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佐藤廉也・鳴海邦匡・小林 茂「U-2機撮影中国大陸空中写真の研究資料としての利用可能性と課題」、『日本地理学会発表要旨集』85、227頁。

[JS102-1] Modern mapping process of East Asian countries: from imperial cartography to GIS (1)

[Tuesday 06 August 14:00-15:30 Room554B] Chair(s): Shigeru Kobayashi (Osaka Univ.)

1) Imperial Cartography in East Asia during the 19th and Early 20th Century: An Overview

Shigeru Kobayashi (Osaka University)

In order to review the modern mapping process of East Asia, a survey of cartographic works by Western countries is necessary as well as the study of those by the native societies. The former expanded their mapping to ports opened for trade and strategic areas, while the latter rapidly changed their way of map making from traditional land measurement to modern surveying.

It is remarkable that Western countries' mapping was expanded with military conflict. The first and second Opium Wars and French and American Expeditions to Korea accompanied surveying of areas concerned. This kind of wartime survey became later one of the most important processes of mapping in East Asia.

Concessions and colonies acquired after military conflicts were also mapped for administration. In contrast to the wartime survey, triangulation was applied commonly in order to fix survey stations.

Japanese mapping in overseas was similar to these works of Western countries, though native in this area. It extended mapping area extensively at wartimes, and made cadastral maps along with topographical maps in its colonies.

Unfortunately, the cartographic information accumulated through these processes is succeeded only partially by the countries mapped, because of the drastically changed international relations. In order to rescue this kind of information, international cooperation is necessary not only in the study of the mapping process but also in the search of maps buried in many institutions.

2) Nautical Cartography of Japan in the Latter Half of the 19th Century

Katsunori Kawamura (Yamaguchi Municipal Ouchi Junior High School)

The aim of this study is to review the nautical cartography of Japan in the latter half of the 19th century.

The Japanese Hydrographic Department, which was established in 1871, published less than 200 nautical charts in 1887 but that number increased to over 700 in 1911. It produced charts of the coasts of other countries such as China, Korea, and Russia in addition to those of its own coasts. Some of them were based on its hydrographical surveys; however, many were translations (republications) of charts produced by Western countries.

Until the latter half of the 19th century, Western countries expanded hydrographical survey area exerting military pressure on the countries of East Asia including Japan.

Japan belatedly participated in this kind of survey and concluded a treaty with Korea (the Japan-Korea Treaty of Amity) in 1876, which contained a provision allowing Japan to survey the coast of Korea, after the Ganghwa Incident in 1875.

Accurate geographic coordinates are essential in nautical cartography. A difference of six minutes was found in the longitude between the nautical charts made by Russia and those made by the U.K. concerning Korean coast. Striving for accurate longitude, Western countries repeated surveys between Europe and East Asia.

In the study of nautical charts of Japan, it is also necessary to gather and analyze nautical charts created by Western countries.

3) Maritime Imagination and Governing Taiwan : Marine Image on the Maps of Qing Taiwan, 1683-1895

Liming Hsia (Eastern Taiwan Studies Association)

This research aims include: to describe the features of seascape on Chinese maps of Qing Taiwan, to illustrate various meanings behind different patterns of seascape on maps, to analyze historical change in each pattern of seascape on maps, to explain the relationship between Qing's policy to Taiwan and maritime image on maps. Furthermore, this research employs 24 pieces of Taiwan-in-full map as objects to analyze the historical change of four patterns of seascape of Qing's Taiwan map.

As a result, in general, Qing's policy of governing Taiwan and its change were key factors influencing the mapping for Taiwan as well as the patterns of seascape on Taiwan map.

[JS102-2] Modern mapping process of East Asian countries: from imperial cartography to GIS (2)

[Tuesday 06 August 16:00-17:30 Room554B] Chair(s): Shigeru Kobayashi (Osaka Univ.)

1) Japanese Modernization and the Cadastre System (1872-1890)

Daiju Koseki (Kyoto Women's University)

After the Meiji Restoration, the new government of Japan started to reform old land system of the Tokugawa Era, in which private landownership had not been fully realized and the obsolete system had compelled people to pay land tax in kind. The first reform was planned to establish the private landownership issuing land certificates (Chiken) to the owners since 1872. Although the first cadastral maps (Jinshin Chiken Jibiki Ezu) were produced at this reform, another new maps (Chiso Kaisei Jibiki Ezu) were prepared since 1873 for the Land Tax Reform (Chiso Kaisei), in which the tax was imposed according to the price of land concerned.

