ACTIVITIES REPORT FOR: Minghui Zhang

1. Background Information

Department: Civil and Environmental Engineering
Degree sought: Doctoral Degree
Degree Start Date: 08/2015
Research interest/topic: Hydrology and irrigation
Keywords: hydrology, irrigation, data scarcity, prediction
Research Advisor 1: Sally Thompson
Telephone: 5106421980
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Research Advisor 2:
Telephone:
Email:

Research Advisor 3:
Telephone:
Email:

2. Skills

Research Skills
Participated in formal coursework/training in research methods, practices, and/or instrumentation in your primary discipline.
Undertook additional formal coursework/training.

Courses/seminars taken in major discipline: 1
Courses/seminars taken outside of major discipline: 2
Courses/seminars taken that specifically covered interdisciplinary topics related to GRFP project: 2

Professional Skills
Made presentation(s) at academic/scientific professional conferences, meetings, or departmental seminars.

Career Skills
Had professional interactions other than internships with nonacademic employers (e.g. industry, government) in order to learn about career opportunities and requirements.

3. International Experience

Took part in any international experiences during this reporting period: No

4. Achievements

Had any achievements to report for this period: Yes

Achievement Type	Achievement Description
Presentations	Author: Minghui Zhang Title: Streamflow Prediction in Ungauged, Irrigated Basins Meeting Name: 2016 Fall AGU Meeting Meeting Location: San Francisco, CA Date: December 14, 2016 Type: Poster

5. Career Plans

Expected Graduation Date: 05/2020
Type of employment pursued: Nonprofit - Full time position
Other:

6. Internships

Took part in any internship(s) lasting 1 month or more: No

7. Other Financial Support

Received any fellowships (other than GRFP), scholarships, or grants during the period: No

8. Stipend Feedback

Stipend comparison to stipends received at your organization: Equal to Others

9. Additional Funding Opportunities

Have you received any Additioanl Funding Opportunity: No

10. Fellowship Year Summary

Fellowship Year Summary Uploaded: No

Fellowship Year Summary Text: 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.