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APPLICATION OF TERRA/ASTER DATA ON AGRICULTURE LAND MAPPING

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ABSTRACT: The object of this research project is to develop methods for preparation of agricultural land maps by extracting information regarding vegetation and bare soil from TEERA/ASTER data. ASTER is a sensor with high spatial resolution and has a multi band characteristics capable of analyzing plants and soil by visible and near infra-red region, of classifying minerals by short wave infrared region, and of identifying rocks by thermal infra-red region. Thus our aim is to prepare agricultural land map utilizing the characteristics of ASTER. The agricultural land maps provide comprehensive information on (1) agricultural land use (Condition of agricultural use of land, namely satellite agricultural land use map), and on (2) soil (distribution of soil constituents and classification of soil, namely satellite soil maps). Our target area is Obihiro area, Hokkido in Japan, and we make satellite agricultural land use maps and satellite soil maps. In this study, we use early summer ASTER data and other satellite data. The prepared map and exiting map are compared and good agreement. A satellite soil map is prepared using ASTER data for farming areas identified by the satellite agricultural land use map. Semi quantitative mineral discrimination is carried out. The methodology is based on the isograin model. The analysis requires spectra patterns of several minerals as data library. A satellite soil map and exiting soil map are also compared and good agreement.

1. INTRODUCTION

As you all probably know, one of NASA's earth observing satellites, named Terra, was launched on December 18th (December 19th JST) 1999 year, carrying the Advanced Spaceborne Thermal Emission and Reflection radiometer (ASTER) developed by the Ministry of International Trade and Industry (MITI) of Japan. Earth Remote Sensing Data Analysis Center (ERSDAC) is distributing ASTER data. ASTER is an optical remote sensor similar to Landsat/TM of the US and SPOT /HRV of France, as well

as a successor of JERS-1/OPS of Japan. ASTER is, however, very unique and characteristic in its most advanced technology. ASTER is an advanced optical sensor comprised of 14 spectral channels ranging from the visible to thermal infrared region. It will offer scientific and also practical data regarding various fields related to the study of the earth

Agricultural users of remote sensing want to make agricultural land use map using remote sensing data, but it is very difficult to make it because of data limitation. ASTER Data is also suitable to determined agricultural land use, and we are going to study at this subject.

Table 1 ASTER Main Characteristics

Spectral Coverage	VNIR	3 Bands	0.52-0.86μm
	SWIR	6 Bands	1.60-2.43μm
	TIR	5 Bands	8.125-11.65μm
Spatial Resolution	VNIR		15m
	SWIR		30m
	TIR		90m
Radiometric Resolution	VNIR	NE??	0.5%
	SWIR	NE??	0.5%-1.5%
	TIR	NE?T	0.3K
Swath Width			60km
Pointing Angle			±8.55°
VNIR			±24°
B/H			0.6

VNIR: Visible and Near-Infrared Radiometer
SWIR: Short Wave Infrared Radiometer
TIR: Thermal Infrared Radiometer

2. OBJECTIVES

The objective of this research project is to develop methods for preparation of agricultural land maps by extracting information regarding vegetation and soil from ASTER satellite data. ASTER is a sensor with high spatial resolution, and has multi-band characteristics capable of analyzing plants and soils by visible to near infrared region, of classifying minerals by short wave infrared region, and of identifying rocks by thermal infrared region. Thus our aim is to prepare agricultural land maps by utilizing the characteristics of ASTER.

3. RESEARCH RESULTS

The agricultural land maps will provide comprehensive information on (I) agricultural land use (conditions of agricultural use of land and agricultural potential of land, namely satellite agricultural

land-use map), and on (II) soil (distribution of soil constituents and classification of soil, namely satellite soil map). Also the feasibility of preparing "ecomaps" integrating the distribution of organisms related to the source of absorption and emission of polluting material and agricultural land use was examined.

3.1 satellite agricultural land maps

A process for analyzing satellite data of varying periods by discriminate matrix method was developed. This process consists of algorithm which classifies the agricultural land use by three-step discriminate matrices of; (I) seasonal variation of surface water distribution, (II) seasonal variation of vegetation cover rate, and (III) seasonal variation of specific wavelength band ratio. Also method for utilizing DEM prepared from ASTER data for classifying agricultural land was verified.

Obihiro area of Hokkaido was selected for study and the present algorithm was applied for the combination of early summer ASTER (Fig 1) and other satellite data. The prepared map (Fig. 2) and existing data were compared. It was verified that this algorithm is effective for preparing satellite agricultural land use maps, and the next step would be to carry out land truth survey in order to examine the accuracy.

