Age and provenance of the Upper Cretaceous to Paleocene Valdez Group of the Upper Chuckogan and Northern Prince William Sound, Alaska

Abstract
Detrital zircon U-Pb ages from turbidites of the Upper Cretaceous Valdez Group of the Chuckogan terrane in Prince William Sound, Alaska help demonstrate the complex relationships with the outboard turbidites of the Paleocene-Eocene Orca Group. The Valdez and Orca Groups, while similar in composition, historically have been divided by meterological grade, age, and geography. Current mapping separates the older Valdez Group of the Chuckogan terrane from the younger Orca Group of the Prince William Sound area. The turbidities of the Valdez Group are typically more deformed and contain pre-metamorphic felsic gneissic facies. The younger Orca Group rocks represent pre-metamorphic conditions. Several samples from the Valdez Group and nineteen from the Orca Group were collected from Prince William Sound and along the Richardson Highway. Detrital zircon U-Pb dates are from the University of Colorado (2015-2018) and the University of Michigan (2018-2019). The Orca Group, as defined by this study, is similar to the Valdez Group in age, composition, and stratigraphy. The Valdez Group is only about 20 m.y. younger than the Orca Group. In this study, the Valdez Group is about 60-90 Ma old and the Orca Group is about 80-90 Ma old. The two groups are similar in their composition and their age range. The age range of the Valdez Group is from 84 to 60 Ma and is concentrated in three clusters: 84-68 Ma, 74-66 Ma, and 62-60 Ma. The oldest cluster includes a previously published sample from Mount Magnificent near Anchorage and one from Study 1 on the Copper River near Chitina that has similar Late Cretaceous boundaries between 84 and 67 Ma in the Late Jurassic (196-198 Ma). Six samples with MAH between 70-45 Ma have very diverse age distributions with the majority of grains forming pronounced Late Cretaceous boundaries between 73 and 71 Ma. These sandstones collected from rocks mapped as the Valdez Group along the Richardson Highway have MDAH between 62-60 Ma, and these have similar MDAH and grain size distributions to rocks of the Orca Group in Prince William Sound. We conclude that the Valdez and Orca Groups are similar in age, composition, and stratigraphy.

Geologic Setting
The Valdez and Orca Groups are both part of the Chuckogan Prince William Sound (CPWS). The orca group is a thick, complex, and continuous sedimentary complex that extends 2,300 km along the southern Alaskan continental margin. The Valdez Group is 84-60 Ma old and the Orca Group is 74-60 Ma old. This study is an investigation into the age and provenance of the Valdez Group and its relationship with the Orca Group in the central Chuckogan terrane. The detrital zircon U-Pb dates are from the University of Colorado (2015-2018) and the University of Michigan (2018-2019).

References

We have two options for the occurrence of Orca Group age-correlative samples in areas mapped as the Valdez Group: (1) the Richardson facies is part of the Valdez Group and is stratigraphically equivalent to the oldest Orca Group (Miners Bay facies), or (2) the Richardson facies is part of the Orca Group and occurs in the Valdez Group as structural slivers (Fig. 5A) or was deposited unconformably on top of the Valdez and subsequently folded into the Valdez Group (Fig. 5B). We conclude that the Valdez Group is 84-60 Ma old and the Orca Group is 74-60 Ma old. This study is an investigation into the age and provenance of the Valdez Group and its relationship with the Orca Group in the central Chuckogan terrane. The detrital zircon U-Pb dates are from the University of Colorado (2015-2018) and the University of Michigan (2018-2019).

Key Points
- MDAH and grain age distributions from the Valdez Group form four zircon facies: Eklutna (84-78 Ma), Seward (74-65 Ma), Unakwik (70-66 Ma), and Richardson (62-60 Ma).
- The Richardson facies overlaps with age of the Miners Bay facies from the Orca Group (Fisher et al., 2019).
- The Valdez Group is Upper Cretaceous to Paleocene in age, younger than previously thought.

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Discussion
The Eklutna (84-78 Ma), Seward (74-65 Ma), and Unakwik (70-66 Ma) facies of the Valdez Group are consistent with the notion that the Valdez Group is as old as the Campanian and Maastrichtian. The Richardson (62-60 Ma) facies, though, is Paleocene and age-correlative with the Orca Group, although the three samples (21-22-15, 20-22-06, and 21-22-04) were collected along Richardson Highway, an area long-mapped as Valdez Group. A comparison of the Richardson facies of the Valdez Group with the Miners Bay facies (which includes the three samples that comprise the Richardson facies) of the Orca Group (Fisher, 2019) shows that these units are nearly identical (Fig. 4).

Figure 1. Geologic map of Prince William Sound, Alaska (modified from Bradley and Miller, 2006). The Valdez and Orca Groups are both part of the Chuckogan Prince William Sound (CPWS), which is a thick, complex, and continuous sedimentary complex that extends 2,300 km along the southern Alaskan continental margin. This study is an investigation into the age and provenance of the Valdez Group and its relationship with the Orca Group in the central Chuckogan terrane. The detrital zircon U-Pb dates are from the University of Colorado (2015-2018) and the University of Michigan (2018-2019).