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# PRELIMINARY GEOLOGIC MAP AND STRUCTURAL SETTING OF THE KATAKURUK DOLOMITE IN THE SADLEROCHIT MOUNTAINS, NORTHEASTERN ALASKA

by

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## INTRODUCTION

The Katakturuk Dolomite is a potential reservoir rock under the coastal plain of the Arctic National Wildlife Refuge (ANWR). The coastal plain is an area of limited bedrock exposure and possibly large potential for oil and gas resources (U.S. Fish and Wildlife Service, 1986; Dolton and others, 1987; Bird and others, 1987) and for which considerable geologic information is needed for an assessment of the petroleum potential. This report presents tentative conclusions on the stratigraphy and structural setting of the Katakturuk Dolomite and associated rocks in the Sadlerochit Mountains where the Katakturuk is widely exposed and may have a structural setting similar to that under the coastal plain of ANWR.

The Sadlerochit Mountains occupy a prominent geographic and structural position as the northernmost mountain range in ANWR. It is one of three prominent east-trending ranges that lie north of the Franklin and Romanzof Mountains of the northeastern Brooks Range. The east-trending anticline underlying the Sadlerochit Mountains continues down plunge under the coastal plain, and progressive northwest truncation along regional unconformities exposed on the north flank of the Sadlerochit Mountains probably continues northward under coastal plain cover. The Katakturuk Dolomite, if present below the unconformities under the coastal plain, would have potential for oil and gas in large detached anticlines involving pre-Mississippian rocks (Kelley and Molenaar, 1985; Kelley and Foland, 1987, p. 259, fig. 203).

This investigation focuses on three issues. These are (1) the degree and nature of deformation of the Katakturuk Dolomite, (2) whether or not the Katakturuk is repeated by imbricate faults, and (3) the lateral extent of significant detachment along the pre-Mississippian unconformity at the top of the Katakturuk.

Previous geologic work in the Sadlerochit Mountains includes a measured section of the Katakturuk and the original definition of the formation by Dutro (1970), a preliminary geologic map of the range by Reiser and others (1970), a colored geologic map by Bader and Bird (1986) of part of northeastern Alaska showing the principal geologic features and structural setting of the Sadlerochit Mountains, and reports on the structural framework of the the coastal plain and adjacent bedrock areas by Kelley and Foland (1987) and Leiggi (1987). A detailed geologic map of the Sadlerochit and Shublik Mountains is by Robinson and others (1989). Clough and others (1987), Clough and others (1988), and Blodgett and others (1986a, b) reported on the stratigraphy and sedimentology of the Katakturuk Dolomite.

## STRATIGRAPHY

### PROTEROZOIC ROCKS

#### Unnamed Rocks

Quartzite, siltstone, argillite, limestone, and basalt are the oldest rocks in the map area. They are probably Precambrian in age as no fossils have been found in them, and they underlie the Katakturuk Dolomite, which also is probably Precambrian in age. The contact with the Katakturuk may originally have been an angular unconformity, but breccia at the base of the overlying Katakturuk and other structural evidence presented later indicates that the contact has had movement.

The basalt in the pre-Katakturuk rocks possibly is correlative with rocks in the Shublik Mountains that Moore (1987) referred to informally as the Mount Copleston volcanic rocks. He reported that a sample of the basalt in the Sadlerochit Mountains has similar mineralogy and composition as the rock in the Shublik Mountains. According to Moore (1987), the basalt in the Shublik Mountains preserves original textures and some original minerals but contains metamorphic minerals of the low greenschist facies. Our observations reveal that the pre-Katakturuk basalt in the Sadlerochit Mountains also is weakly metamorphosed.

Reiser and others (1970) considered the quartzite and argillite, and by inference the siltstone, as belonging to the Neruokpuk Formation and the limestone as a separate unit of uncertain stratigraphic position. They designated these units as Paleozoic(?) in age. They showed the basalt as a separate unit of pre-Mississippian and younger(?) age. Robinson and others (1989) show the pre-Katakturuk rocks in the Sadlerochit Mountains as Neruokpuk.