3-2 Satellite soil maps

A satellite soil map was prepared for farming areas identified by the satellite agricultural land-use map of the Obihiro area of Hokkaido. This newly prepared map is consistent with existing soil map of the area (Fig. 3) and thus the satellite soil map algorithm was proven to be applicable to ASTER data (Fig. 4).

3-3 Ecomaps

An ecomap of the Konsen area of Hokkaido was prepared by integrating satellite agricultural land-use map and wetland map. It was shown that the classified units will not overlap and the delineation accuracy increases when the same satellite data were used, and that this map will be the basis of various analyses with improvements in expression of the ecomap.

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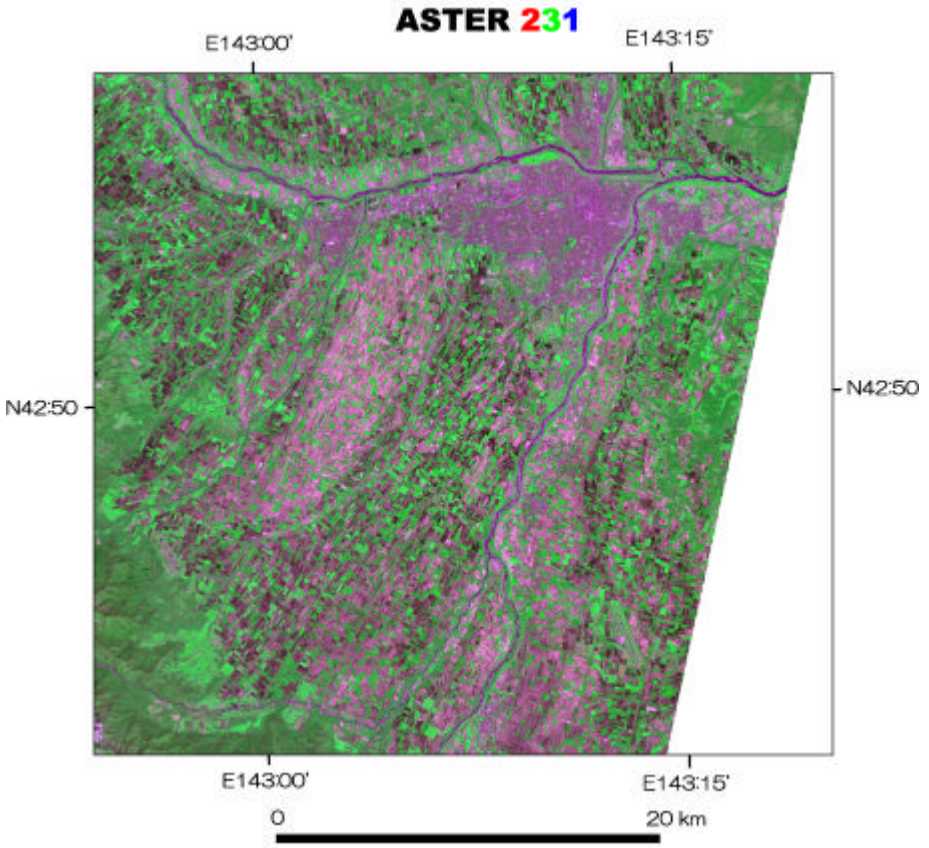

