An outcrop analog for the Colville Foreland Basin from the southern Andes: Clinoforms of the Magallanes Basin, Chile

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Clinoforms with >1000 m of relief that are at least 40 km long crop-out in the Magallanes Basin of southern Chile, recording the axial filling of a deep-water foreland during the Late Cretaceous. Fluvial- and wave-influenced deltaic deposits represent the upper, flat portions of the sigmoidal slope profiles (topset strata). Mudstone, siltstone, and a notable paucity of sandstone generally characterize upper- to lower-slope units (foreset to bottomset strata). However, punctuated delivery of coarse-grained sediment off the shelf edge is evident from channelized bodies composed of conglomerate lags and thick sandstone units. The clinoform-dominated stratigraphic architecture, scale and facies of the outcrop belt have been shown to share many analogous attributes with the Brookian-aged foreland basin fill of the North Slope, Alaska.

In 2009, a presentation to the AGS focused on a bourgeoning understanding of the recently discovered outcrop belt. This follow-up presentation will focus on the results of more than a decade of subsequent research, including facies characteristics and their distributions, geometrical characterization of reservoir-scale bodies, auto- and allo-genic controls on clinoform development (e.g., sediment supply, antecedent topography), and synthetic seismic responses of various portions of the immense outcrop belt. Overall, basin margin evolution and turbidite system characterization has been a primary focus over the last decade. However, a renewed focus on topset sedimentology and stratigraphy is a major current area of research, leveraging the unique opportunity to investigate the entirety of well-exposed shelf, slope to basin floor sediment routing systems.
About the Speaker:

Steve Hubbard joined the faculty in the Department of Geoscience at the University of Calgary in 2006, shortly after completing his PhD at Stanford University. Prior to his PhD he obtained BSc and MSc degrees at the University of Alberta and worked as a petroleum geologist at Shell Canada. His research, teaching and student mentorship is focused on topics in siliciclastic sedimentology and stratigraphy, as well as applications to petroleum geology. He specializes in the processes and products of channelized depositional systems, as well as convergent margin sedimentary basins.

Dip-oriented cross-section across the Late Cretaceous Magallanes foreland basin, Southern Chile. Basin-axial propagation of high-relief clinoforms (> 1 km) infilled the deep-water foreland setting.
From the President’s Desk:

Well that didn’t go according to plan.

Last Spring, we were supposed to be meeting in Fairbanks for our Technical Conference, browsing posters, attending talks, socializing with students, and touring the permafrost tunnel. April now seems so long ago.

Like many of our work and school lives, AGS quickly transformed to an all-virtual existence. Yet we finished the year with an increase in both active members and [virtual] lecture attendees. Even more importantly, we awarded eight students with a combination of AGS and Don Richter Memorial scholarships.

We are ready for a new year. This month, we welcome back Dr. Stephen Hubbard as an AAPG Distinguished Lecturer to present his follow-up work in the Magallanes Basin as a potential outcrop analog for the Brookian petroleum plays. Though we are not ready to meet in person, AGS is committed to continue delivering both a relevant and diverse program of technical presentations and a competitive and significant student scholarship program. We will continue the long tradition of uniting those interested in the geology of Alaska.

Thank you for your interest, participation, membership, and support.

See you on the 17th,
Andrew Dewhurst
To keep up social distancing and still get outside during these disconcerting times, I focused on an exploration of the Chugach Mts. near Anchorage this summer. In addition to incredible scenery and little human contact, one of the intriguing geologic features encountered were rock glaciers. These geomorphic features occur in mountainous areas from south-central Alaska to the Brooks Range with some excellent examples right here in our own backyard (figures 1 and 2). It is interesting to note that the term “rock glacier” was first used by USGS geologist S.R. Capps, (1910) in Alaska due to investigations in the Kennecott region of the Wrangell Mountains.

Rock glaciers consist of a mass of loose rock or talus with lobate wrinkles and ridges, giving one the impression of down-slope movement. As such they exhibit many of the same features inherent in true glaciers, including a lobate front or tongue, lateral moraines, and crescent-shaped ridges. Many are characterized by steep fronts at near the angle of repose. Most occur in areas of high latitude or altitude, in areas of steep cliffs with poor snow cover, and bedrock broken by frost action. Observations by researchers indicate that rock glaciers flow due to the presence of interstitial and/or underlying ice.

Controversy surrounds the origin of rock glaciers, but they appear to be of two types: ice-cored and ice-cemented. Ice-cored form when rock talus debris is deposited on the surface of a pre-existing glacier; the source area being the steep walls of a glacial cirque. The underlying glacial ice provides a relatively smooth surface for down-slope movement of the talus. Ice-cemented rock glaciers can form when ice and snow melt on the surface of a talus slope. The resulting water filters down through the underlying talus freezing to ice at depth. The ice reduces cohesion between the rock fragments, enabling down-slope movement. Some rock glaciers may have formed by a combination of these two modes of origin. Whatever the formation history, ice is the mechanism which provides the lubrication for the fractured rock to slowly move downslope. A mining tunnel driven through a rock glacier in Colorado, first passed through loose rock, then through rock with interstitial ice, then finally passing through a small quantity of glacial ice before entering solid rock.

Some fine examples of rock glaciers can be found in the Chugach Mts. near Anchorage. What appears to be an active rock glacier occurs in a cirque on the northwest aspect of Mt. Williwaw at the headwaters of the north fork of Campbell Creek (Figure 1). Evidence of recent movement includes a partially unstable frontal lobe. Also, the turquoise-colored water in the lake at the rock glacier foot would indicate that fine rock flour is being produced by the grinding together of moving rocks and introduced into the lake. The result being the characteristic glacial lake color.

Another good example occurs in the Penguin Creek drainage east of Anchorage (Figure 2). This rock glacier also shows signs of recent movement, including a steep unstable frontal lobe and minimal vegetation on its surface.

References:
Send a photo of your pet rock to: ken.helmold@alaska.gov
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Contact membership coordinator Kirk Sherwood with changes or updates (e-mail: membership@alaskageology.org; phone: 907-334-5337)

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