The Neruokpuk is considered to be in part Precambrian but to have rocks that may be as young as Devonian (Sable, 1977). Dutro and others (1972) concluded that the Neruokpuk may contain several stratigraphic sequences, all of uncertain ages and correlation. In view of these uncertainties and the difficulties previous workers in the Sadlerochit Mountains had in applying a name and age to them, the rocks below the Katakturuk are here designated as unnamed and are considered as Proterozoic in age and probably correlative with some units of the Neruokpuk Formation.

### Katakturuk Dolomite

The Katakturuk Dolomite was defined by Dutro (1970) from exposures in the Shublik Mountains, immediately south of the Sadlerochit Mountains. Dutro found the Katakturuk in the Shublik Mountains to be mostly dolomite that formed on a marine shelf and that it is at least 1,040 m thick. He divided the formation into nine informal members. In the Sadlerochit Mountains, the Katakturuk also is mostly dolomite but is about 2,500 m thick.

By far the most extensive exposures of the Katakturuk are found in the Sadlerochit Mountains where the formation crops out east-west along strike for 55 km, nearly the entire length of the range, and for an average width of about 3.5 km. In the present study, the formation has been divided into three informal members that were mapped for a distance of about 35 km in the central part of the range and that almost certainly can be traced to the west end of the range (Robinson and others, 1989). However, these members were not recognized east of the Nularvik River in this reconnaissance examination, owing to abundant breccia and extensive cover of solifluction debris. In general, the Katakturuk in the Sadlerochit Mountains has considerable lateral and stratigraphic continuity and, except near the east end of the range, is relatively little deformed.

The upper contact of the Katakturuk outside the Sadlerochit Mountains is an unconformity beneath Cambrian and younger rocks (Blodgett and others, 1986a; Sable, 1977). In the Sadlerochit Mountains, the basal beds of the overlying Lisburne Group are brecciated, and they cross strata of the Nanook Limestone and the Katakturuk in angular discordancy.

No fossils have been found in the Katakturuk Dolomite in the Sadlerochit Mountains. The formation is considered to be Proterozoic in age because it underlies the Nanook Limestone, whose lowest strata in the Shublik Mountains are considered to be Late Proterozoic or Early Cambrian in age (Blodgett and others, 1986a).

## ORDOVICIAN ROCKS

### Nanook Limestone

The Nanook Limestone crops out in the Sadlerochit Mountains from about 10 km west of Katakturuk River to the east end of the range (Robinson and others, 1989), but in this study these rocks were mapped with the underlying Katakturuk Dolomite. Beds of the Nanook are mostly light- to medium-gray limestone and dolomite that in outcrop resemble beds of the Katakturuk.

Only the upper part of the Nanook occurs in the Sadlerocht Mountains, whereas lower as well as upper parts of the formation are found to the south in the Shublick Mountains (Blodgett and others, 1986a; Sable, 1977). These relations suggest that the Nanook lapped onto a Katakturuk high in the Sadlerochit Mountains. In the Sadlerochit Mountains, the Nanook rests disconformably on the Katakturuk whereas the contact with the overlying Lisburne Group is an angular unconformity.

Studies of the Nanook Limestone in the Shublik Mountains show that the formation may be in part of Late Proterozoic age and that it contains fossils as old as Late Cambrian in age and as young as late Early or early Middle Devonian in age (Blodgett and others, 1986a; Robinson and others, 1989). The only fossils that have been found in the Nanook in the Sadlerochit Mountains are of Ordovician age (James Blodgett, oral commun., 1989). The Nanook in the Sadlerochit Mountains could have Cambrian and Devonian strata, but it is not likely to have beds of Proterozoic age.

