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Author: Ms. Manyi Guo
China Academy of Aerospace Science and Innovation, China

Mr. Guang Huo
China Academy of Aerospace Science and Innovation, China
Dr. Mingkun Li
China Academy of Aerospace Science and Innovation, China
Mr. Kaige Wang
China Aerospace Science and Technology Corporation (CASC), China
Dr. Baoliang Sun
China Academy of Aerospace Science and Innovation, China
Dr. Xiaoning Zhao
China Academy of Aerospace Science and Innovation, China

DESIGN OF EMERGING CONTAMINANTS ORIENTED CLOUD-EDGE-END SPACE-GROUND INTELLIGENT MONITORING AND MANAGEMENT SYSTEM

Abstract

In view of the seriousness and urgency of dealing with emerging contaminants(ECs) scientifically, effectively and sustainably, innovative pilot work about intelligent monitoring and management of ecological environment has been carried out at different districts all over China such as Liangjiang district in Chongqing. In order to develop low-cost ECs treatment capabilities with wider monitoring range, more precise detection and faster adjustment, a design of ECs oriented cloud-edge-end space-ground intelligent monitoring and management system has been proposed in this paper, which features space-based monitoring capabilities for ECs and the cloud-edge-end intelligent application architecture of ecological environment protection.

In the aspect of space-based monitoring capabilities for ECs, new satellite payloads and heterogeneous constellations have been designed considering monitoring requirement and specific spectrum of ECs, which is regarded as the capability extension of current mature ground-based monitoring means. Based on high-resolution satellite images(HRSI), set geographical nodes along ECs diffusion paths described in digital elevation mode(DEM) after necessary process and divide objective districts into grids taking these nodes for reference. Besides, establish thorough ECs database at particular nodes by means of data spatialization and pick grids representing areas polluted more severely as hot spots with a modified recognition method proposed in this paper. Within hot spots, achieve precise positioning of ECs sources after eliminating influence of weather or temporary environment change by conducting dynamic monitoring.

In the aspect of the cloud-edge-end intelligent application architecture of ecological environment protection, define central data processing resource, resources of environment departments at all levels and multi-domain sensors as the cloud, edges and ends in sequence. Under this application architecture proposed in this paper, digitization and intelligence of data perception, communication, processing and management will be integrated and multiplied. Firstly, intelligent data perception contributes to awareness and prediction of pollution as well as recognition and tracing of contaminants. Secondly, intelligent data communication can support real-time monitoring and control and solve intercommunity, interoperability and compatibility problems among data link nodes. Thirdly, intelligent data processing is used to precise detection and reliable evaluation as well as hierarchical decision and effective conduction. Finally,

intelligent data management will achieve optimized and customized data-push to improve sense, degree and activity of public participation for environment protection.

All in all, the introduction of new domain technologies and platforms as well as the intelligent data collaboration will have great significance for the innovative treatment of ECs.