

MERIS–BASED AQUATIC PETROLEUM POLLUTION MONITORING MODE

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Abstract: It is imperative under the situation that the monitor is strengthened in the face of accidental and accumulative circumstance of aquatic petroleum pollution. And as well the control of its spatial and temporal changes in time will be helpful in the protect of marine environment and in the guarantee of the sustaining development of proliferous and breed aquatics. Remote sensing technique can be used as a important detection means owing to its advantages of cover-wide, dynamic and low-cost in the obtainment of regional information.

This paper presents a study of satellite–based aquatic petroleum pollution monitoring mode. First, four field data collections were made in 2006 and 2007. The sampling sites were in northwest China and northeast China where the rivers are all threaten by petroleum pollution. Reflectance spectra were measured with a portable FieldSpec FR spectroradiometers (ASD Inc.) (350-1050nm). Currently water samples for concentration measurement associated with chlorophyll and petroleum contamination and suspended material guided by some related standard of China.. The features of the spectral reflectance were probed into with the 148 collected spectral data and water quality parameters using elimination method. The most important feature of water spectra in visible and near-infrared wavelength influenced by petroleum pollution was discovered after analysis in detail. It exhibited three peaks and two troughs in the water spectral curves influenced by petroleum contamination. The peaks are near 570-590nm and 680-710nm and 810-830nm, respectively. The troughs are near 650-680nm and 740-760nm, respectively.

Secondly, the 109 samples collected from the polluted rivers in 2006 and 2007 were employed to simulate remote reflectance of ENVISAT/MERIS, which a 68.5° of Field-of-View push-broom imaging spectrometer that measure the solar radiation reflected by the Earth, at a ground spatial resolution of 300m, in 15 spectral bands. The field spectral data were processed as corresponding bands of ENVISAT/MERIS. At the same time the detecting wave of MERIS data determinated above were taken into account. And then the MERIS–based monitoring mode of petroleum pollution concentration was established according to Fisher multiclass discriminant rule and combining with corresponding water quality data. They are

$$\text{Class1} = 1.533 + 14.168 * b_7 - 16.249 * b_8 + 3.769 * b_9 \quad (1)$$

$$\text{Class2} = -2.329 - 18.688 * b_7 + 21.574 * b_8 - 5.897 * b_9 \quad (2)$$

$$\text{Class3} = -1.128 - 3.614 * b_7 + 3.145 * b_8 + 0.633 * b_9 \quad (3)$$

Where, class1, class2 and class3 are respectively score of each class, b7, b8 and b9 are reflectance of three corresponding band of ENVISAT/MERIS. The accuracy is up to 75% for petroleum pollution with the validation of the reserved samples.

Finally, the mode was applied to the ENVISAT/MERIS data overpass on June 5, 2007 in order to obtain the distributing image of petroleum pollution concentration in the rivers. By mean of the image the temporal change and spatial distribute of the petroleum concentration within the rivers were analyzed. The result shows that the establishment of identification mode based on remotely sensing provides an effective means to obtain rapidly and low-cost the concentration of petroleum pollution in water environment.

Keywords: ENVISAT/MERIS, water spectral features, Fisher multiclass discriminant rule, petroleum pollution concentration.