## PENNSYLVANIAN AND MISSISSIPPIAN ROCKS

### Lisburne Group

Brosge and others (1962) extended the name Lisburne Group to carbonate rocks in the eastern Brooks Range and included in it the Lower Mississippian Wachsmuth Limestone, the Upper Mississippian Alapah Limestone, and the then newly named Pennsylvanian and Permian(?) Wahoo Limestone. The Wachsmuth has not been recognized in the Sadlerochit Mountains. The Wahoo in the area of this report contains beds of very latest Mississippian age but primarily contains beds of Morrowan (Early Pennsylvanian) and Atokan (Middle Pennsylvanian) age and does not contain strata of Permian age (Mamet and Armstrong, 1984). Studies of the Lisburne Group in the Sadlerochit Mountains include an investigation of the paleoecology and rugose colonial corals by Armstrong (1973) and a paper on diagenesis and stratigraphy of the group by Wood and Armstrong (1975). Armstrong and Mamet (1975, 1977, 1978) studied the Carboniferous stratigraphy of the northeastern Brooks Range and included descriptions, illustrations, and details of the distribution and zonation of the microfossils in the Lisburne Group.

Included here with the Lisburne Group is the type locality of the Mississippian Itkilyariak Formation (Mull and Mangus, 1972), which rests on Proterozoic rocks and is overlain by and grades into the Alapah Limestone of the Lisburne. The type section is in the NW 1/4, Sec. 7, T.3 N., R. 31 E. (incorrectly identified by Mull and Mangus), near the east end of the Sadlerochit Mountains. According to Mull and Mangus, the formation at the type locality consists of reddish-brown to maroon limestone, sandstone, conglomerate, and breccia interbedded with greenish-gray shale and sandstone. At this locality, the formation is about 45 m thick and crops out for a distance of 800 m. It is the only locality of the formation that has been recognized in the area.

## TRIASSIC AND PERMIAN ROCKS

### Sadlerochit Group

The Sadlerochit Group unconformably overlies the Lisburne Group and consists of the Upper Permian Echooka Formation and the Lower Triassic Ivishak Formation (Detterman and others, 1975). Rocks of the Sadlerochit Group crop out above strata of the Lisburne Group the entire length of the Sadlerochit Mountains and are the youngest Paleozoic rocks in the area.

## INTRUSIVE ROCKS

Jurassic gabbro forms a sill in the unnamed Proterozoic clastic rocks east and west of Itkilyariak Creek near the east end of the map area. Mafic intrusive rocks are rare in the northeastern Brooks Range. Sable (1977) reported mafic dikes in the Devonian(?) Okpilak batholith, centered about 40 km southeast of the east end of the Sadlerochit Mountains. Unlike the sill in the Sadlerochit Mountains, these dikes are mineralogically altered and schistose.

# STRUCTURAL GEOLOGY

## STRUCTURAL SETTING

The rocks of the Sadlerochit Mountains lie in a complex stack of northeast- to east-trending imbricate thrust sheets and northerly verging folds that extends from well within the Brooks Range northward to the range front and under the Arctic coastal plain. Kelley and Foland (1987) and Leiggi (1987) discussed the structural geology of the coastal plain and adjacent bedrock areas, and Bader and Bird (1986) show the distribution of rocks and structures in the northeastern Brooks Range, including the Sadlerochit Mountains.

The Weller thrust of Kelley and Foland (1987), a major thrust fault that extends east-west the length of the Sadlerochit Mountains, emplaced the unmapped Proterozoic rocks, the Katakturuk Dolomite, the Nanook Limestone, and the overlying Mississippian to Triassic rocks into their present structural position in the upper plate. Lower plate rocks range in age from Mississippian to Paleocene. The thrust dips 50 degrees south, approximately parallel to the attitude of the overlying Proterozoic strata. At depth the thrust merges with a regional decollement. Near the east end of the range, the surface expression of the fault dies in a north-vergent anticline in which the Mississippian, Permain, and Triassic strata are folded into the thrust plane. Thrust transport was north-northwest (Kelley and Foland, 1987).

