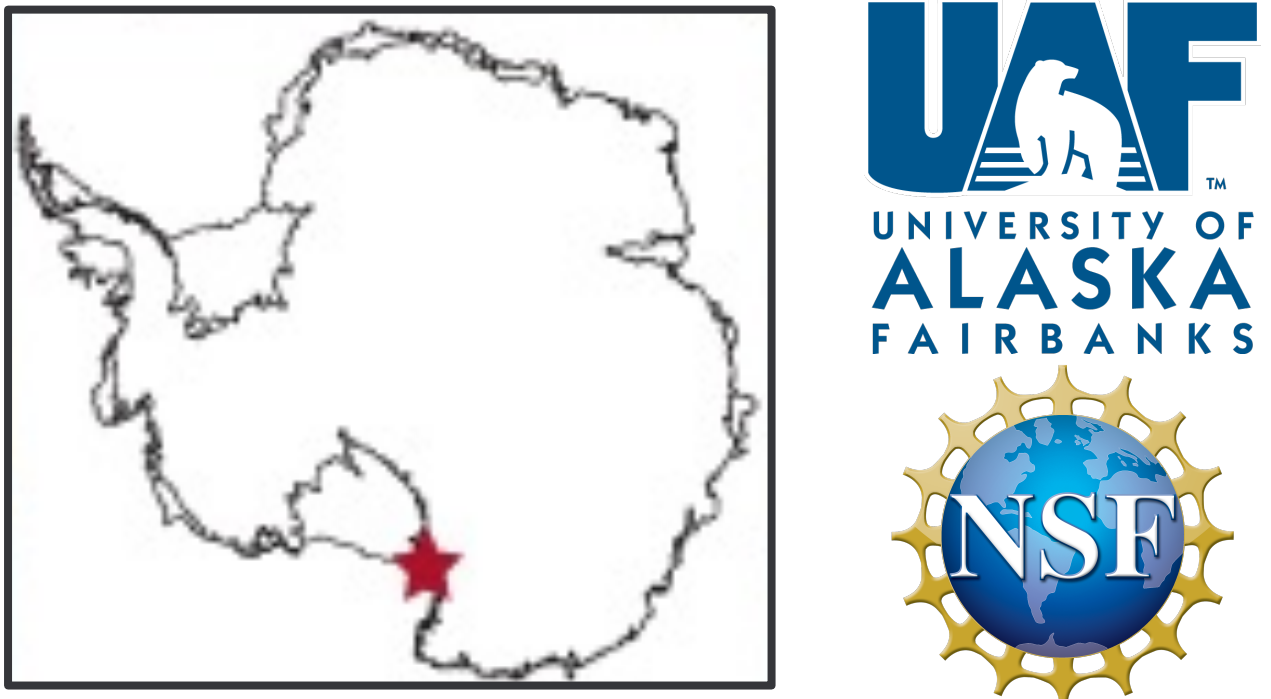


Interpreting the history of Blood Falls and the terminus of Taylor Glacier, Antarctica through photographs and field observations



