

Land Surface Phenologies and Seasonalities Using Earthlight to Monitor Changes in High-Latitude Croplands

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Phenology and seasonality are complementary aspects of ecosystem functioning: phenology deals with timing of biotic phenomena; whereas, seasonality concerns temporal patterns of abiotic variables. Enhanced land surface parameters derived from passive microwave data enable improved temporal monitoring of agricultural land surface dynamics compared to the vegetation index data available from optical data. Despite a coarser spatial resolution, the AMSR-E data products are more sensitive to intra-seasonal changes in surface moisture than MODIS data products. Accordingly, the AMSR-E data are better able to detect both flash droughts and the onset of drought. We compare and contrast land surface phenologies using data from 2003-2010 in the Volga River Basin of Russia, and the spring wheat belts of the USA and Canada. We find reasonable relationships between retrieved air temperature, fractional open water, surface moisture, and vegetation optical depth at three microwave frequencies. We focus in particular on the extraordinary heat wave that impacts Russia in 2010. The results suggest possible applications for data from the new microwave radiometer AMSR2 launched in 2012.

Keywords: passive microwave, land surface phenology, croplands, Russia, North America, 2010 heat wave