

Volcanic ash cloud detection from MODIS image based on CPIWS method

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Abstract

Volcanic ash cloud detection has been a difficult problem in moderate-resolution imaging spectroradiometer (MODIS) multispectral remote sensing application. Principal component analysis (PCA) and independent component analysis (ICA) are effective feature extraction methods based on second-order and higher order statistical analysis, and the support vector machine (SVM) can realize the nonlinear classification in low-dimensional space. Based on the characteristics of MODIS multispectral remote sensing image, via presenting a new volcanic ash cloud detection method, named combined PCA-ICA-weighted and SVM (CPIWS), the current study tested the real volcanic ash cloud detection cases, i.e., Sangeang Api volcanic ash cloud of 30 May 2014. Our experiments suggest that the overall accuracy and Kappa coefficient of the proposed CPIWS method reach 87.20 and 0.7958%, respectively, under certain conditions with the suitable weighted values; this has certain feasibility and practical significance.

Key words: remote sensing image, principal component analysis (PCA), independent component analysis (ICA), support vector machine (SVM), volcanic ash cloud.

Full text is available at

<https://link.springer.com/article/10.1007/s11600-017-0013-1>