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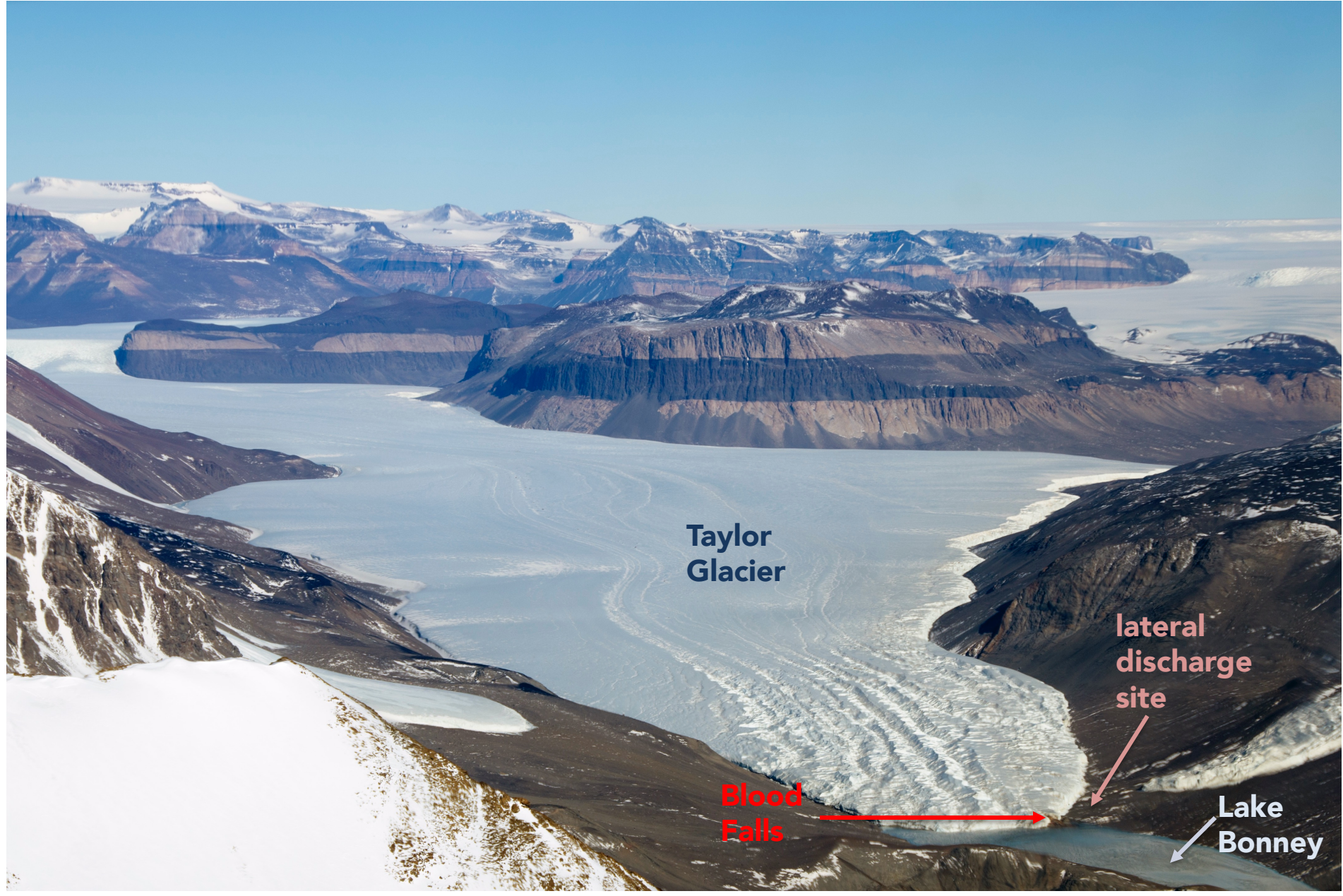
Session: Community Tools and Products for Cryosphere Discovery & Application
AGU Abstract #814865
LA-UR-21-31562

