JUNEAU ICEFIELD RESEARCH PROGRAM 2017

JIRP Research Projects: Mass Balance

Overview: Glacier mass balance is a measurement of glacier health. When gains (snowfall) outpace losses (melt), a glacier has positive mass balance and grows. The opposite is true when losses outpace gains. Snowfall and melt in turn are determined by the climate specific to a given location. Thus, mass balance is the crucial link between the climate system and glaciers.

JIRP Mass Balance: JIRP monitors annual mass balance of the Taku and Lemon Creek glaciers. These two records, starting in 1946 and 1953 respectively, are two of the longest on the planet and are an important component of the larger scientific community's understanding of glacier change. The core, season-long effort of JIRP mass balance is to continue these important data sets. As a part of this the JIRP 2017 mass-balance team will be responsible for a first-order analysis of the 2017 annual mass balance of the Juneau Icefield.

Specific Research for 2017: In addition to the annual monitoring effort, the primary 2017 research effort will compare JIRP's traditional mass-balance measurements with remotely sensed glacier mass balance measurements by the Gravitational Recovery and Climate Experiment (GRACE). Glaciological measurements of glacier mass balance have been collected in North America for over 70 years, but only a handful of glaciers around the Gulf of Alaska region have such records. Additionally, glaciers are logistically difficult to monitor via standard glaciological measurements, restricting the number of glaciers that can be measured using these *in situ* methods. Remotely sensed GRACE data – now available for a period of over 10 years - allows for statistical comparisons between these remotely sensed and glaciological records.

Logistics: Mass balance research begins at Camp 17 at the end of the second week of JIRP where field methods are introduced on Lemon Creek Glacier. Field efforts continue throughout the season as we move to Camps 10, 18 and 26 while working on the Taku, Gilkey and Llewellyn glacier systems.

Faculty: Listed by dates of involvement

- Faculty Leads:
  - Matt Beedle (UNBC), June 24 – July 15 (JNU-C17-C10)
  - Chris McNeil (USGS), July 1 – 15 (C17-C10)
  - Christian Kienholz (U. Alaska Southeast), July 15 – 28 (C10)
- Field Assistant:
  - Danielle Beaty (JIRP -Staff), July 24 – August 17 (Full Season)

Recommended pre-JIRP reading:

Strel, A. 2016. Tackling the Taku: Measuring Mass Balance on the Juneau Icefield, Lindsey Nicholson Blog. [*infographic*] http://lindseynicholson.org/2016/10/glacier-mass-balance-infographic/

Pelto, M., Kavanaugh, J., and McNeil, C. 2013. Juneau Icefield Mass Balance Program 1946–2011: *Earth System Science Data*, v. 5, no. 2, p. 319–330.

NASA. 2017. GRACE Mission Page. [*NOTE: Please review the Mission Overview, Multimedia, and Spacecraft &Instruments links*] https://www.nasa.gov/mission_pages/Grace/index.html

Arendt, A., Luthcke, S., Gardner, A., O'Neel, S., Hill, D., Moholdt, G., and Abdalati, W. 2013. Analysis of a GRACE Global Mascon Solution for Gulf of Alaska Glaciers, *Journal of Glaciology*, 59, 217, 913-924, doi:10.3189/2013JoG12J197