

# A summary of MODIS water content

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The goal of this project is to generate systematic global estimates of vegetation canopy water content from MODIS satellite data. Vegetation water stress has important implications for biogeochemical cycling in natural ecosystems, agriculture, and forestry. Water stress limits plant transpiration and carbon gain. The regulation of photosynthesis creates close linkages between the carbon, water, and energy cycles and to the nitrogen cycle through metabolism.

## Methods

MODIS measures the sunlight reflectance of the vegetation in the visible, near-infrared, and shortwave infrared. Radiative transfer models determine how sunlight interacts with plant and soil materials. These models can be applied over a range of scales and ecosystem types. Artificial neural networks were used to optimize the inversion of these models to determine vegetation water content. We carried out multi-scale validation, of the product using field data, airborne and satellite cross-calibration.

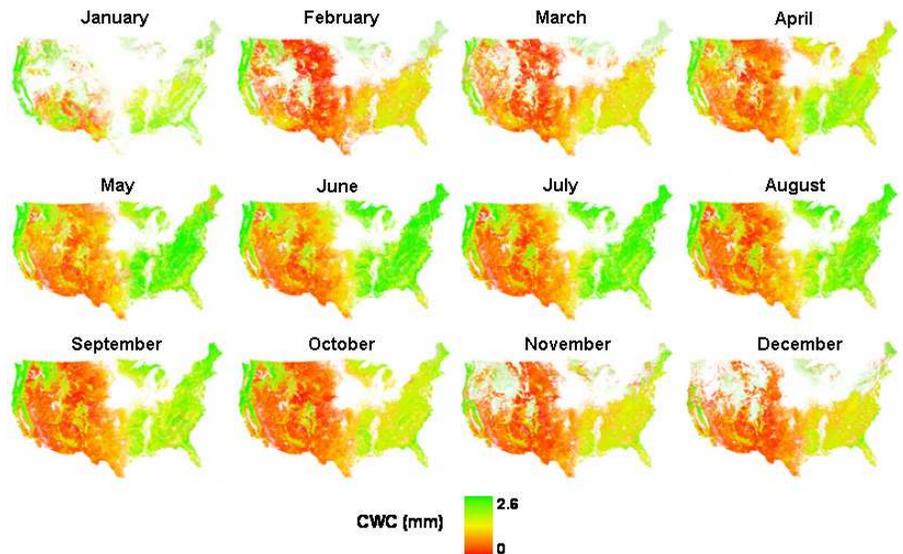


Figure 1. Change in Vegetation Canopy Water Content (CWC) for 2005 for natural vegetated areas in the USA. Areas covered by snow or clouds not considered.

Canopy Water Content - US - Year 2005

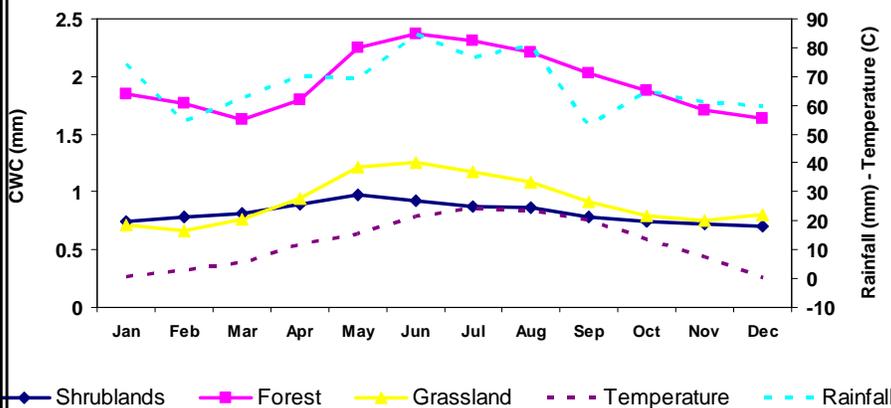


Figure 4. Multitemporal trend in canopy water content (CWC) for the continental USA. Compared with rainfall and air temperature.

## Outcomes

A program publicly available to generate vegetation water content from MODIS images, so this variable can be related to climate and atmospheric circulation variables, predict soil moisture, assess wildfire risk or incorporated in climate evolution models.

## Applications

- Predict the linkages between these cycles to understand feedbacks to atmospheric concentrations of greenhouse gases, and to estimate primary productivity of the biosphere.
- Monitor/assess natural vegetation health related to drought, pollution or diseases.
- Improve irrigation scheduling by reducing the over-watering and under-watering.
- Identify wildfire behavior/risk: drives ignition probability and burning efficiency.
- Good indicator of soil moisture and Leaf Area Index.