However more effort was required to establish the modern land system. In 1887, land

registration system was introduced and finally in 1889, the preparation of land register (cadastre) was institutionalized. During this reform, the necessity of precise cadastral maps was felt, because previous maps were inconsistent in land classification and erroneous because of insufficient survey. Therefore, a new land survey was promoted. In some areas, the final fair copies of new maps (Kosei Chizu) were prepared, whereas in the other areas, the drafts maps (Jioshi Chosa) were utilized for the land registration.

Although the Ministry of Finance led these two investigations, the Department of the Interior also ordered local public body to carry out another land investigation for accurate land boundary and consistent land classification. However, this investigation was not completed.

2) The Japan military cartography in Taiwan before the colonial period: Re-examining the vicinity map of Taipei Prefecture in 1894

Hsiung-Ming Liao (Academia Sinica)

The Japanese military attack of the indigenous tribes of Southern Taiwan during the 1874 Expedition was the first military action since the Meiji Restoration. This was also the first major diplomatic incident involving the Qing Empire and the Japan, consequently leading to changes in policies of Japan military cartography. The Japanese General Staff Headquarters devised a series of actions to patrol and survey clandestinely, collecting geographic data through all kinds of means. Many maps of Taiwan had already been issued just after the First Sino-Japanese War, and before the Japanese Colony, fully demonstrating how Japanese military had accumulated rich results in geographic investigation.

While looking back on the process of these secret survey maps of Taiwan before the Japanese colonial period, this study also focuses on the 'The Secret Survey Map of Northern Taiwan in 1888' made by Ozawa Tokuhei and the 'The Vicinity Map of Taipei Prefecture in 1894' made by the Japanese Military Survey Bureau, and along with other maps made by the English and the French to make a comparative analysis using GIS. The sources and accuracy of the geographic data from these different regions will be used to understand the process of making these secret survey maps made by the Japanese. The study concludes with a case study of the 'The Vicinity Map of Taipei Prefecture in 1894' to portray the research issues of the old military maps. We hope to initiate the attention of these colonial maps in the relative academic realms.

3) A Historical Geography Research of Peking-Mukden Railway under the Vision of Modernization(1881-1912)

Chingchi Huang (Loyola Map Workshop), Xibo Chen

The 9-kilometer Tangshan-Hsukochuang Railway, which was completed in 1881, marked the actually first railway in China and later enlarged to the 840-kilometer Peking-Mukden Railway(now it is called Beijing- Shenyang Railway) in subsequent 31

years. The construction of Peking-Mukden Railway was influenced jointly by the geographical environment and China's early modernization movement.

During the modernization of China, the conservative force was very strong and fiercely opposed to constructing railways. Peking-Mukden Railway was unavoidably influenced by many factors such as geomantic omen, economy, geography and military.

In this research, we will overlay and analyze related old topographic maps(including Japanese mapping up to 1945) to retrieve the geographic information of the old railway lines, canals, settlements, royal cemetery and hunting ground by GIS. This research will try to solve the following historical and geographical problems:

1. Why Peking-Mukden Railway can be allowed to build?
2. Discuss the extension of Peking-Mukden Railway by stages and analyze the factors influencing the design of this line.
3. Why the railway was so tortuous from Beijing to Tianjin?

Topographic maps were used by modern countries for national spatial planning. In the past, obtaining large scale topographic maps of China was difficult. This article is not only expected to clarify the historical and geographical problems of transportation modernization in late Qing China, but also deepen the interdisciplinary approaches of historical geography research.

Keywords: Modernization, Northern China, Peking-Mukden Railway, railway history, Topographic maps

[JS102-3] Modern mapping process of East Asian countries: from imperial cartography to GIS (3)

[Tuesday 06 August 17:30-19:00 Room554B] Chair(s): Shigeru Kobayashi (Osaka Univ.)

1) Japanese Mapping of East Asia in Relation with Nautical Charts Produced by Western Countries during the 19th Century

Kunitada Narumi (Konan University), Shigeru Kobayashi

During the 19th century, Western countries created many charts of East Asian waters along with the development of trade relations with this area. After the Opium War, this process of mapping was accelerated exerting frequently military pressure upon countries concerned.

