**SEASONAL AND DIURNAL FLUCTUATIONS IN SUSPENDED SEDIMENT CONCENTRATIONS IN GLACIAL MELTWATER ON MOUNT RAINIER, WASHINGTON**

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**Abstract**

Mount Rainier is the most glaciated peak in the conterminous United States, offering a valuable laboratory for studying glacial processes. This study examines the sensitivity of suspended sediment concentrations (SSC) in glacial meltwater to meteorological conditions. We collected meltwater from Emmons and Nisqually Glaciers, as close to the glacier termini as possible, and filtered these samples to find the concentration of sediment per liter of water. Meltwater discharge was estimated in order to determine the relationship between discharge and suspended sediment transport. Our measurements suggest that the diurnal minimum of SSC is in the morning, while peak concentrations are in the evening, following the warmest part of the day. Our data also show a delayed or prolonged SSC minimum on cloudy mornings; SSC in meltwater from Nisqually Glacier decreases over two days, while Emmons has two minima. Some authors have suggested that this change occurs due to a decrease in available sediment beneath the glacier. Analysis of meltwater from Nisqually Glacier in October reveals the opening of and excavation of sediment from the subglacial environment in response to a rain event.

**Methods**

Suspended sediment samples were collected using 500ml polypropylene bottles every 4 to 6 hours (Collins, 1979) and then filtered in the lab (figure 3). Water volume and sediment weight were recorded to obtain sediment concentration (mg/L; Singh et al., 2016).

Sediment samples were also collected with an autosampler (Collins, 1979) when the river channel is easily accessible by car. Measurements of channel depth (figure 4) were used along with the channel width to get channel area. Velocity of the river was calculated using a flow probe (Hartsharya et al., 2008) near shore, in addition, velocity was taken from the middle of the channel using a flow meter (Singh et al., 2014). Channel area and velocity (Hartsharya et al., 2006) were then used to obtain the river’s discharge.

**Results**

**Background**

Mount Rainier is a stratovolcano in the Cascade Volcanic Arc that holds the largest glacial volume of the contiguous U.S. (figure 1; Sisson et al., 2011). Mount Rainier has a population of 3.3 million surrounding its base making hazards on and around the mountain an issue. Suspended sediment is defined as grains less than 2 mm in size and suspended in a water column (Mills, 1979). Suspended sediment is discharged throughout the ablation season. The amount of sediment evacuated depends on the subglacial drainage system as it reflects the amount of sediment storage beneath the glacier. The evolution of the subglacial drainage system (figure 2) relies on the weather and timing, magnitude, and when the water is moving beneath the glacier (Collins, 1990, Collins, 1991).

**Discussion**

• Higher sediment concentrations with lower discharge measurements at Nisqually Glacier on June 27th are indicative of the subglacial drainage system finding new pathways beneath the glacier as sediment is evacuated through new subglacial areas (Collins, 1990).
• Cloud cover at both Nisqually Glacier on June 28th and Emmons Glacier on July 13th cause increased sediment concentrations. Emmons Glacier has greater meltwater discharge which in turn causes higher SSC.
• Autopilot samples are less concentrated than hand samples (figure 6), due to either the current pushing the intake hose closer to the channel edge and away from the most turbulent flow, or (b) a hand sample protocol that collects from the entire water column.

**Conclusions**

• Discharge is dependent on daily temperatures and solar radiation (Hammer et al., 1983)
• SSC diminishes towards the end of the ablation season as the drainage system closes and sediment beneath the glacier is expelled (Hillmali et al., 2005).
• The drainage system beneath Emmons and Nisqually glaciers evolve from a distributed drainage system to a conduit drainage system during the ablation season (Collins, 1990)

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**References**