Geophysical Research Abstracts
Vol. 21, EGU2019-7965, 2019
EGU General Assembly 2019

Flood monitoring based on FY-3/MWRI data

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Floods are one of the most frequent hazards in the world. Flood monitoring and warning are the common concerns of many countries. Fengyun-3 Microwave Radiation Imager (FY-3/MWRI) data present a capability for flood-waterlogging monitoring and soil moistures estimation because of the ability of the microwave signal to penetrate through cloud and provide a daily coverage and because they are sensitive to the water and near soil surface.
Firstly, the approach of FY-3/MWRI data for flood monitoring is put forward based on the polarized ration index (PRI) using MWRI vertically and horizontally polarized brightness temperature values in this paper. PRI is less affected by atmospheric conditions and is not dependent on the soil temperature. Furthermore, this index is sensitive to the soil wetness. PRI at 36.5GHz and 89GHz are calculated separately to analyze the characters of different frequency channels. The two frequencies with higher spatial resolution than others frequency are proper to detect earth surface detailed information.
Secondly, the spatial resolution of MWRI data are interpolated to 10km, at this resolution, many water surfaces will generally be imaged as mixed pixel containing substantial fractions of water and land. So, PRI is a combination of different response generated by the water surface and the land surface. The PRI characterizing each surface type is weighed by its surface fraction. Water surface fraction (WSF) method based on Linear Special Mixed Model is applied to estimate subpixel scale water area.
Thirdly, to realize the one map of flood-waterlogging information, the map is requested to simultaneously show the flood water and soil moisture information. The flood-waterlogging thematic map product generated by WSF information layer overlaying on the soil moisture layer is designed in this paper.
In July of 2013, the Songhuajiang river basin of China was hit by severe heavy rains. The rise of water level in rivers, lakes and reservoirs caused the severe flooding and waterlogging disaster. MWRI images on July were selected to carry out an experiment upon the method. The WSF flooding maps of Songhuajiang river basin were produced. To evaluate the WSF mapping method presented in this study, the flooding map derived from MODIS images with 250m spatial resolution were used to validate the flooding map base on MWRI data with 10km using WSF method. The results showed that there was good agreement on the aspect of flooding spatial distribution characteristics between MODIS and MWRI data. The WSF method based on MWRI PRI was able to produce satisfying flood maps over large-scale coastal areas. The flood-waterlogging thematic map product can provide more abundant information for flood control and disaster alleviation.