地学前缘 2008, 15(5) 256-263 DOI: ISSN: 1005-2321 CN: 11-3370/P



论文

# 铜陵矿区土壤重金属元素的空间变异及污染分析

1 合肥工业大学 资源与环境工程学院, 安徽 合肥 230009
2 安徽省地质调查院, 安徽 合肥 230009

摘要:

运用地统计学分析手段对铜陵矿区土壤中的As、Cd、Hg、Pb和Zn 5种重金属元素进行空间变异分析及空间插值,并进行污染分析,以期为铜陵矿区土壤环境评价、土壤污染修复及环境决策提供科学依据。数据来源于“安徽省江淮流域多目标区域地球化学调查”结果,采用Johnson变换进行正态转换,地统计拟合变异函数中,As、Cd元素为球状模型,Pb、Zn元素为五球形模型,Hg元素为指数模型。结果表明,As、Cd、Pb、Zn元素的变异函数表现为各向异性,其方向性可能主要受矿床分布控制;Hg元素块金效应较大,表明其受小尺度因子影响较大,其进一步分析须增加采样密度。铜陵矿区土壤中的As、Cd、Pb和Zn元素均有较高的污染风险,尤其Cd元素污染风险最大,而Hg元素的污染风险较低。As元素污染的主要原因是铜矿、铅锌矿、褐铁矿矿床及其开发;Cd元素的污染与铅锌矿床及其开发,以及农业污灌有关;Pb、Zn元素的污染与铅锌矿床及其开发密不可分。

关键词: 土壤;重金属;地统计学;空间变异;铜陵

## Spatial variance and pollution analysis of soil heavy metals in Tongling mining area, South China.

1.School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, China
2.Anhui Institute of Geological Survey, Hefei 230009, China

Abstract:

The paper interprets the spatial variance structure of As, Cd, Hg, Pb and Zn in soil in the Tongling mining area of China, makes spatial interpolation, and analyzes the pollution by using geostatistical method, expecting to provide insight into risk assessment of environmental pollution, soil remedy and decision making. The dataset of soil element contents is derived from project of “Multi target Regional Geochemical Survey in Jianghuai Drainage Area in Anhui Province” by Anhui Institute of Geological Survey, China. With normalized datasets that are transformed by Johnson transformation, the variogram models are fitted, in which the As and Cd are spherical, Pb and Zn are pentaspherical, and Hg is exponential. The results show that the variograms of As, Cd, Pb and Zn exhibit anisotropy, which possibly is controlled by the distribution of ore deposits; Hg behaves strong nugget effect, which is influenced by small scale factors, and the further study should increase the sample density. The As, Cd, Pb and Zn in soil in the Tongling mining area have high pollution hazard, especially the Cd; the Hg has low hazard. The pollution of As results from the copper deposits, the lead zinc deposits and limonite, and from their exploitation; the pollution of Cd is related to lead zinc deposits, the exploitation, and agricultural irrigation with waste water; the pollution of Pb and Zn are mostly ascribed to the lead zinc deposits and related exploitation.

Keywords:

Key words: soil; heavy metal; geostatistics; spatial variance; Tongling

收稿日期 null 修回日期 null 网络版发布日期 null

DOI:

基金项目:

安徽省科技攻关计划项目(08010302200);安徽省优秀青年科技基金项目(08040106907,04045063);中国地质调查局项目(2004 012)

通讯作者:

作者简介: 白晓宇(1983—),男,硕士研究生,研究方向为资源与环境的综合评价及信息技术。E mail: baidayuvictor@163.com