|  |
| --- |
| **Please write a 2-3 paragraph SUMMARY of your fellowship activities and major accomplishments within the last year.** |
| https://www.fastlane.nsf.gov/grfp/images/spacer.gif | |
| https://www.fastlane.nsf.gov/grfp/images/bullet-gold.gif This should be written for the public, and should address both the Intellectual Merit and the Broader Impact of your work. |  |
| https://www.fastlane.nsf.gov/grfp/images/spacer.gif |  |
| https://www.fastlane.nsf.gov/grfp/images/bullet-gold.gif Enter the summary below (1000-5000 characters) OR attach a one page document (1 page limit). |  |
| https://www.fastlane.nsf.gov/grfp/images/spacer.gif |  |

**Understanding Irrigation in a Data-Scarce World**

In the past year, I began to develop a method that estimates irrigation practices in data-scarce watersheds using remotely sensed data and streamflow observations. Our approach is based on the expectation that different irrigation practices and technologies will leave discernable and differentiable signals in streamflow regimes. Important characteristics of non-irrigated streamflow regimes can be estimated from soil, climate and catchment information, and perturbations from these regimes due to a variety of irrigation practices can then be calculated with a simple hydrologic model. My primary accomplishments this year were setting up the hydrologic model and performing proof-of-concept modeling experiments with different synthetic catchments and irrigation types. So far I have shown, through modeling of 400 synthetic climate/catchment types, that differences in irrigation practice (in particular, sourcing from water import, surface water, or aquifers) can be resolved by parameterizing the deviations from non-irrigated streamflow. In the future, I hope to discern alterations not only in predominant water source, but also in irrigated area, irrigation technology, and scheduling decisions: these are aspects of irrigation not accurately detected with existing remotely sensed methods. In the following months, I will develop an inverse model that relates deviations in streamflow to the upstream irrigation practices that caused them.

This research could have a significant impact on food security and environmental sustainability of irrigation worldwide. Success in improving food security and irrigation sustainability hinges on knowledge of irrigation practice and understanding how irrigation interacts with, and alters, the natural water cycle. Despite its importance, however, information about the extent and practice of irrigation is limited. Irrigation data are currently derived from remote sensing, national aggregated statistics, or ground surveys, which suffer (respectively) from inaccuracies, lack of spatial resolution, or lack of accessibility. The method I am developing will be spatially resolved, accurate, and accessible. It may sharpen our estimates of irrigation and help us gain insight into the interaction between irrigation choices (regarding water sources, scheduling and technology) and environmental sustainability. Ultimately, it may help expand our knowledge of global irrigation practice and create new information to tackle issues in food security and environmental sustainability. This work is also a step towards increasing data availability on human impacts in order to improve water resources management.