Plants show stress in thermal spectrum

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Plants experience stress as a result of growing under non-optimal conditions. For example, too little water or low temperatures lead to clear responses such as wilting or defoliation. But exposure to milder forms of stress can also affect a plant. Researchers at the ITC Faculty for Geo-information science and Earth Observation of the University of Twente have found a way to detect these milder forms of stress.

A new study reveals that plants show signals in a part of the electro-magnetic spectrum that has been very little studied for plants to date. The study is forthcoming in one of the leading remote sensing journals, ISPRS Journal of Photogrammetry and Remote Sensing.

A team of plant ecologists and spectroscopists of ITC have shown that when plants were stressed, either by lack of water or too low temperatures, plants change their emissivity in the thermal infrared. Emissivity determines how much energy a surface radiates.

Thermal infrared

Electro-magnetic radiation can be characterized by its "size", the wavelength. Very short radiation (400-700 nanometers or 0.0000004-0.0000007 meters) is visible light. Radiation of longer wavelengths is known as infrared radiation and used, for example, in night vision equipment. A specific part of this infrared part of the spectrum, called thermal infrared (3000 – 12000 nanometers), turns out to contain information on whether plants are suffering from mild, but prolonged stress.

Tune energy budget

The importance of the mentioned study is that subtle plant stress can be detected when looking at radiation in the thermal infrared. But also, it means that plants tune their energy budget to some extent by changing how much energy they lose in the form of thermal infrared radiation. This will influence how plants respond to, for example, climatic change.

More information: Maria F. Buitrago et al. Changes in thermal infrared spectra of plants caused by temperature and water stress, *ISPRS Journal of Photogrammetry and Remote Sensing* (2016). DOI: 10.1016/j.isprsjprs.2015.11.003

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