## THE NANOOK-KATAKTURUK STRUCTURAL BLOCK

The Katakturuk Dolomite together with the overlying Nanook Limestone acted as a structural unit, the Nanook-Katakturuk structural block, during thrust faulting in the Sadlerochit Mountains. The principal structure of the Nanook-Katakturuk block is a south-dipping homocline exposed along the axial part of the Sadlerochit Mountains. Dips in the homocline are 20 to 60 degrees, with a mean value of 30 degrees. A conspicuous feature of the Katakturuk in the homoclinal block is a high degree of structural and stratigraphic continuity. Beds in certain thin stratigraphic intervals can be traced for hundreds of meters (Robinson and others, 1989).

Conjugate high-angle faults cut the Nanook-Katakturuk block and the Mississippian to Triassic strata. Most of these faults strike approximately north 30 degrees east and have the greatest offset and length of all the faults. Faults that strike approximately north 45 degrees west are fewer in number, shorter, and probably of smaller offset than the faults that strike northeast.

Northeast-trending faults in the conjugate set have consistent apparent offsets. The offsets suggest either dip-slip motion, in which southeast blocks are down-thrown, or left-lateral strike-slip motion. The greatest amount of apparent offset along individual faults typically is along the northeastern segments nearest their apparent intersection with the Weller thrust and becomes progressively less along southwestern segments. Apparent offset diminishes and the faults disappear in the upper part of the block and the overlying strata.

Northwest-trending faults in the conjugate set have poorly represented and conflicting offsets. In only 2 localities do northwest-trending faults offset mapped units. East and adjacent to the upper Nularvik River, a northwest-trending fault in sec. 14 and 23, T. 3 N., R. 28 E., has an apparent dip-slip offset with the down-thrown block on the southwest, and in sec. 7 and 16, T. 3 N., R. 29 E., and sec. 12 T. 3 N., R. 28 E., a northwest-trending fault has an apparent dip-slip offset with the down-thrown block on the northeast.

Cross-cutting relations between northwest- and northeast-striking faults appear systematic. Northwest-striking faults terminate against northeast-trending faults, except for an equivocal case in SW/4, sec. 18, T. 3 N., R. 29 E., where trucation relations are not clear. Northeast-striking faults do not appear to cut and offset northwest-striking faults; clear continuations of northwest-striking faults are not apparent across northeast-striking faults.

The conjugate fault system cutting the Nanook-Katakturuk block and overlying strata appears to terminate against the Weller thrust. Even faults that have relatively large offsets in the Katakturuk show no apparent displacement at the Weller thrust or of the Mississippian to Triassic strata below the thrust. Additionally, the conjugate fault system does not clearly involve the Precambrian clastic and metaclastic rocks that underlie the Katakturuk.

The Katakturuk Dolomite in the Sadlerochit Mountains is pervasively fractured and locally brecciated. Fractures are conspicuously present in thin section, hand specimen, and outcrops. Most fractures are filled to some degree by carbonate cement. Slip between breccia clasts probably involved small amounts of rotation. Despite pervasive fractures, the Katakturuk Dolomite exhibits the high degree of structural and stratigraphic continuity previously noted.

Some fracture zones in the Katakturuk Dolomite are associated with the high-angle faults and with bedding plane shears. Breccia locally occurs along the conjugate faults and is well developed in shaly beds at the top of the lower member.

Disruption of the Katakturuk Dolomite is more intense in the eastern part of the Sadlerochit Mountains than in the western part. West of the Katakturuk River, the Katakturuk is structurally simple, is not extensively fractured, and mappable conjugate faults were not identified. East of the Katakturuk River, small unmappable normal faults, bedding plane shears, and breccia zones are numerous. From the Nularvik River east to the last exposures in the Sadlerochit Mountains, the Katakturuk Dolomite is shattered and locally brecciated and faulted. Bedrock outcrops are extensively covered with solifluction debris, probably reflecting the degree of fracturing of the dolomite. Mapping of units identified farther west cannot be done with confidence. Marker beds indicate that the map units recognized to the west are present, but poor bedrock exposure severely limits mapping the units with precision.

