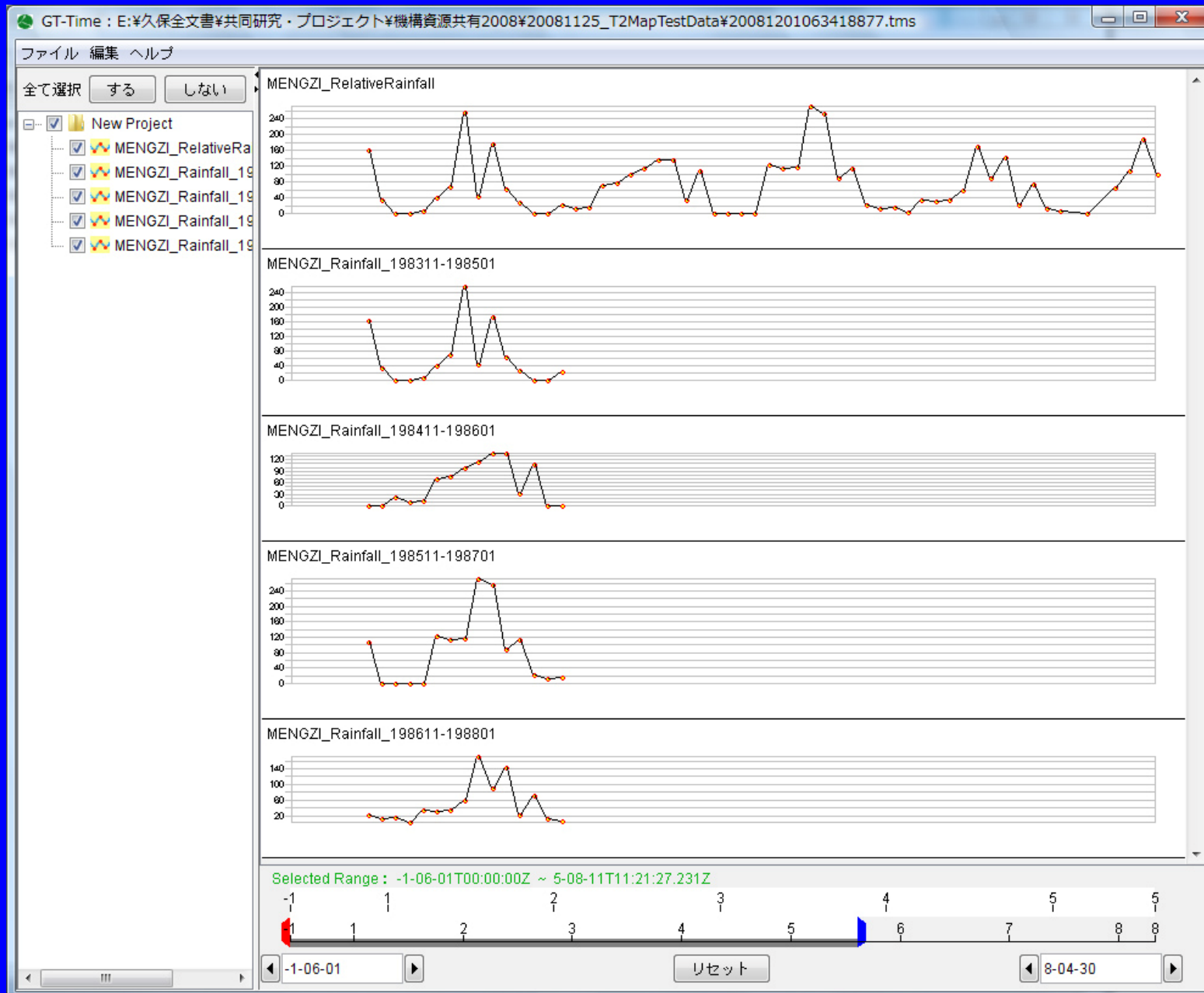
Heap group of data layer using *relative time-axis*



