Poster #21-16

Quantifying Distributed Exchanges of Groundwater with the Columbia River – Preliminary Results

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BER Program: SBR
Project: University Award

Streams and rivers receive groundwater from their surrounding contributing watersheds to generally increase channel discharge down the river network. The inflow of groundwater is typically invisible to the naked eye, yet the contribution of groundwater, dissolved solutes, and energy has important biogeochemical and ecological impacts on surface waters. The goal of this project is to determine whether there is a clear relationship between the water management activities within and beyond the river corridor (lands that contribute to rivers; i.e., lateral watershed areas) to the fluxes and locations of groundwater inflows to the river channel. We are developing a new approach to identify the locations of, and estimate the fluxes of contributing groundwater (i.e., groundwater inflow to rivers) along the Columbia River. This new approach relies on detecting water quality anomalies along the river bed – especially dissolved oxygen, temperature, and electrical conductivity – indicating locations of groundwater inflows to the channel. Our data collection platform collects these data and GPS position at high frequency (<1 min). River discharge measurements are made upstream and downstream of these groundwater discharge locations. Combined, these field data would then be used to estimate how much water is entering the river from the ground, based on two mixing models. Repeated throughout the irrigation and non-irrigation seasons, these measurements will be used to determine whether there is a relationship between the locations and/or magnitude of fluxes of groundwater inflow to rivers to irrigation activities in the lateral contributing area to each segment of the river. Here we present our findings from our first field campaign to collect data along a segment of the Columbia River, WA in February 2018.