Alteration mineral mapping and metallogenic prediction using CASI/SASI airborne hyperspectral data in Mingshujing area of Gansu Province, NW China

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Hyperspectral remote sensing is a frontier of remote sensing. Due to its advantage of integrated image with spectrum, it can realize objects identification, superior to objects classification of multispectral remote sensing. Taken the Mingshujing area in Gansu Province of China as an example, this study extracted the alteration minerals and thus to do metallogenic prediction using CASI/SASI airborne hyperspectral data. The Mingshujing area, located in Liuyuan region of Gansu Province, is dominated by middle Variscan granites and Indosinian granites, with well developed EW- and NE-trending faults. In July 2012, our project team obtained the CASI/SASI hyperspectral data of Liuyuan region by aerial flight. The CASI hyperspectral data have 32 bands and the SASI hyperspectral data have 88 bands, with spectral resolution of 15nm for both. The hyperspectral raw data were first preprocessed, including radiometric correction and geometric correction. We then conducted atmospheric correction using empirical line method based on synchronously measured ground spectra to obtain hyperspectral reflectance data. Spectral dimension of hyperspectral data was reduced by the minimum noise fraction transformation method, and then purity pixels were selected. After these steps, image endmember spectra were obtained. We used the endmember spectrum election method based on expert knowledge to analyze the image endmember spectra. Then, the mixture tuned matched filter (MTMF) mapping method was used to extract mineral information, including limonite, Al-rich sericite, Al-poor sericite and chlorite. Finally, the distribution of minerals in the Mingshujing area was mapped. According to the distribution of limonite and Al-rich sericite mapped by CASI/SASI hyperspectral data, we delineated five gold prospecting areas, and further conducted field verification in these areas. It is shown that there are significant gold mineralized anomalies in surface in the Baixianishan and Xitan prospecting areas. The application of CASI/SASI airborne hyperspectral remote sensing data in the metallogenic prediction of the Mingshujing area has achieved ideal results, indicative of their wide application potential in geological research.