

反应堆工程

# 基于奇异值分解方法的嫦娥一号γ射线谱仪谱线定性分析

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**摘要** 针对嫦娥一号γ射线谱仪(CE1 GRS)探测数据难以从谱形特征直接进行定性分析的问题,提出采用噪声调整的奇异值分解(NASVD)方法提取CE1 GRS数据中相互正交的谱线主成分,然后分别分析月表各区域对应谱线的低序层谱线中的峰信号,通过鉴别各峰信号对应的能量值是否等于特定元素的特征γ射线能量来确定月表各区域的元素种类。结果表明,该方法能够识别出的月表可能元素包括U、Th、K、Fe、Ti、Si、O、Al、Mg、Ca和Na等11种元素。

**关键词** [嫦娥一号γ射线谱仪](#) [γ射线谱](#) [定性分析](#) [奇异值分解方法](#)

分类号

## Qualitative Analysis of Chang'e-1 γ-ray Spectrometer Spectra Using Noise Adjusted Singular Value Decomposition Method

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**Abstract** From the features of spectra shape of Chang'e-1 γ-ray spectrometer (CE1 GRS) data, it is difficult to determine elemental compositions on the lunar surface. Aimed at this problem, this paper proposes using noise adjusted singular value decomposition (NASVD) method to extract orthogonal spectral components from CE1 GRS data. Then the peak signals in the spectra of lower order layers corresponding to the observed spectrum of each lunar region are respectively analyzed. Elemental compositions of each lunar region can be determined based upon whether the energy corresponding to each peak signal equals to the energy corresponding to the characteristic gamma-ray line emissions of specific elements. The result shows that a number of elements such as U, Th, K, Fe, Ti, Si, O, Al, Mg, Ca and Na are qualitatively determined by this method.

**Key words** [Chang'e-1 γ-ray spectrometer](#) [gamma-ray spectra](#) [qualitative analysis](#) [noise adjusted singular value decomposition method](#)

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