Fig. 1 ASTER image of Obihiro Area on 25 May 2000

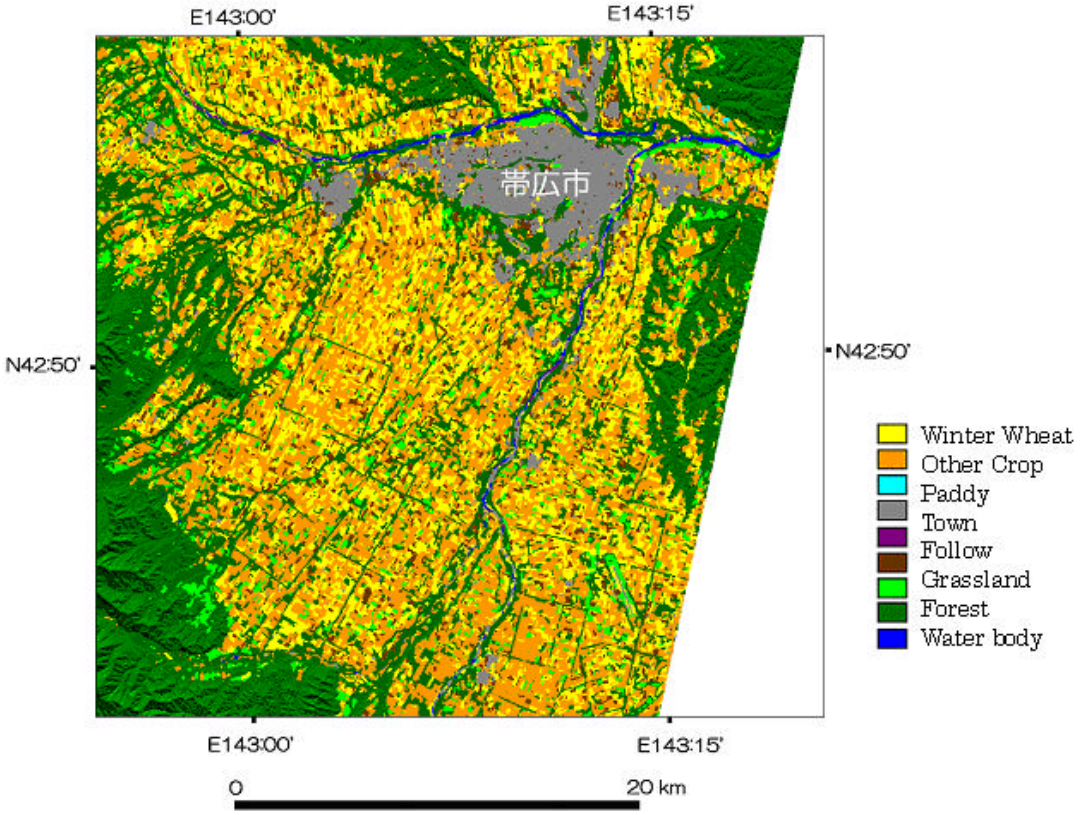

Figure 2 Agricultural Land Map of the Obihiro Area

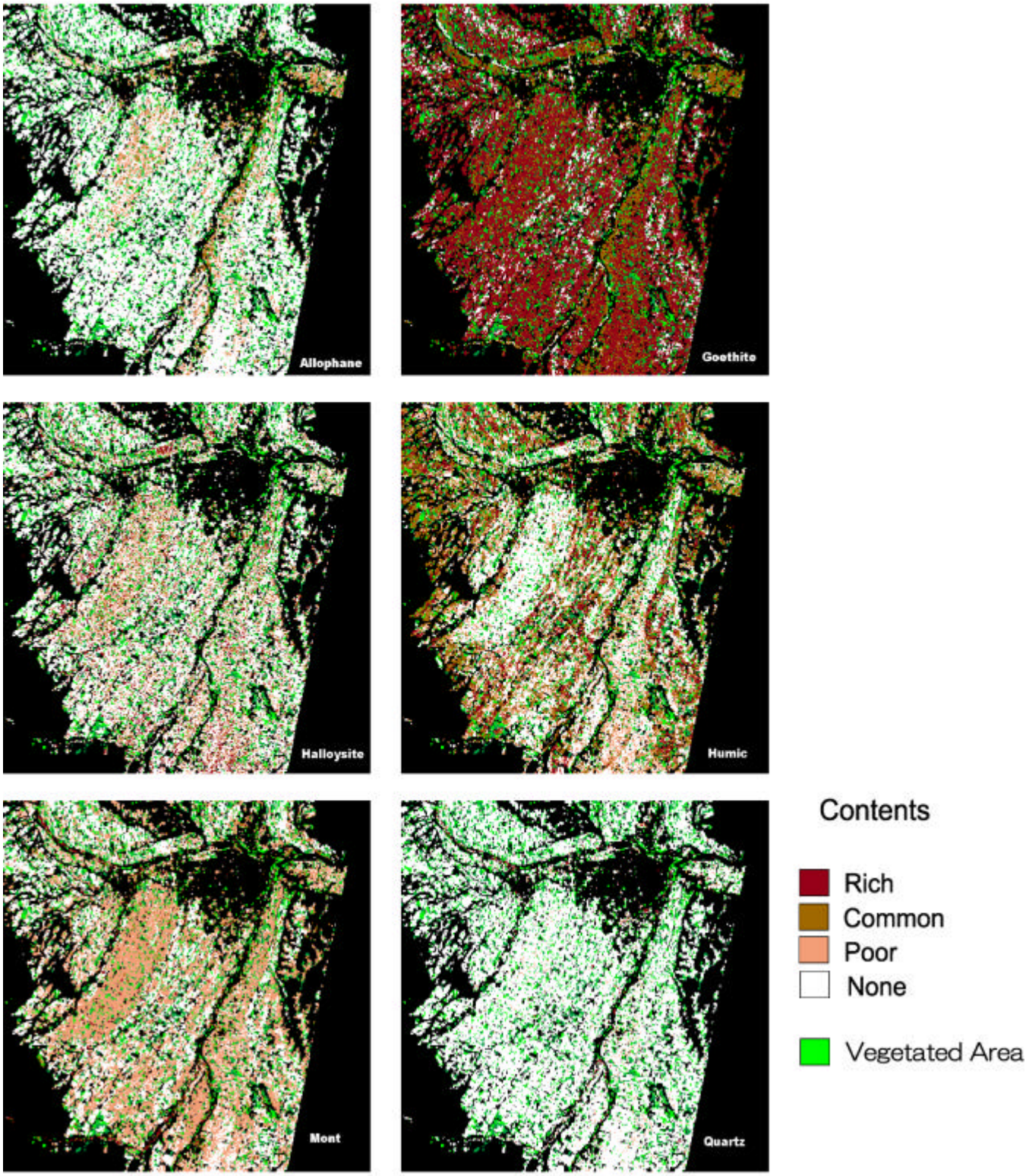