## Upper and Lower Contacts of the Nanook-Katakturuk Structural Block

The Nanook-Katakturuk block is in fault and likely depositional contact with adjacent rocks in the Sadlerochit Mountains. Fault contacts resulted from thrust-ramping of the block over much younger strata. The Nanook-Kataktutruk block is at least locally structurally detached along unconformities with overlying and possibly underlying strata. Leiggi (1987, p. 753, fig. 4) inferred a thrust fault at the base of the Katakturuk in the Sadlerochit Mountains. Additionally, locally prominent breccia zones and shears resulting from small scale thrust-detachment or shear related to flexural slip folding has modified depositional relations.

The contact between the Nanook-Katakturuk block and the underlying Proterozoic clastic rocks probably is a fault. West of the Nularvik River, the conjugate faults mapped in the block terminate at the Weller thrust, but east of the river, where the unnamed Proterozoic clastic rocks intervene between the Weller thrust and the Katakturuk Dolomite, the conjugate faults terminate along the base of the Katakturuk. These relations, as discussed earlier, suggest that the contact of the Katakturuk with the underlying rocks is a thrust fault. Locally the unnamed Proterozoic rocks are sheared, and quartzite beds are broken by low-angle faults. Basal beds of the Katakturuk were examined incompletely to determine whether shearing along the contact is local or pervasive. These beds of the Katakturuk are not concordant with underlying clastic rocks.

The depositional contact between the Nanook-Katakturuk block and the overlying Mississippian strata is probably only locally faulted in the Sadlerochit Mountains. Kelley and Foland (1987) recognized a detachment thrust, the Sunset thrust, within a widespread Mississippian shale where the shale is present and along a regional unconformity at the base of Mississippian strata where the shale is not present. They based their interpretation on prominent detachment folds in Mississippian carbonate strata in the Franklin Mountains where the shale is present, and they tentatively identified imbricate faults involving pre-Mississippian strata that possibly merge with a detachment along the base of Mississippian strata in the eastern Shublik Mountains and detachment folds in the eastern Sadlerochit Mountains. The results of the present study and that of Kelley and Molenaar (in press) infer that the Sunset thrust is probably restricted to the eastern Sadlerochit Mountains and has little displacement.

## Folds

Folds involving Mississippian to Triassic strata detached from pre-Mississippian rocks occur in the eastern and southern Sadlerochit Mountains. Strongly north- to north-northwest vergent and locally overturned concentric folds in Mississippian and Pennsylvanian carbonate strata and Permian and Triassic clastic strata crop out east of the Nularvik River on the North flank of the Sadlerochit Mountains. A near-overturned north-vergent anticline in part cut by the Weller thrust crops out at the east end of the Sadlerochit Mountains (Kelley and Molenaar, in press; Reiser and others, 1970); rocks in the core of the fold are part of the regional homocline in the range and apparently are not commensurately folded into the core of the anticline (Kelley and Foland, 1987). Anticlines and synclines in Mississippian to Triassic strata are recognized as far west as the upper Katakturuk River on the south flank of the Sadlerochit Mountains.

Breccia and shears are locally evident along the contact between the Nanook-Katakturuk structural block and overlying Mississippian carbonate strata (Kelley and Foland, 1987). Elsewhere, the contact is clearly exposed and exhibits no evidence of structural disruption (Imm and Watts, 1987; Wallace, Meigs, and others, 1987). In areas where the Kayak Shale is absent, Robinson (1987) reported clasts in the basal Lisburne Group derived from rocks underlying the Lisburne Group in the Sadlerochit Mountains, strongly inferring that at least locally detachment is not coincident with the contact between Mississippian and older rocks.

