

Tajikistan and Kyrgyzstan physical hydrology field work summary

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In July and August 2016, Alice Hill conducted physical hydrologic field methods training at Tajik National University (Tajikistan) as well as data collection (Kyrgyzstan). This work was in collaboration with fellow CU-Boulder graduate student Alana Wilson, the Kyrgyz Institute of Water Problems and Hydropower (IWPH) in Bishkek, and in conjunction with social-economic research conducted by CU-Boulder researcher Cholpon Minbaeva. The physical hydrology work incorporates the elements summarized below.

- 1) **Tajik field methods training:** With the aim of increasing consistency and standards of water sampling methods across researching institutions we met with Professor Inom Normatov and his research group at Tajik National University in Dushanbe, Tajikistan in mid-July. We delivered short presentations on the role of water sampling in hydrologic research objectives, as well as foundational water chemistry background. We provided a full demonstration and training of in-field water sampling methods and techniques, adhering to standard US protocols. The training was timely, given two Tajik graduate student-led water sampling field campaigns planned for late July including the Vakhsh River basin in the Pamir Mountains.



Above: Alice demonstrates field filtering protocols with students from Tajik National University.

- 2) **Naryn basin characterization:** The Naryn basin was utilized as a pilot of my Rapid Hydrologic Assessment (RHA) approach to characterize hydrology of remote regions over large scales. We conducted water sampling for chemistry and isotopes from the glacial source waters at the Kumtor gold mine (3873 m ASL) downstream to the start of Toktogul Reservoir (898 m ASL). While the premise of the RHA suggests sampling sites are dictated by landscape characteristics as opposed to access, the reality of working with Kyrgyz partners in this region is that they restricted sampling to sites to those accessible by vehicle. Thus the sampling transect was mostly conducted by 4WD van, limiting the ability to access all targeted sites. One river reach was accessed by packrafts, and two days of sampling was accessed by hiking and climbing. In total 41 samples were collected, including 1 glacier ice, 3 glacier outflow, 2 snow, 9 groundwater, 1 precipitation and 25 surface water. Additional unique headwater samples were provided by the IWPH; we may be able to incorporate isotope data from them into our study.
- 3) **Kyzyl Suu basin:** We conducted a water sampling ‘blitz’ over two days across the entire Kyzyl Suu basin for water chemistry and isotopes. The study domain spanned from the alpine headwaters at the Kara-Batkak Glacier to the lower elevations of the Kyzyl Suu (river), just above the outlet to Isysk Kul (lake), and work was facilitated by IWPH employee and Kyrgyz graduate student Muhammed Esenamanov. This domain includes an elevation



Above: Alice filters Chon Kyzyl Suu river headwater samples near the Kara Batkak glacier. **Below:** Approaching the toe of the Kara Batkak glacier to sample glacier outlet water and glacial ice.



change of 1719 m over 44 km, and captures rapid changes to land use over this relatively short distance. 14 water samples were taken (1 glacier ice, 1 glacier outflow, 1 rain, 2 groundwater, and 9 river water). Consistent spatial resolution of river samples was able to be maintained over the extent of the reach. In addition, a glacial outflow water sample from the Kara-Batkak glacier was taken for tritium analysis to provide further

insight to meltwater source age and as a comparison to tritium samples in Nepal's Langtang Valley.