

## Achievement of CEReS Research Projects

<p><b>Project 4</b></p>
<p><b>Subject:</b> Application of remote sensing methods to regional issues --- enlightenment activities by means of the synergy effect of various spatial data</p>
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<p><b>Objective of the project:</b> Presently several earth observation satellites are operating simultaneously and new satellite programs are planned. In this circumstance, the use of satellite data is expected to be important for understanding the regional environment and for exploiting a new field of application. In this project, by integrating and freely providing the spatial information such as satellite data and geographical information, we expect to generate synergetic effect with the combination of CEReS research method and result, then to create a new field and to feedback the scientific results to a local.</p>
<p><b>Summary of Achievement</b> Satellite remote sensing was applied to various problems existing in Asian region. The problems to be solved include water problems, food problems, air pollution, and many. New remote sensing techniques were developed for advanced agriculture, air pollution monitoring, and so on. Satellite imageries and their secondary data were open to public through world wide web to promote the utilization of satellite remote sensing.</p>
<p><b>Details of Achievement</b></p> <p><b>Achievement 1: Water problems in China</b></p> <p><b>1-1 Hydrological cycle in North China Plain, China<sup>1)</sup></b> Fields research was started in 1998 concerning hydrological cycle (including flux studies) and its implications to water problems in North China Plain (NCP). Decadal collaboration with Chinese colleagues achieved proper recognition of current situation and future perspective of water resources in semi-arid NCP.</p> <p><b>1-2 China's Great flood in 1998<sup>2)</sup></b> China suffered great flood in Changjiang, Songhua and Nenjiang in 1998. Especially, flood hazard in Changjiang got worldwide news coverage. Because 1998 was the warmest year after global warming got a position of primary global concern, the floods were tend to be considered as the effect of global warming. Detailed monitoring of flood by satellite and field research with Chinese colleges revealed the floods are influenced not only by climatic change but also by human factors.</p> <p><b>Achievement 2: Environmental monitoring in Asia</b></p> <p><b>2-1 Herbaceous plant monitoring in semi-arid environment<sup>3)</sup></b> Herbaceous plant that supports environment and life in semi-arid region was vulnerable to climatic change. The response of herbaceous plant to weather conditions was examined in Mongolia and Inner-Mongolian Plateau. The outcomes gave an implication on the response of grassland ecosystem to the global warming.</p> <p><b>2-2 Groundwater degradation in arid region<sup>4)</sup></b> Groundwater as a primary water resource in arid region was investigated in United Arab Emirates, Turpan basin in western China, and the Dead Sea Basin, Jordan. Synthetic research including remote sensing revealed the occurrence of groundwater, changes in groundwater cycle, geochemical characteristics, accompanied water problems, and so on. The outcomes offered valuable knowledge for integrated water managing in arid regions.</p> <p><b>2-3 Hydrological changes in Xinjiang, China<sup>5)</sup></b> The response of regional water resources to the climatic changes was investigated in Xinjiang, China. Water resources were changing under the influences of both human factors and climatic factors. The outcome presented the holistic perspective of future water resources in Xingjiang.</p> <p><b>2-4 Heat island studies in Tokyo Metropolitan Area<sup>6)</sup></b> Heat islands in Tokyo Metropolitan Area were researched by using remote sensing and GIS. The results showed the decadal changes in heat islands and its effect to local weather conditions.</p> <p><b>Achievement 3: Air pollution monitoring</b></p> <p><b>3-1 Measurement of NO<sub>2</sub> and aerosol in the urban atmospheric using differential optical absorption spectroscopy (DOAS) with an aviation obstruction light source<sup>7), 8), 9), 10)</sup></b> We proposed a novel DOAS method that is based on a white flashlight source and a compact CCD spectrometer. By using an optical path length of 5.5 km, for instance, NO<sub>2</sub> and SPM concentrations can be measured with an accuracy of 1 ppb and 1 μg/m<sup>3</sup>, respectively. The DOAS method acquires a data point every five minutes, much more frequent than the data (every one hour) provided from the Ministry of the Environment</p>

Atmospheric Environmental Regional Observation System (AEROS).

### **3-2 Measurement of atmospheric pollutants using differential optical absorption spectroscopy (DOAS) with a PC projector light source <sup>11)</sup>**

The DOAS measurement with an aviation obstruction light is limited to the daytime. Moreover, the measurement cannot be carried out where no obstruction flashlight is situated. Alternatively, we proposed the use of a commercially available PC projector as a white-light source. This is relatively inexpensive, yet the possibility of unattended, continuous operation is quite suitable for the DOAS measurement. This light source is portable, and it can be used during both daytime and night time. A conventional PC projector was successfully used as a DOAS light source in Seoul, Chiba and Nagano, making it possible to observe the data for 24 hours.

### **Achievement 4: Utilization of Spatial Information Data project**

#### **4-1 Development of an efficient sugar beet cultivation support system <sup>12,13)</sup>**

To assess the feasibility of developing an efficient sugar beet cultivation support system to effectively reduce the costs of beet cultivation, beet collection and sugar production using an agricultural spatial information data, and also to predict the root yield of sugar beet three months before the harvesting season, an analysis of satellite data and meteorological data was carried out in this study.

### **Achievement 5: Environmental Information Base Projects**

#### **5-1 Land Information Browsing System**

Homepages that publish digital thematic maps was constructed on WWW and open to public through internet. The datasets include secondary products of satellite data and thematic maps on land characteristics.

#### **5-2 Satellite Image Browsing System**

Homepages that exhibit past satellite images were constructed on WWW and open to public through internet. Past imageries after 1972 could produce new information through synergy with clients.

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