# DISCUSSION

## Detachments Involving the Nanook-Katakturuk Structural Block

There appear to be three thrust faults that separate the Nanook-Katakturuk structural block from other rocks in the Sadlerochit Mountains. The Nanook-Katakturuk block and underlying Proterozoic rocks have been ramped up from unexposed substrate into their present position above the Weller thrust. Additionally, the Nanook-Katakturuk block appears to be in fault contact with the underlying unnamed Proterozoic clastic rocks. Detachment also locally occurs between the Nanook-Katakturuk block and overlying Mississippian rocks.

The Weller thrust ramps upward from a decollement below the Katakturuk Dolomite and emplaces an anticline cored by Katakturuk Dolomite over strata (not shown on the map) as young as Paleocene in age. The decollement below the Katakturuk Dolomite is not exposed, although the probable detachment between the Katakturuk Dolomite and underlying Proterozoic clastic rocks could be representative of the decollement.

Detachment between the Katakturuk Dolomite and underlying Proterozoic rocks is inferable from field relations. High-angle conjugate faults appear to terminate along the contact between the Katakturuk Dolomite and the unnamed Proterozoic clastic rocks as they terminate elsewhere along the Weller thrust. Continuations of the conjugate faults are not readily apparent in the Proterozoic rocks, inferring either truncation of the conjugate faults or merger of conjugate tear faults with a thrust fault.

Detachment along the regional unconformity at the base of the Mississippian section on the north flank of the Sadlerochit Mountains probably is restricted to the area east of the Nularvik River. Along the south flank of the Sadlerochit Mountains, Mississippian strata are probably detached from the Nanook-Katakturuk block as far west as the upper Katakturuk River.

Anticlines and synclines in Mississippian to Triassic strata inferably detached from pre-Mississippian rocks crop out on the north flank of the Sadlerochit Mountains east of the Nularvik River. The folds are strongly vergent to overturned to the north and are concentric. Where deeply eroded, their limbs are tightly appressed. Their concentric style infers that they terminate at depth, presumably at the unconformity at the base of the Mississippian strata.

The strike of folds in Mississippian to Triassic strata in the northeastern Sadlerochit Mountains further infers detachment along the unconformity at the base of Mississippian rocks. For example, the western segment of the Itkilyariak anticline (Kelley and Foland, 1987) trends east-northeast, perpendicular to the regional transport direction rather than to faults that cut pre-

Mississippian rocks, such as the Weller thrust. North of Weller Creek the segment of a syncline not involved in drag folding along the Weller thrust also trends east-northeast. Folds involving Mississippian to Triassic strata attached to pre-Mississippian rocks would most likely have strikes parallel to the strike of pre-Mississippian rocks and the faults that cut the pre-Mississippian rocks, namely east rather than east-northeast.

Contrasts in folding style between rocks above and below the unconformity at the base of the Mississippian section infer detachment in the eastern Sadlerochit Mountains. The north-vergent and nearly overturned anticline in Mississippian to Triassic strata above the Weller thrust involves incommensurately folded Proterozoic rocks (Kelley and Foland, 1987, p. 260, fig. 204). The apparent lack of continuity in rotation across the unconformity indicates at least limited slip between the concentrically folded Mississippian to Triassic strata and the discordant underlying Proterozoic rocks.

Folds that probably reflect detachment along the unconformity at the base of the Mississippian section occur as far west as the upper Katakturuk River on the south flank of the Sadlerochit Mountains. The folds are strongly asymmetrical, north-vergent, concentric anticlines and synclines in Mississippian to Triassic strata, similar to folds elsewhere in strata that are probably detached from pre-Mississippian rocks. Additionally, the folds strike south-southwest, suggesting that they are detached from pre-Mississippian rocks that have an east-trending structural grain.

