Measuring Evapotranspiration Through Remote Sensing

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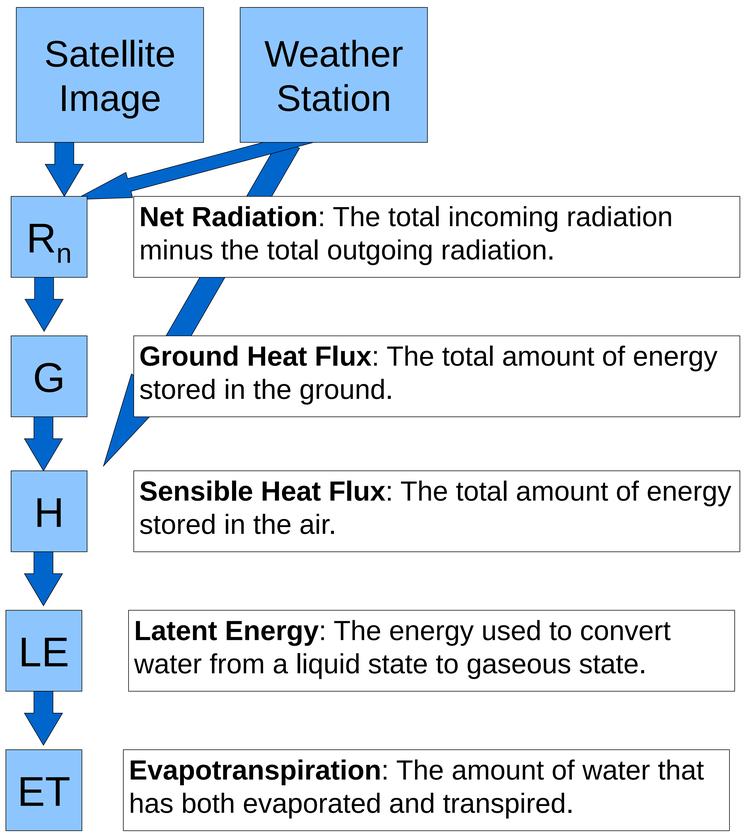
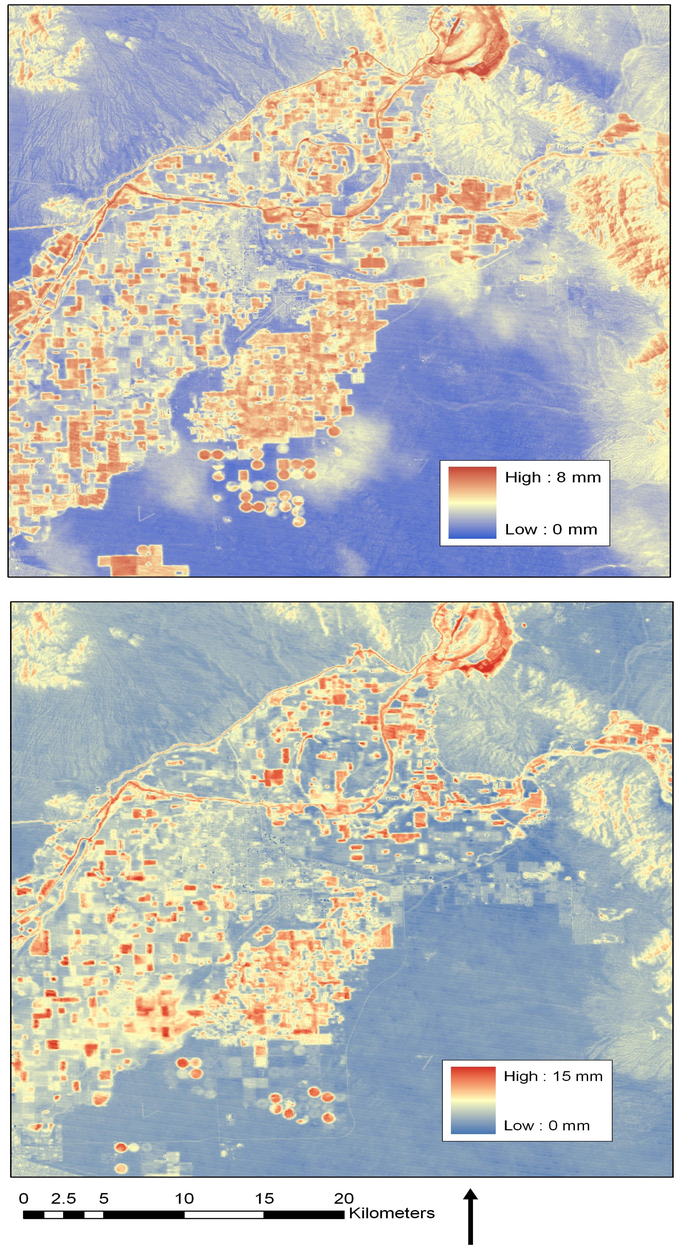
Can future water usage be estimated from remotely sensed image?

