GC8-Hydro-32, updated on 27 Apr 2024
https://doi.org/10.5194/egusphere-gc8-hydro-32
A European vision for hydrological observations and experimentation

Improving water resource management through the development of a flux tower network and remote sensing modeling of evapotranspiration and water stress of woody perennial crops in California

William Kustas[1], Nicholas Bambach[2], Andrew McElrone[3], Kyle Knipper[4], Alfonso Torres-Rua[5], Matthew Roby[4], Maria Mar Alsina[6], John Prueger[7], Joseph Alfieri[1], Sebastian Castro[8], Lawrence Hipps[9], Lynn McKee[1], Oscar Belfiore[10], and Guido D'Urso[11]

[1]USDA-ARS, Hydrology & Remote Sensing Lab, Beltsville, MD, USA
(bill.kustas@ars.usda.gov)(joe.alfieri@usda.gov)(lynn.mckee@usda.gov)
[2]Department of Land, Air and Water Resources, University of California Davis, Davis, CA, USA (nbambach@ucdavis.edu)
[3]USDA-ARS Crops Pathology and Genetics Research Unit, Davis, CA, USA (andrew.mcelrone@usda.gov)
[4]USDA-ARS, Sustainable Agricultural Water Systems Unit, Davis, CA, USA(kyle.knipper@usda.gov) (matthew.roby@usda.gov)
[5]Department of Civil & Environmental Engineering, Utah State University, Logan, UT, USA (alfonso.torres@usu.edu)
[6]E & J Gallo Winery, Winegrowing Research Modesto, CA, USA (mimaralsina@gmail.com)
[7]USDA-ARS, National Laboratory for Agriculture and the Environment, Ames, IA, USA (john.prueger)
[8]Department of Viticulture and Enology, University of California, Davis, CA, USA (sjcastro@ucdavis.edu)
[9]Department of Plants Soils and Climate, Utah State University, Logan, UT, USA (lawrence.hipps@usu.edu)
[10]Dept. Agricultural Engineering and Agronomy University of Naples Federico II, Naples Italy (oscarrosario.belfiore@unina.it)
[11]Department of Agricultural Sciences - University of Naples Federico II, Naples Italy (durso@unina.it)

Improving water resource management in the western United States is critically needed to achieve sustainability between the competing demands of water supplies for cities and towns, for agriculture, particularly irrigated regions, by industries principally for generating electricity, and for the environment (i.e., providing adequate ecosystem services). The last decade marked by historically severe droughts revealed the need for new water management policies and environmental regulations. Moreover, the impact of climate change not only has exacerbated droughts but also may be causing episodic extreme wet periods requiring a new paradigm on water management strategies for surface water reservoirs and groundwater aquifers. The Sustainable Groundwater Management Act (SGMA) is an example of developing a water management policy for sustainability of water resources in California. California produces 80% of the world's almonds, is the 4th largest wine producer worldwide while also providing three-quarters of the fruits and nuts in the U.S. Much of the production requires reliable water sources for irrigation. This has motivated research into designing networks of evapotranspiration (ET) flux tower measurements in grape and tree crop systems in conjunction with developing new remote sensing tools for mapping crop water use, ET, to efficiently use and conserve water resources across the over 1.5 million acres of woody perennial crop production fields. This acreage is largely

irrigated and uses approximately 70% of freshwater resources in the region. The two projects, GRAPEX (Grape Remote sensing Atmospheric Profile and Evapotranspiration eXperiment) and T-REX (Tree-crop Remote sensing of Evapotranspiration eXperiment) have the overall goal to identify management opportunities to maximize water use efficiency in vineyard, almond and other woody perennial crops. This presentation will describe the measurement network used for understanding the water and energy flux exchange of these complex cropping systems and in validating and refining remote sensing modeling tools from UAS and satellite platforms for estimating ET and crop water stress from plant and sub field to regional scales required for improving water management strategies of these agricultural systems.