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| 著者(和文) | TouchSamphors |
| Author(English) | Samphors Touch |
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論文審査の要旨及び審査員

| 報告番号 | 甲第 | 号 | 学位申請者氏名 | | Samphors Touch | |
|-------------|-----|--------|---------|-----|-----------------------|-----|
| | | 氏名 | 職名 | | 氏名 | 職名 |
| 論文審査 審査員 | 主査 | 竹村 次朗 | 准教授 | 審査員 | 阿部 直也 | 准教授 |
| | 審査員 | 大即 信明 | 教授 | | Thirapong Pipatpongsa | 准教授 |
| | | 日野出 洋文 | 教授 | | | |
| | | 高橋 章浩 | 教授 | | | |

論文審査の要旨 (2000 字程度)

This doctoral thesis entitled "Case studies on environmental evaluations of ground surface in paddy fields and deep subsurface under a coal mine" aims at two main objectives, 1) searching the significant bands of vegetation indices that can indicate the relationships between electrical conductivity of soil and field hyperspectral reflectance of rice, 2) proposing methodology of ground water modeling for large area open pit lignite mine to control groundwater pressure in deep-seated aquifers for safe deep excavation. Both objectives are related to large area problems with limited qualitative and quantitative data, which is common in developing countries. The outline of thesis is summarized as follows:

Chapter 1: [Introduction] Background, problem statement, objectives and scope of this research are explained.

Chapter 2: [Remote sensing for evaluating the soil salinity] The fundamental backgrounds of soil salinity and the remote sensing technology for evaluating the soil salinity were explained. In addition, the literature review of previous research related to soil salinity using remote sensing technique was also summarized.

Chapter 3: [Relationships between electrical conductivity of soil and reflectance of the rice in northeastern Thailand] Detail methodology and results of case studies for soil salinity are presented. The statistical analysis revealed that the changes in soil electrical conductivity (EC) were significantly sensitive to the ripening stages of both jasmine rice and glutinous rice planted on different levels of soil salinity. Among reflectance measurements, canopy reflectance was highly correlated with soil EC. The highest correlations are found in the near infrared (NIR) and shortwave infrared (SWIR).

Chapter 4: [Relationships between electrical conductivity of soil and reflectance of the soil in northeastern Thailand] The relationships between soil EC and reflectance are studied together with the chemical compositions in the salt-affect soils. From the investigation, the appropriateness of EC as salinity indicator is confirmed. The weaker correlation is found between the EC and soil reflectance than that between the EC and rice reflectance.

Chapter 5: [Environmental problems in open pit mining and groundwater modeling for the assessment] General background of groundwater modeling, groundwater problem in mining for safety assessment are explained, such as groundwater flow equation, type of aquifers, influence of groundwater on stability, mode of floor heaving and floor heaving evaluation.

Chapter 6: [Groundwater modeling of Mae Moh open pit lignite mine, Thailand] Critical features and condition of Mae Moh open pit mine are presented. Especially hydro-geological setting, climate, and rainfall are carefully studied considering the process of groundwater modeling, such as conceptual model, model domain and grid design, and specification of material properties, model boundary condition and initial head distributions. The calibration of steady state and transient state models were also made to ensure that the groundwater modeling met the acceptable agreement between observation heads and computed head.

Chapter 7: [Floor heaving analysis of Mae Moh open pit lignite mine, Thailand] This chapter explains the case study of model prediction to establish the rational dewatering plan to reduce adverse groundwater pressure for the safe excavation with minimum pumping volumes. From the study, the dewatering plan was proposed for the period from 2007 to 2015.

Chapter 8: [Conclusions and recommendations] The conclusions and recommendations from the case studies done for the two environmental problems, soil salinity and groundwater, are summarized. The limitations of this research and necessity of detailed investigations for the further researches were also reported.

This study is considered as valuable outcomes contributing to the advancement of Engineering especially in the field of Geo-environmental Engineering. Therefore, it is considered sufficient in fulfillment of the requirement for the degree of Doctor of Philosophy.