The Japanese Navy and Army, which entered belatedly this arena of map making, drew up maps of the coastal areas in East Asia by reference to Western charts. Of those, the General Charts of Pei-Ho (“北河總圖”) published in 1875 are a typical case. Their figures were drawn duplicating those of four British Admiralty charts (Nos.2653, 2654, 257 and 258), which were produced on the basis of the works of French, American and British surveyors during the Arrow War, in combination with transliterating the place-names and notes into kanji and kana. Japanese military updated their maps

and charts of East Asia by importing the new charts and sea pilots from Western countries. Compiling maps of coastal areas of China and Korea, Western charts were utilized also as the frame of longitude and latitude.

However, Japan gradually surveyed the surrounding areas of East Asia independently and became one of contributors of geographical information subsequently. This process of changing information sharing deserves greater attention in the historical study of modern cartography of frontier areas in East Asia.

2) The military cartography in WWII: A comparative study of the 1/50,000 topographic mapping between the U.S. and Japanese army in Taiwan, 1944-1945

Chun-Lin Kuo (National Dong-Hwa University), Hsiung-Ming Liao

After the outbreak of the WWII, the topographic mapping in colonial Taiwan was once suspended, but a large number of the later colonial period's 1/50,000 topographic maps were reproduced by Japanese army in 1944 and 1945. This urgent military mapping not only filled the unmeasured mountain areas, but also renewed several flatlands with the latest aerial survey techniques. At the same time, the U.S. army, going into the final battle with Japan, had produced a set of 1/50,000 color topographic map for the whole island without landing Taiwan. The former set of 1/50,000 topographic map was the most completed large-scale topographic map in colonial Taiwan; the later colorful one was continuing used and revised by KMT government after the War. Both of them thus became valuable spatial information recording the geographic changes of Taiwan in the middle of 20 century.

This study aims to investigate these two 1/50,000 topographic map sets produced by U.S. and Japanese military for their differences of mapping contents and survey methods in Taiwan. Furthermore, with the usage of GIS and the comparison of other pivotal historical materials, these maps could be used for representing the geospatial landscape of Taiwan before and after the war. Since the related digital archives of historical maps and aerial photos are gradually released in recent years, we will also highlight the two 1/50,000 cartographic map sets' research value -the key reference for the aerial photos taking by the U.S. army during the WWII- among the digital archives' map collections.

3) A Database of Early Japanese Military Maps of China and Korea

Shigeru Kobayashi (Osaka University), Kumiko Yamachika, Rie Watanabe, Kenta Yamamoto, Akihiko Namie

A series of manuscript maps of China and Korea drawn by Japanese army officers in 1880s were found at the Geography and Map Division, the Library of Congress, Washington, D.C. in 2008. These maps, which had been originally garnered at the Japanese Land Survey, were confiscated by U. S. Army Map Service after WWII and

transferred to the Library of Congress.

Scrutinizing them, it became clear that they are important materials for the study of historical cartography of East Asia, where modern surveying was applied belatedly. Young Japanese army officers made a traverse survey of main routes of China and Korea, taking bearings with compasses and measuring distance by pace. Most of the maps are middle scale (1: 100,000 or 1: 200,000) and describe roads and waterways that connect central places. Just before the start of the Sino-Japanese War, they were compiled into a collection of 131 sheets on a 1: 200,000 scale covering area from Korea to environs to Peking. The longitude and latitude and coastline shown in them were derived from nautical charts made by Western Countries.

Utilizing the photos of these maps taken at the Library of Congress, the authors constructed a database of these maps, which show the early stage of Japanese collection of geographical intelligence and its relation to cartographical development in East Asia.

On the applicability of GIS analysis to modern military and colonial maps of East Asia

Shigeru Kobayashi (Osaka University, Professor emeritus)

Key Words: imperial cartography, East Asia, Western countries, Japan, database, GIS

The British embassy of George Macartney to China in 1793 was the first applier of modern surveying instruments for map making in East Asia. In addition to the hydrographic survey with chronometer, astronomical observations to measure the latitude of Peking and Chengde of Jehol was carried out. Several charts and maps included in Staunton's report show geographical reconnaissance of the coast and main routes of China was successfully accomplished by this embassy, whose end has been generally described as failed.

Following this beginning, successive surveys by British hydrographers such as Daniel Ross extended charted areas from southern coast to northeastern sea including Korea and Japan. During the Opium War (1840-1842), this kind of survey penetrated into the interiors of China. Small British gunboats with steam engines went up the Yangtze to find the channels suited for Western large ships.