Blood Falls

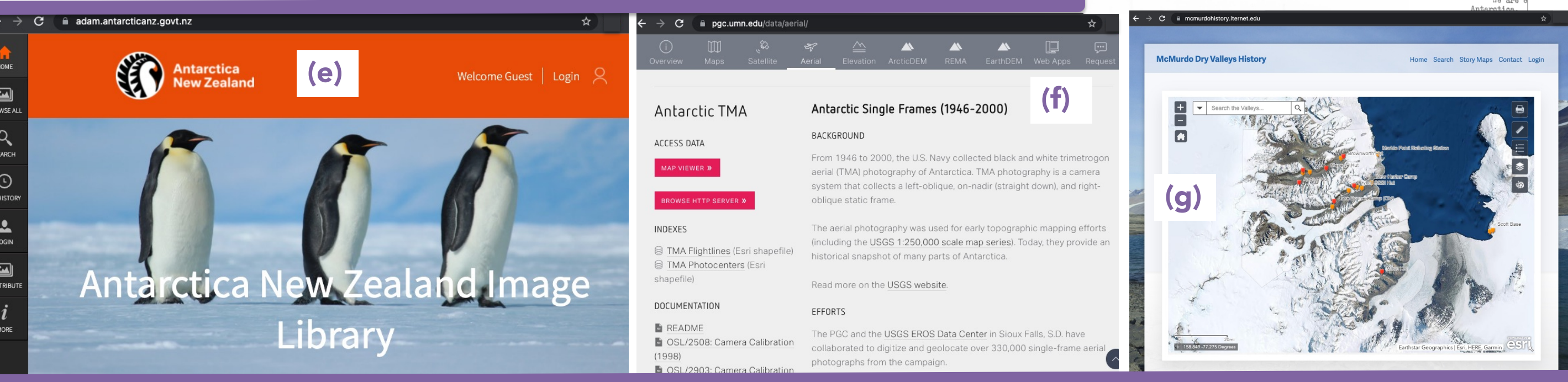
EPISODIC DISCHARGE OF SUBGLACIALLY-SOURCED IRON-RICH BRINE

- We use publicly available archives to construct a record of activity & inactivity of Blood Falls
- Evidence of activity = icing deposits form if air temperatures are cold enough, but melt/sublimate away over weeks-months
- Discharge during warmer air temperatures leaves no icing deposit, but more likely to be observed as active outflow because of human presence during the summer field season
- Important for: understanding cold glacier hydrology & microbiology of Blood Falls
- We compiled a record of people in the area from 1903-04 through 1993-94, to provide a resource for other researchers using public photo archives

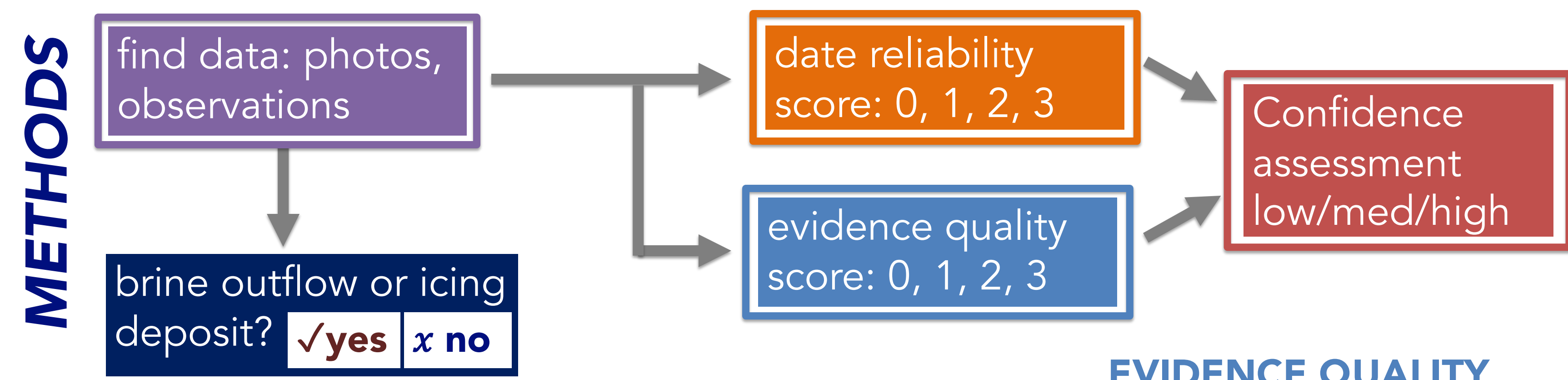
DATA SOURCES



Taylor Glacier, an outlet glacier of the East Antarctic Ice Sheet, terminates in Lake Bonney.
Image: Michael Studinger, Operation Ice Bridge



