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论文

基于RBF神经网络的煤储层随机建模

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摘要：

利用RBF神经网络进行非条件模拟，改进估计加模拟误差法(ESE)随机模拟技术，在ArcGIS和MATLAB软件平台上进行煤储层随机建模。在贵州省织纳煤田实例研究中，获得了与煤层气资源量有关的煤层厚度、空气干燥基灰分、煤中空气干燥基水分等煤储层属性随机建模多个实现。利用50，100次两组随机建模实现计算煤层气资源量，进行概率资源量分布特征研究，煤层气概率资源量分布类型相似，基本呈正态分布，资源量变化范围分别为14.972×10 8 ~16.964×10 8 ，14.972×10 8 ~17.047×10 8 m 3 ，平均值分别为15.92×10 8 和15.97×10 8 m 3 。利用100次随机建模实现获得的资源量数据制作累积概率分布图，得到P90，P50，P10三个概率资源量。研究区煤层气实际资源量大于P90（15.389×10 8 m 3 ）的概率是90%，大于P10（16.611×10 8 m 3 ）的概率为10%。提出基于栅格像元的煤层气资源量概率空间变异分析方法，通过计算获得了由50次随机模拟实现得到的栅格资源量概率空间变异图。

关键词： 随机建模；煤储层；径向基函数神经网络；估计加模拟误差

Stochastic simulation of coalbed methane reservoir by radial basis function neural network

Abstract:

Stochastic simulation method，known as Estimation & Simulation Error(ESE)，was ameliorated for coalbed methane(CBM) reservoir characterization.In the method，the unconditional simulation process was a vital step，which was achieved by radial basis function neural network(RBFNN) based on MATLAB and ArcGIS geographic information system(GIS).The method was applied to generate many Stochastic simulation realizations of coal bed attributes relevant to CBM reserves from coalfield Geodatabase，including coalbed thickness，ash and moisture content，in the case study in Zhina coalfield，Guizhou，China.Two groups of gas reserves were calculated with the data obtained from eighty-four wells by using fifty and one hundred of random realizations.Analysis of these reserves indicates that they have the analogical normal probability distribution，the reserves range are 14.972×10 8 -16.964×10 8 m 3 and 14.972×10 8 -17.047×10 8 m 3 respectively，and the average reserves are 15.92×10 8 and 15.97×10 8 m 3 respectively.Three probabilistic reserves，named as P90，P50 and P10，were acquired from the reserves by using one hundred of random realizations.The probabilities of the real reserves more than P90(15.389×10 8 m 3) and P10(16.611×10 8 m 3)is 90% and 10% respectively.Methodology was presented for the cell-scale spatial variability of gas reserves probabilities，which was subsequently applied to the case study.The spatial variability of gas reserves probabilities is performed by the probabilities calculation in the fifty raster data layers of gas reserves from fifty random realizations.

Keywords: stochastic simulation;coalbed methane reservoir;radial basis function neural network;estimation & simulation error(ESE)

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