

Study on extracting soil moisture information by fusion of optical and radar data

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In this paper, the IHS transformation is used to integrate ASAR radar image and TM optical image, and then the soil humidity index is acquired by performing BP neural network based on the output of the image integration. The radar backscattering coefficient are highly relevant to the soil moisture in the bare flat areas, so are the TM3,4,5. Therefore the two can be combined with better soil moisture information extraction. Two methods are tested respectively for TM and ASAR data fusion and humidity index extraction. For the first one, the IHS integration of TM3, 4, 5 and ASAR data is firstly carried out, and then the result of fusion together with TM6 is used as input of the BP neural network and the output corresponds to five different categories according to different soil moisture values. The second, the thematic information (Land Surface Temperature LST, Normalized Difference Moisture Index NDMI, Normalized Difference Vegetation Index NDVI), which are closely related to soil moisture information, is extracted, and then integrated with ASAR data to obtain soil humidity index using the BP neural network. Finally, the fusion images are evaluated qualitatively and quantitatively using entropy, average gradient and Standard deviation. The field ground data are also used to validate the soil humidity index calculated by the two different ways. It shows that the data fusion by IHS transformations can not only retain the spectral characteristics of the original multi-spectral image, but also obtain rich spatial information of radar image, which will help interpret the image. Comparatively, the indirect fusion should be more conducive to reflect the soil moisture information.

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