The survey during the Opium War was important not only because the Western map making intruded into the interior of China for the first time, but also because it was the first wartime modern survey in East Asia. Thereafter, warfare such as the Arrow War(1856-1860), Byeong-in yangyo (丙寅洋擾、1866) and Simmi yangyo (甲未洋擾、1871) at the coast of Korea, the Sino-French War (1884-1885), and the Sino-Japanese War (1894-1895) accompanied land survey by intruders. Whereas almost all of the wartime surveys were tentative in nature, and plane table and alidade was main instruments, Russia adopted triangulation for the survey of important parts of Manchuria occupied after the Boxer Rebellion (1900).

Along with the wartime survey, some of the consuls, who were dispatched to the diplomatic offices set up at treaty ports, engaged land survey. The British consul, Robert Swinhoe (1836-1877) and American consul, Charles Le Gendre (1830-1899) are early examples. Japanese army officers, who surveyed the main routes of Korea during 1880s are also included in this category. As members of Japanese legation or consulates, they traveled remote areas under the escort of Korean officials.

In contrast to these surveys, the mapping of colonies was carried out systematically in most of cases. Japanese colonial government applied triangulation in Taiwan, Korea, Kwantung Province and Karafuto (Sakhalin), just like land surveys in the colonies of Western countries as British India and Dutch East Indies.

In order to apply GIS technology to these military and colonial maps, we have to know their diversity in the first place. Most of the surveys by consuls depended on a simple traverse survey. They took bearings with compass and measured distance by pace and maps produced show only the routes which connect important places. The wartime survey during and after the Sino-Japanese War, plane table and alidade were the main instruments of the surveyors. Although the maps prepared by this method are far more accurate than those by simple traverse survey, its accuracy is limited in small extent. Accidental errors accumulated as the mapped areas extended. Although the maps prepared on the basis of triangulation are accurate in general and suited for the application of GIS technology, such as the overlay analysis, the areas covered with this kind of map are limited.

Accordingly, in order to apply GIS technology to these maps, we have to know not only their diversity but also their spatial and temporal coverage of the areas concerned. A unified catalogue with sufficient metadata and chronologically arranged index maps, showing the space-time location of all mapped areas, should be created making use of GIS. A database of the images of these maps also should be prepared for easy access from researchers and citizens concerned.

The Gaihōzu Digital Archives dispatched from the Department of Geography of Tohoku University and a newly opened database from Osaka University called *Early Japanese Imperial Maps of China and Korea* are experimental examples toward the formation this kind of catalog. The former shows images of Japanese military and colonial maps of Asia-Pacific areas, which are housed in several Japanese universities, whereas the latter shows those of manuscript maps prepared by Japanese army officers during 1880s, which were found in the Library of Congress, Washington, D.C.

As one of the promoters of these archives and database, the presenter hopes that they will be a focus of discussion of researchers of the Asian Network for GIS-based Historical Studies.

Three Databases of Japanese Imperial Maps

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Japanese imperial maps attract the attention of researchers of historical cartography and East Asian history. A workshop was held in October, 2011 on the role of Japanese imperial maps (Gaihozu) as sources of East Asian history and a series of papers were published (Cross Currents, 2012). The recognition of these neglected maps was stimulated partially by the following databases.

One is the Gaihozu Digital Archives of the geographical department of Tohoku University. It provides mainly images of topographical maps of Southeast Asia. As for China and Korea, only catalogs are opened.

Another is a collection of military maps of East Asia and western Pacific of Ochanomizu University. In spite of its small number, it deserves to see because of the military intelligence they contain and skillful presentation.

In addition, A Database of Early Japanese Imperial Maps of China and Korea was opened recently. The manuscripts drawn by Japanese Army officers in 1880s had been originally garnered at the Japanese Land Survey. They were confiscated by U. S. Army Map Service after WW II and transferred later to the Library of Congress. Young Japanese army officers made a traverse survey of main routes of China and Korea taking bearings with compasses and measuring distance by pace. This database was constructed utilizing the photos of the maps taken at the Library of Congress.

With these databases, the authors hope to open a new field of study of Japanese imperial maps, which show the changing process of geographical intelligence collection in East Asia and the Pacific.