Data sources include: (a) Victoria Univ. of Wellington Antarctic Expedition Reports, (b) Japan's Antarctic Record, (c) New Zealand's *Antarctica*, (d) *Antarctic Journal of the US* and its predecessors, (e) Antarctica New Zealand Image Library, (f) USGS EROS Archive Aerial Photography Antarctic Single Frame Records (g) McMurdo Dry Valleys Historical Archive + prior compilations: Black (1969), Keys (1979, 1980), Lawrence (2017), and many more published papers & books



EVIDENCE QUALITY

✓yes

1959-1960 field season photo, John McCraw
(No photo with more context available)
Photo: MDV Historical Archives

✓yes

3 Feb. 1981 airphoto (1980-1981 season)
(Low resolution, icing fan present? See red arrow)
Photo: USGS (2017) through the Polar Geospatial Center

x no

18 December 1903
R. Scott's description of Taylor terminus area (no mention of any red discoloration, icing, etc.)
Text from: Scott (1907)

✓yes

5 November 1962, photo by Robert F. Black
(icing fan visible in this and other photos)
Photo in Black (1969)

✓yes

1990-1991 summer season
(clear description of summertime brine outflow)
Text from: Spigel & Priscu (1998)

x no

1989-1990 summer season painting by Jonathan White
(no red icing deposits in this or associated paintings from same season)
Accessed through the Antarctica New Zealand Pictorial Collection

Newly reported events

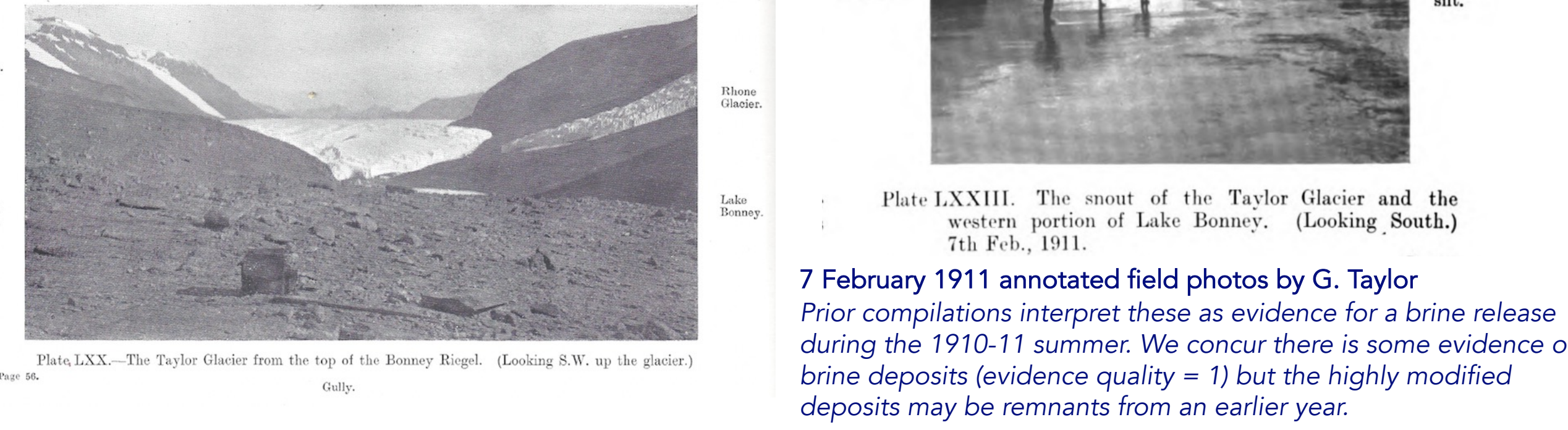


1969-70 field season photo by Lois Jones of Blood Falls. Obvious icing deposit (observation quality = 3), photo title in archive: 'Taylor Red Melt'. Date listed in the source archive is 1969-70 field season; to our knowledge this is the only season Lois Jones was in Antarctica (date reliability = 3).

