ABSTRACT
The ROCSAT-2 is designated to the second satellite of the Republic of China. It is expected to be launched in 2003, and is designed primarily to image the region of Taiwan Island. The equatorial descending local time is around 10:00 a.m. The satellite will be operated in a circular sun-synchronous orbit with exactly 14 revolutions per day. By virtue of the nearly global coverage of the orbit, the images taken by ROCSAT-2 can also be acquired through international cooperation if the foreign ground stations are capable of receiving the downlink data. The satellite will provide high tasking agility for along-track or cross-track imaging with the viewing field of regard of 45 deg. The remote sensing instrument (RSI) has four Landsat-like multispectral visible bands. It will provide images for 2 m ground sampling distance (GSD) in panchromatic band and 8 m GSD in multispectral bands over 24 km swath in the nadir direction. The secondary payload of ROCSAT-2 is a scientific instrument called the imager of sprites, the upper atmospheric lightening (ISUAL). It will be the first payload to observe the upper atmospheric lightening from space. The objective of this experiment is to study the nature of electrodynamic coupling between thundercloud and upper atmosphere. The theoretical analysis for ROCSAT-2 system is presented in this paper.

1. INTRODUCTION
The National Space Program Office (NSPO) is executing a long term space program for the Republic of China (ROC) since 1991. With increasing number of commercial remote sensing satellites coming on line currently or in the near future, such as SPOT-4 & 5, Landsat-7, and IKONOS, the remote sensing applications are expected to flourish in Taiwan. On the other hand, Taiwan is experiencing rapid economic growth with dynamic changes in land use. Especially, it is an island prone to natural disasters brought on by typhoons during the summer time and by frequent earthquakes. Timely available of remote sensing data is essential and critical for Taiwan’s development. As the second satellite program initiated by NSPO, ROCSAT-2 will focus primarily on satisfying local users need. Therefore, frequent revisit and timely available data for Taiwan area are very important characteristics that distinguish the ROCSAT-2 from other commercial satellites.

The ROCSAT-2 mission objectives include civilian applications such as natural disaster evaluation, agriculture and forestry and land use planning, environmental monitoring, coast guard and rescue, academic researches and education, and international cooperation. It is a three-axis stabilized satellite to be launched by a small expendable launch vehicle into a sun-synchronous orbit. The primary payload is remote sensing instrument (RSI) and the secondary payload is imager of sprites, the upper atmospheric lightening (ISUAL). The main purpose of this paper is to present the theoretical study for ROCSAT-2 system.
2. MISSION DESIGN
ROCSAT-2’s mission is to daily image the Taiwan and its surrounding area for disaster monitoring, land use planning, and oceanic surveillance during the 5-year mission lifetime. In nighttime it is designed to pass over Amazon, Indonesia, and US mid-west for sprite imaging; and over Arctic and Antarctic for aurora imaging. The image taken in the nadir direction will have a swath width of 24 km. It has a field of regard of ±45 deg for off-the-track viewing. The imaging over Taiwan will be conducted under a favorable sunlight condition, and preferable to completely image the whole Taiwan Island during one pass. The ROCSAT-2 system architecture, including satellite, ground, and data processing, is shown in Figure 1. The mission orbit parameters are as follows:
- Altitude: 891 km circular sun-synchronous orbit
- Inclination: 98.99 deg
- LTDN: 9:45 a.m.
- Groundtrack: passing through the point located at (120.0 deg E, 24 deg N)

3. SATELLITE SYSTEM
The ROCSAT-2 satellite includes the spacecraft bus, RSI, and ISUAL. The spacecraft bus and RSI are built by Astrium in France cooperated with NSPO, and ISUAL is built by University of California at Berkeley (UCB) in US cooperated with Tohoku University in Japan and National Cheng Kung University (NCKU) in Taiwan.

4. GROUND SYSTEM
The ROCSAT ground segment (RGS) is a collection of ground-based resources linked by a communication network to provide tracking, telemetry, command, monitoring, and control functions for the ROCSAT serial missions. The NSPO also maintains a contract with European Space Agency (ESA) to use its two TT&C stations during emergency situation. The RGS will be utilized to support the ROCSAT-2 mission. New capability and capacity will be planned and added to the existing infrastructure according to related ROCSAT-2 mission requirements. The RGS mainly includes multi-mission center (MMC) and X-band antenna system (XAS).

5. CONCLUSIONS
The ROCSAT-2’s daily revisit for a large coverage not only will fulfill the Taiwan’s domestic needs, but also will promote the international cooperation for Earth resource exploration. The scientific payload on board ROCSAT-2 will conduct the first mission for red sprite observation, which will be valuable for the science community in the world. Any kinds of international cooperation related to the ROCSAT-2 image data or science data are welcome.

6. REFERENCES
2. NSPO’s Document, “ROCSAT-2 Systems Requirements Review (SRR) Report,” RS2-
Figure 1. ROCSAT-2 System Architecture.