U-2 機撮影中国大陸空中写真の研究資料としての利用可能性と課題

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Aerial Photographs by U-2 Planes as a research material: Its value and tasks to be tackled

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キーワード：空中写真、U-2 機、中国大陸、地理学研究

Keywords: Aerial photography, U-2 plane, Mainland China, Geographical research

はじめに 演者らは、1945年8月までアジア太平洋地域で日本が作製した地図(広義の外邦図)の調査を継続する過程で(小林編2009など)、アメリカ国立公文書館Ⅱ(NARAⅡ)の収蔵資料の調査を重ね、同館でU-2機撮影の中国大陸偵察空中写真を公開していることを知った。地形図や空中写真の利用が厳しく制限されている中華人民共和国の地理学研究に際しては、すでにCORONA偵察衛星の写真が広く利用されてきた(渡邊・高田・相馬2006、熊原・中田2000など)。これに対しU-2機による空中写真は、高度約2万メートルで撮影されたもので、地上での解像度は2.5フィート(75センチ)といわれ、実体視も可能である。ただし、その撮影はアメリカの軍事的関心に左右され、また衛星写真と違い広範囲をカバーしないことなど、利用に際しては注意が必要である。まだ未調査の点も多いが、本発表ではここ一年間にわかってきたことを報告し、関係者の関心を喚起したい。

U-2 機による偵察撮影の背景 よく知られているように、U-2機はアメリカ合衆国の秘密の偵察機として開発され、当初はソ連の核兵器やミサイル開発の偵察に利用された。高空を飛行するため、その攻撃は容易でなかったが、1960年5月にソ連軍により撃墜されパイロットが捕虜になって以後、その存在が広く知られるとともに、ソ連上空の偵察飛行は停止された。当時CORONA衛星の開発が進行していたことも、この停止に関与すると考えられる

(Day et al.1998)。これ以前より中華民国空軍のパイロットに訓練を施すなど、U-2による偵察の準備が開始されていたが、1962年初頭からその中国大陸上空飛行が本格的に開始された。

中華民国空軍では、すでに通常の飛行機による中国大陸の空中偵察をアメリカとの秘密の協力関係のもとで実施しており(通称「黒コウモリ中隊」による)、U-2機の偵察についてもアメリカの関与を秘匿するため特別の中隊(通称「黒猫中隊」)を創設し、アメリカ国家安全保障会議の専門グループと大統領および中華民国政府の承認のもとで偵察飛行を行った。撮影済みのフィルムはアメリカに運ばれてからポジフィルムが複製され、中華民国に戻されていたが、一時期には横田基地のアジア写真判読センター(ASPIC)で処理されたこともある(Pedlow and Welzenbach 1992:

226,229)。なお最近の台湾では「黒猫中隊」に関する公文書が公開されるようになってきている(荒武達朗徳島大准教授による)。

U-2 機の撮影対象、写真の特色と今後の課題 以上のようなU-2機の偵察飛行については、CIAが刊行した*Central Intelligence Agency and Overhead Reconnaissance: The U-2 and OXCART Programs, 1954-1974* (Pedlow and Welzenbach 1992)が詳しい。

2013年6月に新たに公開されたこのテキストにも伏せ字が残るが、核兵器開発や潜水艦の建造、飛行場やミサイル基地の偵察が主目的であった。また中印国境紛争(1962~3年)に際しても偵察を行い、インドのネルー首相に写真を提供している。ただし中華人民共和国の防空能力は徐々に向上し、1968年以降陸上の偵察は行われなくなり、電子偵察に移行する。

U-2機搭載のカメラは首振り型で、垂直写真のほかその両側の斜め写真も撮影し、いずれも各コマは進行方向に向かって長細いかたちとなる(47×22.5cm)。またフィルム・ロールは右と左に分かれている。1フライトで撮影されるコマは8000にのぼり、ロールが50本以上に達することもあり、特定の地域のコマを探し出すのに長時間が必要である。

この背景としては、経度1度、緯度1度の表示範囲に分割されているNARAⅡ備え付けの標定図(マイクロフィルム)からフライトやコマの番号を知ることができても、目指す番号のコマを参照するにはフィルム・ロールの缶に記入された番号だけが頼りなので、場合によってはカンザス州の倉庫に保存されている当該フライトのロールを全部取り寄せる必要があるという事情がある。取り寄せに数日かかるだけでなく、1回の閲覧で参照できるのは10ロールにすぎない。また偵察飛行なので、雲のため地上が写っていないこともしばしばである。

今後はU-2機による写真の全容を把握するためには全104のフライトの飛行ルートを示す図も目指したいが、標定図のないフライトのある可能性もみとめられ、利用の条件整備には関係者の協力が必要である。

なお、本発表の準備に際しては、岩田修二首都大学東京名誉教授のご教示を得た。