Ordinary Numerical Data by Hu-Time

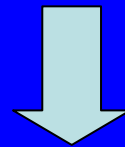
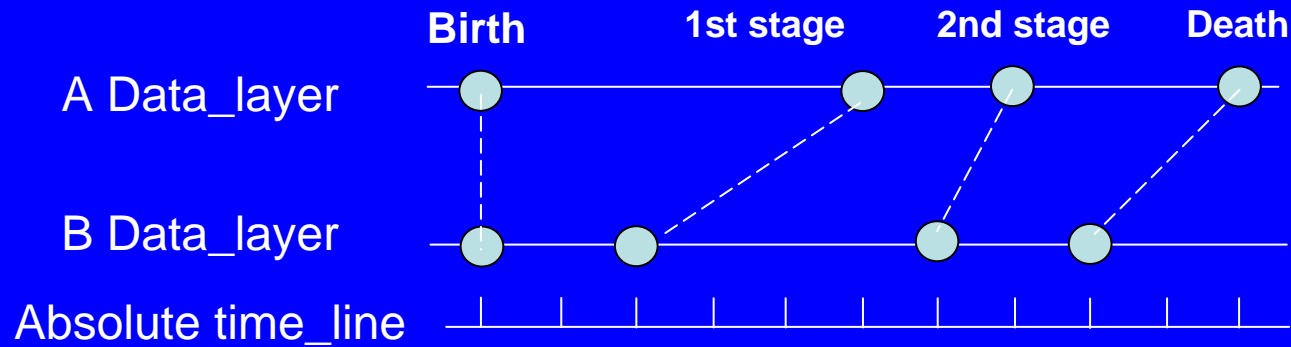


Align by Introducing Relative Time-axis

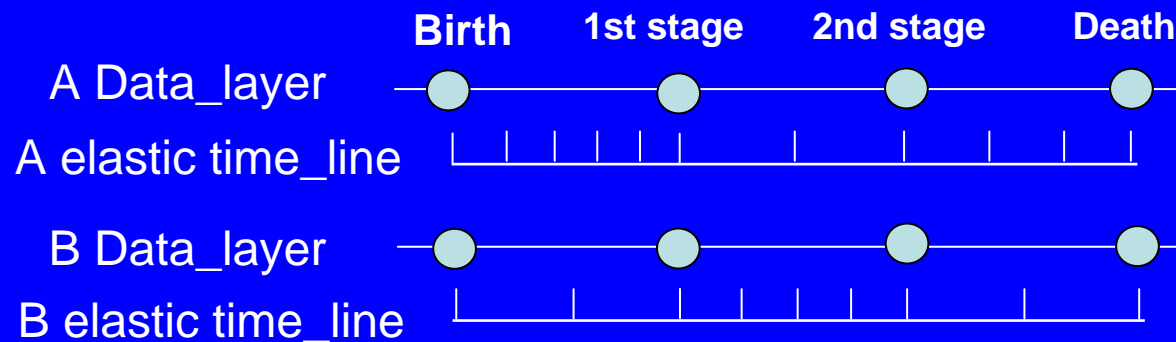


Idea of Adjusting and Comparing Events

using Elastic time axis for presenting partial-order relation



Similar to Dynamic Programming matching



Ex.1 Lifecycle of living thing

Ex2: Agricultural calendar, Fishery calendar

Future task

• The ideas given today is still in the experimental level.

The future task is;

• To implement basic and essential part of time-space integrated archives system.

To provide Humanities researchers with friendly tools to upload and download actual data-set, online data-modification including thematic keywords.

How to archiving data by attaching triplet if data contains many events without explicitly expressed triplet such as Yunnan chronicle, while numerical data from meteorological research has explicit triplet in data field.

• To implement various cultural/local calendar system, gazetteer, thesauri for specific theme, etc.

• To provide Humanities researchers with their-friendly tools for them to upload and download actual data-set, online data-modification including thematic keywords.

• Integration of HuMap and HuTime which allows user to dynamic switch from one to another.

• To discuss and verify whether it is worthy to introduce and implement the ideas of recording interrelation link and *cychronicle*, into HuMap and HuTime.