Figure 3 Satellite Soil Component Materials Distribution Map of the Obihiro Area

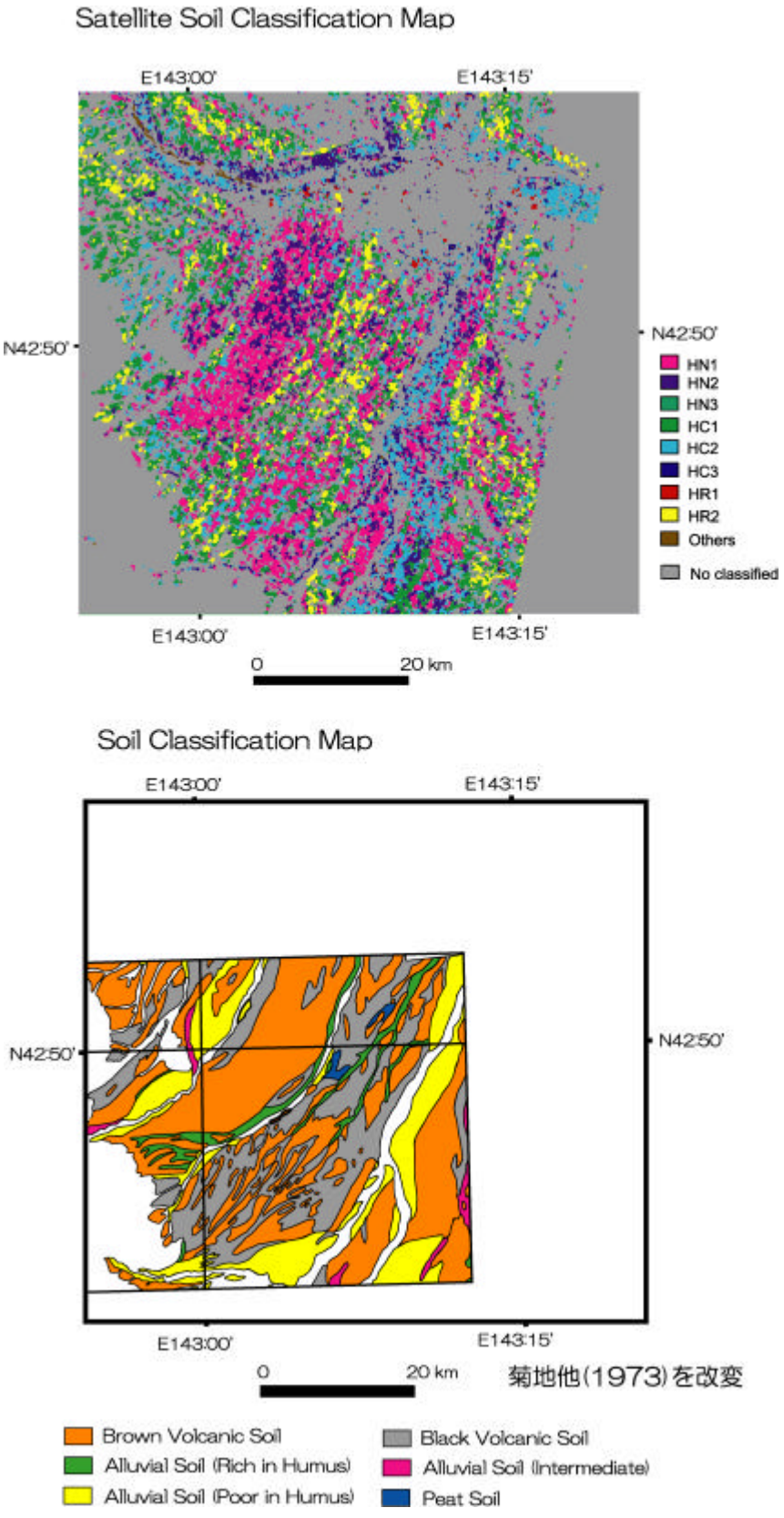

Figure 4 Satellite Soil Classification Map of the Obihiro Area