

CLIMATIC VS. TECTONIC CONTROLS ON SEDIMENTATION

The Neoproterozoic Port Askaig Formation and the Late Cenozoic Yakataga Formation

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The Yakataga Formation contains a high-resolution record of Late Cenozoic climate change and tectonic activity in the Gulf of Alaska. In this tectonically-active glaciated basin, diamict (poorly-sorted sediment commonly interpreted as glacial deposits) form as a result of subglacial processes, glacially-influenced marine processes and/or tectonically-controlled sediment instability. In addition, the Yakataga Formation contains a record of relative sea level change over time, which results from the interplay of sediment supply, ice margin fluctuations and tectonic activity. Distinguishing between climatic and tectonic controls on sedimentation is not always straightforward as they can leave very similar sedimentary and stratigraphic signatures. However, it is critical to do so in order to establish proxy indicators of glacial conditions and tectonic activity, which in turn can be used to evaluate the relationship between climate and uplift.

Identifying the relative importance of climatic and tectonic controls on the nature of glacial successions can be achieved by integrating detailed sedimentary evidence of tectonic activity and glacial conditions with a stratigraphic analysis of the major changes in depositional conditions. An overview of this approach is presented using the Neoproterozoic Port Askaig Formation as an example. Although the tectonic setting of this succession differs from that of the Yakataga Formation, the comparison highlights key aspects of this kind of analysis.

A study of the Yakataga Formation similar to the one carried out on the Neoproterozoic Port Askaig Formation is proposed. Its aims would be to 1) establish the relative importance and stratigraphic distribution of diamict formed by different processes, 2) establish whether there is any sedimentary evidence of tectonic activity, 3) identify significant bounding surfaces within the succession and 4) using this data, establish an allostratigraphy of major changes in depositional conditions over time. This sedimentological and stratigraphic analysis of the Yakataga Formation, together with refined geochronological, paleontological and tectonic data, would contribute to our understanding of the relative importance of tectonic and climatic controls on continental margin sedimentation in the Gulf of Alaska.