

Ecological and Physical Effects of the Surficial and Groundwater Exchanges Between Land and Sea (EPHESUS)

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The Southern Bohai Sea is highly impacted by significant hydrological processes such as morphological changes and mixing between continental fresh waters (surficial and groundwater) and marine waters. These processes generally take place in coastal areas because of human activities superimposed to natural processes. The salt contamination, pollution and land sinking, are producing serious damages to the soil properties, freshwater resources as well as jeopardize the eco-biological system. In order to perform a correct coastal management, hydrological processes have to be in depth understood. The occurrence of alternating dry/wet conditions in transitional environments, such as wetlands, deltas, and lagoons, usually challenges the use of traditional direct and geophysical surveys for comprehensive hydrogeologic investigations. The object of the project is to implement a new monitoring system integrating various Earth Observation techniques, in situ measurements and hydrological models. Advanced remote sensing techniques integrating optical, thermal and microwave imageries will be applied in two test areas.

Multispectral imagery will be processed for identifying changes in land-cover and land-use through time (in the past 20 years), enhancing the transformations from agricultural to industrial use or from wetlands to fish farms which have impacted coastal ecosystems. Moreover, optical data will be used to monitor water quality parameters. With hyperspectral images, we will study the ecological vegetation responses to soil salinization; thermal data will be used to detect sea surface temperature anomaly, and EO techniques based on SAR interferometry will be used to find the ground subsurface deformation. Through the implementation of this project, regional remote sensing algorithms and retrieval models will be proposed for salty water intrusion, and a demonstration of multi-sensor integration will be established for the Southern Laizhou Bay. Scientific publications, participation to DRAGON3 meetings and young scientist training as well as dissemination are important outcomes of this project. Funding from Chinese Academy Sciences and other departments of China (NSFC, SOA, MEP etc) will provide financial support to carrying out the project, including field measurements and laboratory data analysis.

地表及地下水"陆 - 海"交换的生态和物理效应

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水文过程对渤海南部影响甚为严重，如，包括地表水与地下水在内的陆地淡水与海水间的混合、形态变化等；由于海岸带区域人类活动对自然过程的介入，这些过程带来的生态和物理效应十分突出。咸水入侵、污染和地表沉降，都正在对土壤性质、淡水资源带来损害，同时危及生物生态系统。为科学地开展海岸带管理，必须深入了解水文过程。湿地、三角洲和泻湖等干湿交替的过渡环境，通常会对基于传统、直接的地球物理调查方法的综合水文地质考察带来挑战。本项目拟集成各种先进地球观测技术、现场观测及水文模型、建立一新的监测系统。基于可见光、热红外及微波的先进遥感技术集成，将会被用于黄河三角洲、莱州湾及其流域两个试验区的观测。

多光谱遥感影像将被用来识别过去20年间地表覆盖相关变化，这些变化已经影响到了沿海生态系统，其中重点关注农业用地向工业、城市用地的转变、湿地向养殖场的转变。此外，光学遥感将被用于水质参数监测。我们将利用高光谱影像研究植被、生态对土壤盐碱化的响应；利用热红外数据探测海表温度异常，以及采用基于干涉合成孔径雷达观测技术监测地表形变等。通过本项目的实施，我们将会提出关于海水入侵的区域化遥感指针、反演模型与评价方案，也会建立针对莱州湾南部的多源遥感集成示范。本项目成果，将包括科学出版物、参加"龙计划3"会议、年轻科学家培养以及科学传播等。来自中国科学院、国家自然科学基金委员会、国家海洋局以及国家环境保护部等部门的相关研究计划，会对本项目的实施提供资助，包括野外采样及室内数据分析。