



Detection of the green tide at the Yellow Sea and tracking its wind-forced drifting by remote sensing

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The largest green tide in the world happened during June-July, 2008, at the Yellow Sea where the coastal city of Qingdao is for the sailing events of the 2008 Olympic Games. The green tide is not poisonous, but, it has adverse impacts on many activities, e.g., tourism, transportation, aquaculture. As the results of in-situ investigation, the green tide is formed by the bloom of a macroalgae species, Enteromorpha prolifer, which has the similar spectral responses as green vegetation and thus may be identified by the Normalized Difference Vegetation Index (NDVI). Satellite image data of Moderate Resolution Imaging Spectroradiometer (MODIS) terra/aqua is used to assess the impacted area by the green tide and to monitor its drifting path through the processing procedures including land-water demarcation, clouds removal and green tide identification by NDVI. The bloom was first detected successfully by satellite images on 15 May, 2008, and lasted to the end of July. The results show that the area impacted by green tide was more than 10,000 square kilometers in the middle of Yellow Sea, 25 times as much as the officially reported area surveyed with traditional in-situ measurements. The time series of images indicate that the green tide was not produced in-situ but drifted from the southern Yellow Sea, which can give us important information about the causes of green tide and help us with its prevention. The northward and northwestward drifting paths of green tide is consistent with the southerly to southeasterly wind pattern at the Yellow Sea in Summer which is proved with the simultaneous sea surface wind field retrieved from the Seawinds scatterometer on QuikSCAT. The result suggests that the wind-forced surface current played the key role in the drifting of green tide, and it also gives evidence to an arguable conclusion that the surface current near the northern coast of Jiangsu Province is northward in Summer.