As urban areas in arid environments continue to grow, understanding how water is being used becomes increasingly important. Through the use of the METRIC (Mapping EvapoTranspirtation at high Resolution with Internalized Calibration) model it is possible to measure the amount of evaporation and transpiration (the loss of water from plants) using only a satellite image and a single weather station. Comparing the amount of evapotranspiration to the change in vegetation between 1990 and 2010 in Yuma, AZ will hopefully allow for future predictions of evapotranspiration.

Flow chart of how Evapotranspiration is calculated using a satellite image and weather station.

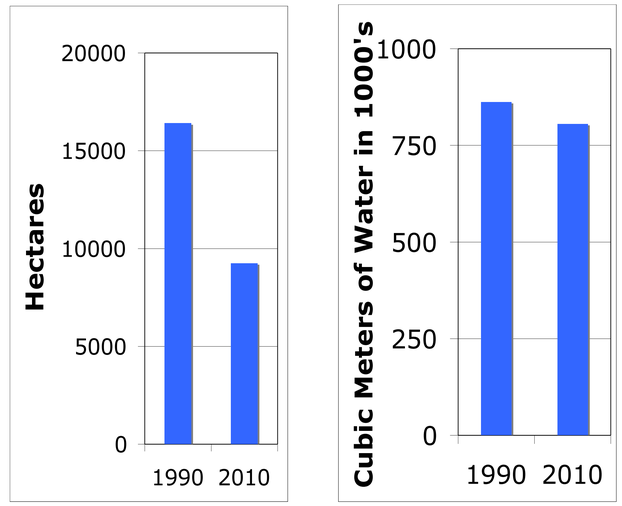


Similar volume of water is used in both images even though much less area is farmed in 2010.



As seen in the August 1990 image on top there are more areas with high ET than 2010 although the ET is at a lower amount. This indicates that in 2010 farmers are using more water per hectare that in 1990.

Even with about half as much healthy vegetation there is almost as much ET.



The agriculture was selected using the normalized difference vegetation index that identifies areas of healthy vegetation. Then by taking the values of ET that occurred in each field it was possible to sum the amount of ET to see the changes over time. This shows that **it may not be possible to predict future ET.**

Future research could be used to track water usage in any arid environment.

- By correlating crop success to ET would help farmers use the correct amount of water and limit overwatering.
- Refining the model to allow for the use of multiple weather stations over a large area would allow for an accurate assessment of an area as large as Arizona.
- Sensitive areas such as wetlands could be monitored to see how ET is changing over time as the area changes.
- Correlations to climate models in combination with urban growth models would allow for a more comprehensive prediction of future water use.

Acknowledgements: A special thanks to Shai Kaplan, my mentors Elizibeth Wentz and Soe Myint, Peggy Nelson and the COURS class. This material is based upon work supported by the National Science Foundation under Grant No. SES-0951366 Decision Center for a Desert City II: Urban Climate Adaptation (DCDC). Any opinions, findings and conclusions or recommendation expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).