Assessment of methods for measuring glacier mass balance of the Taku and Lemon Creek glaciers, southeast Alaska

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The Juneau Icefield Research Program (JIRP) has collected annual glaciological mass balances for the Lemon Creek Glacier (10 km^2) since 1953 and Taku Glacier (730 km^2) since 1946. End-of-season glacier-wide mass balances are derived annually from mid-summer snow depth measurements in pits and short-duration mass balance modeling. We continued this glaciological record during the 2017 JIRP season by compiling snow thickness and density measurements from more than 30 snow pits. Deploying a high frequency ground penetrating radar (GPR), we measured the variability of the snow depth around selected pits. We use these data to assess whether individual field sites are representative of the entire glacier. To evaluate the glaciers' health, we compare the 2017 mass balance both at pit sites and glacier-wide to corresponding measurements from previous years. We further compare the glacier-wide mass balances of the Taku and Lemon Creek glaciers (period 2004–2015) to mass changes detected by the Gravity Recovery and Climate Experiment (GRACE) satellites (mascons 1352 and 1353). The goal is to investigate whether regional GRACE-detected mass changes reflect the mass changes of the two glaciers. Lemon Creek Glacier is a challenging candidate for this comparison because it is small compared to the ~12 100 km^2 GRACE mascon solutions. Taku Glacier is equally challenging because its mass balance is stable compared to the negative balances dominating its neighboring glaciers. Challenges notwithstanding, a high correlation between the glaciological and GRACE-derived balances for Lemon Creek and Taku glaciers would encourage future use of GRACE data to estimate glacier-specific mass balance. [Poster]

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