Photo from: The Ohio State University Archives (Byrd Polar Center; Antarctica Expeditions 1969-1970).



Earliest images



Observations of brine deposits or outflow activity

FOR EACH SUMMER SEASON, WE REPORT YES or NO or NO DATA

Prior compilations did not usually distinguish between no data found in archives and data indicates no Blood Falls activity

confidence level: brine deposit or outflow?						high x no	medium x no	low x no	(no data) ???	low ✓yes	medium ✓yes	high ✓yes	
Summer season										1956-57	57-58	58-59	59-60
1960-61	61-62	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70				
1970-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80				
1980-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90				
1990-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00				
2000-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10				
2010-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20				

Additional seasons**: 1903-04 (no, low confidence), 1910-11 (yes, low confidence), 1946-47 (airphotos available, but were taken from an angle and distance that precludes interpreting Blood Falls activity)
**To our knowledge, no other seasons before 1956-57 had field parties or fly-overs. For seasons after 1956-57, "no data" means we have not yet found Blood Falls observations from these years, but they may exist.

Changes in timing or frequency?

MORE BRINE RELEASE EVENTS HAVE OCCURRED IN THE HISTORICAL PERIOD THAN PREVIOUSLY REPORTED

Recurrence intervals for subaerial brine discharge at the glacier or lateral site are not known; however, data from our study and prior compilations indicate that discharge event time scales are on the order of weeks to perhaps a few months in duration and occur during the majority of years with observations available. The temporal resolution of observations in the pre-LTER era are not sufficient to comment on potential changes in seasonal timing of outflow events.

Is your research in the Dry Valleys?

OUR COMPIATION OF WHO WAS IN TAYLOR VALLEY PRE-1993/94 MAY HELP

For season-by-season lists of who was where and when, please see Chris's thesis: - focused on Taylor Valley, see the Appendix for Chapter 2

Our compilation improves date control for the photos in public archives, to help researchers address glaciological, environmental, hydrological, and other questions using the rich historical archives.

We've successfully narrowed down the dates for several photos from 'unknown' field seasons, and hope it helps you do the same!

DO YOU HAVE BLOOD FALLS/TAYLOR GLACIER OBSERVATIONS TO SHARE?

We are especially interested in these summer seasons, please email Chris: cgcarr@alaska.edu
1960-61, '64-65, '79-80, '83-84, '84-85, '85-86, '86-87, '87-88, '88-89, '92-93
We're adding to the pre-1993-94 scope of the initial project (seasons prior to McMurdo Dry Valleys Long Term Ecological Research Project), observations from these years are also helpful:
1994-95, '2017-18, '20-21

ACKNOWLEDGEMENTS

We thank Robin Nicholson at the University of Alaska Fairbanks Geophysical Institute Mather Library, Max Sullivan at the Victoria University of Wellington Library, and staff at Archives New Zealand for their assistance tracking down historical records, original authors, and copyright use permissions. Adrian Howkins provided assistance with records through the McMurdo Dry Valleys Archive. We thank Paul Dayton and Paul Robinson for permission to use their photos, and Paul Dayton for the detailed and helpful correspondence. We thank Emilie Sinkler and Regine Hock for providing thoughtful feedback during the development of the methods for this paper. Thank you to Carl Tape, Martin Truffer, and Josh Carmichael for reviews of the related dissertation chapter written by CGC. VUWAE reports were obtained through the New Zealand Electronic Text Collection, available at <http://authority.nzetc.org/tm/scholarly/tei-corpus-VUWAnta.html>. Geospatial support for this work, including access to the USGS airphotos, was provided by the Polar Geospatial Center under NSF-OPP awards 1043681 and 1559691. Financial support for this project was provided by NSF Award OPP 1144177 to E.C.P.

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