

Passive Microwave Radiometry for Levee Monitoring

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A b s t r a c t The levee in Wilnis that has broken last summer and flooded an urban area has never been inspected on the consequences of long-term drought. So it happened that the levee, that had been assessed 'stable' a month before, nonetheless broke through. To date, the levees in the Netherlands for example are still not being inspected on the consequences of drought. We present a solution in this paper for levee monitoring by means of passive microwave radiometry (PMR). PMR is based on measurements of the natural electromagnetic spectrum of objects in the millimetre to decimetre range of wavelengths. Compared to other remote sensing techniques, such as colour and infrared photography, thermal images and lidar, PMR is the only technology taking measurements under the earth's surface and therefore is very well suited for levee monitoring in a fast and reliable way. PMR systems only record naturally emitted radiation of the earth. Investigations of water and land surfaces occur in the 0.8-2 to 18-30 cm spectral bands. Within these bands, the land surface radiation is primarily a function of the free water content in soil, but it is also influenced by other parameters, such as shallow groundwater, above ground vegetation biomass, salinity and temperature of open water, where the sensitivity is a function of the wavelength. At wavelengths shorter than 0.8 cm, surface radiation is considerably influenced by the atmosphere (water vapour, clouds, rain). At wavelengths longer than 21 cm, the surface radiation is affected by the ionosphere, galaxy radiation, and technical communication facilities. Through this unique project, the PMR technique can be introduced in the Netherlands and the rest of Europe. The team have already been working together successfully on projects in the United States. Very detailed and geo-referenced maps showing the locations of saturated and dry levees can be produced using the radiometers that have to be manufactured, flown from a light aircraft or helicopter, or potentially from spacecraft, and integrated with GPS for positioning and orientation. The timeframe from partners, development of the PMR sensors, first data collection campaign, to data processing and data presentation is one year. If the pilot project meets or exceeds the expectations, the PMR sensors will be used for commercial projects and the partner company will hire extra personnel for flight planning, data acquisition, data processing of the PMR data, project management, sales and technical development. Above all, situations such as described, or worse, will be prevented in the future.