Each month the Utah Water Research Laboratory (UWRL) takes a moment to highlight a student, alumni, or staff member that has gone above and beyond in their research field and achievements. This month we highlight Alfonso Torres-Rua, an Assistant Professor of Civil and Environmental Engineering at Utah State University. Alfonso also works as the Chief Scientist at AggieAir, a service center housed within the UWRL.

Dr. Alfonso Torres-Rua

Alfonso received his BS in Agricultural Engineering from the La Molina National Agrarian University, and then his MS and PhD from Utah State University agricultural water management and machine learning. After joining the UWRL staff, his focus turned to remote sensing, and he quickly became a leader in the AggieAir program.

AggieAir Director Cal Coopmans commented on Alfonso’s impact on AggieAir, saying, “Dr. Torres is the scientific powerhouse behind AggieAir’s great successes. Over the years he has applied his deep scientific background and unique set of skills and insight to propel the data gathering quality of AggieAir to world-class scientific heights. Dr Torres’ work in aerial thermal infrared (TIR) calibration is one of the group’s highest achievements to date. No other group has the abilities to fly and generate calibrated TIR data over so much acreage, while keeping the scientific clarity that is required for high-value crop study such as wine grapes, and the use of TIR and other such aerial sensing technologies will grow in importance as water and other resources become more constrained.”

We recently sat down with Alfonso to learn more about his experiences at the UWRL and his career:

**Tell us about yourself:**

I was born and raised in Peru and studied at La Molina Agrarian University from 1996 to 2000. My first choice as a freshman was Statistics, but I ended up in the Agricultural Engineering program. After my studies, I was working for the Ministry of Economy in Peru for several years on federal and state projects. I had a great boss who was always encouraging me to go abroad and pursue a graduate degree. I applied to several universities: Oklahoma State, Wageningen University, and others. In the end I chose the MS program in Irrigation Engineering at Utah State University. Here I got to meet the “legends” of Agricultural Engineering, whose books and articles were the base of my undergrad learning back in Peru. I met George Hargreaves, Wynn Walker, Richard Allen, and Gary Merkley, among others. After my MS, I received an offer to pursue a doctoral degree at the UWRL under Mac McKee and Wynn Walker in machine learning in agricultural water resources, a topic little understood back then. The topic was so new that journal editors could not find reviewers for the submitted manuscripts. When I was completing my PhD, I came across the topic of remote sensing for water use. It was a new world to me, and I became obsessed with understanding it (I am still obsessed). After a while, in 2012, I was invited to apply the new UWRL AggieAir UAV technology into agriculture and water management, so I brought “satellite knowledge” into the program. I think my most clever idea from the very beginning was to “sync” AggieAir and Landsat satellite timings, so we could compare one to another. Little did I know that in the following years I would specialize into sensors technology and calibration, as well as understand the opportunities and challenges of UAV technology to respond to agriculture and water applications.
Tell us more about your current research:

My area of research is the application and development of remote sensing information for farming, water, and natural environments. Because I participate in AggieAir as a scientific advisor in other missions related to energy efficiency, urban applications, river corridors, etc., I learn about new applications and challenges of the technology. Currently I am focused on estimation of evapotranspiration at high resolution and integrating UAV results into satellite ET applications, where we are working with collaborators from USU, USDA, NOAA, and NASA among others.

What inspired you to choose this field of study?

The amount of work still needed. As I say to my students in class, even after 40 years of remote sensing knowledge, we have not solved the main issue in agriculture and water management: timely, cost-effective information for decision making. We have to make remote sensing-based information accessible to the industrial farming company and to the farmer with no internet. In the water and agricultural research communities, we talk about bringing the right information to the end users, but challenges in data acquisition, processing, cost, and timely delivery are still present.

Which classes are you teaching this semester?

I teach Remote Sensing of Land Surfaces. This class teaches you about the fundamentals and applications of remote sensing across multiple applications (agriculture, landscapes, urban, health, climate change). No two semesters are the same. I am always thinking what new/old piece of knowledge I can incorporate to the class. My hope is that students can complete the semester with a clear understanding of remote sensing, and to come up with clever uses of remote information on different aspects of water and land management.

What would you tell a student who’s interested in pursuing a similar career? Any advice?

This research area is driven by passion, ingenuity, and science, as any other. Because agriculture happens to be a scientifically demanding remote sensing application, it also requires additional knowledge: a clear understanding of water-climate-soil-plant interactions at plant level and larger scales, weather and climate challenges, and socioeconomic and technological status of end users. There is no one-solution-for-all nor is the same information of value to every irrigator or end user. Custom, cost-effective solutions are needed, and this is where a student can bring new, fresh ideas.

Why did you choose to work and teach at the UWRL?

The AggieAir UAV program at Utah State University. It has no comparison worldwide, and it has provided me with the opportunity to learn, challenge and enhance traditional remote sensing knowledge and to bring UAV science and technology closer to agriculture, water and its information needs.

Want to learn more about Alfonso’s work? Follow him at @torres4rua or read about his research at his USU profile or USU’s Digital Commons