Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

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Inventors

Zhaocheng Wang

Enrique Vivoni

Contact

Physical Sciences Team

Streamflow Determination from Remote Sensing Imagery

The streamflow regime is a critical determinant of many ecological and hydrological processes and plays an important role for regulatory purposes. Three regime categories are often used to describe a river reach: perennial, intermittent, and ephemeral. This distinction has important consequences for water resource management, e.g., since the Clean Water Act uses the streamflow regime characteristics for imposing regulations on pollutant discharges and maintaining water quality in rivers. And, protecting intermittent rivers and ephemeral streams (IRES) is critical since they provide valuable ecological and hydrologic functions. Additionally, there is a significant challenge for local agencies to determine jurisdictional status of IRES.

Current efforts to determine streamflow status include the use of streamflow gaging stations, ground-based cameras, field inspections by staff, biological indicators, and citizen reporting. All these methods share limitations of having low spatiotemporal sampling, limited access to privately owned lands, and difficulty in obtaining data covering vast areas. To overcome these limitations requires a spatial-explicit, large-scale observation platform that captures the flow presence in rivers and/or streams across any time period.

Researchers at Arizona State University have developed an algorithm for predicting the presence of water and streamflow regime in rivers and streams at high spatial and temporal resolution. With remote sensing datasets, this method can detect the presence of water in a channel and map the streamflow regime at any place(s) along the river or stream. The algorithm is robust and can be applied to arid and semi-arid rivers or streams with ease and at a low cost.

Additionally, this algorithm can be applied to detect other rapidly varying phenomena from remote sensing imagery. This could include monitoring and mapping agriculture, forestry, grazing, infrastructure, natural disasters, and maritime and coastal areas.

Potential Applications:

- Detect varying phenomena from satellite imagery for:
  - Streamflow regime determination – intermittent versus ephemeral
  - Crop growth mapping – track irrigation water use, monitor crop health, predict yield
  - Forestry management – determine areas affected by thinning, fire, disease, etc.
  - Grazing management – design rotation plans
  - Natural Disasters – determine affected versus nonaffected areas

- Floods – mapping flood areas
- Maritime/Coastal - ship/boat tracking

Benefits and Advantages:

- Aids in classification of reaches as intermittent versus ephemeral
- Less-labor intensive method for detecting water presence and flow regime
- Can provide information on locations where field work is difficult (e.g., in remote areas) or not feasible (e.g., on private owned lands)