No unanimity of opinion exists on the areal limits of detachment of Carboniferous strata in the northeastern Brooks Range. In some of the first reports of detachment tectonics in the northeastern Brooks Range, workers (Kelley and Molenaar, 1985; Leiggi and Russell, 1985; Rattey, 1985) recognized widespread detachment of Carboniferous strata. Kelley and Molenaar (1985) reported widespread detachment along the unconformity at the base of the Pennsylvanian to Mississippian Lisburne Group in the Sadlerochit and Shublik Mountains, which Kelley and Foland (1987) subsequently referred to as the Sunset thrust. Leiggi (1987) recognized a progressive northward decrease in structural shortening of the Lisburne Group and estimated 41% and 15% shortening, respectively in the Franklin and Sadlerochit Mountains. Robinson (1987), suggested that the Lisburne Group depositionally overlies pre-Mississippian rocks in the Sadlerochit Mountains and that the Kayak Shale, regionally present below the Lisburne Group elsewhere in northeastern Alaska, is absent by nondeposition as suggested by Armstrong and Mamet (1978, 1975). Wallace, Hanks, and others (1987) and Wallace, Meigs, and others (1987) suggested that detachment at the base of the Lisburne Group is restricted to areas where the Kayak Shale is present south of the Sadlerochit Mountains and that detachment of the Lisburne Group extends no farther north than the Shublik Mountains.

The present work offers evidence of structural detachment, albeit with unknown but likely small magnitude displacement, in the eastern and southern Sadlerochit Mountains. Folds in Mississippian to Triassic strata detached from underlying pre-Mississippian rocks indicate detachment beyond the original distribution of Kayak Shale. Locally the detachment may not be confined to the unconformity. It is probable that detachment along the unconformity at the base of the Mississippian strata, that is, along the Sunset thrust of Kelley and Foland (1987), dies out in the Sadlerochit Mountains. This conclusion is based (1) on evidence that clasts of pre-Mississippian rocks along the base of the Lisburne Group indicate that only minimal transport has occurred across that detachment in the eastern Sadlerochit Mountains, and (2) on the undisturbed contacts at the base of the Lisburne Group in the western Sadlerochit Mountains.

Detachment along the unconformity at the base of the Mississippian strata in the eastern and southern Sadlerochit Mountains possibly approximates the limit of regional detachment in the context of the regional work of Leiggi (1987), Wallace, Hanks, and others (1987) and Wallace, Meigs, and others (1987). The apparent northern limit of this detachment in the Sadlerochit Mountains trends west-southwest across the central part of the range. The trend is orthogonal to the regional transport direction of Kelley and Foland (1987) and to slickensides observed by them in footwall cuts in the Marsh Creek thrust sheet along upper Marsh Creek.

## CONCLUSIONS

The Katakturuk Dolomite is exposed in a homocline in an erosionally breached doubly plunging east-striking anticline that extends the length of the Sadlerochit Mountains. The anticline is underlain by the Weller thrust that dies out in the eastern Sadlerochit Mountains and extends the length of the range. The anticline is one of a family of fault-floored anticlines superimposed on a broad anticlinorium that plunges both east and west under the coastal plain and dips under the coastal plain to the north.

The Nanook Limestone and Katakturuk Dolomite make up a south-dipping homoclinal block largely detached from underlying rocks and at least partially detached from unconformably overlying strata. The homocline is discordant with overlying more steeply dipping Mississippian to Triassic strata in the south limb of an anticline. The Weller thrust emplaces the Nanook-Katakturuk block and parts of the leading limb of the anticline on strata as young as Paleocene in age along the foot of the western range front. In the eastern part of the range, the Weller thrust ramped Katakturuk Dolomite and underlying Proterozoic clastic rocks, likely detached from the Katakturuk Dolomite, against Mississippian to Triassic strata. Apparent dip-slip displacement across the Weller thrust progressively diminishes eastward and dies out into a strongly north-vergent anticline at the east end of the Sadlerochit Mountains. In the eastern and southeastern parts of the Sadlerochit Mountains, the Nanook-Katakturuk block probably is detached from overlying Mississippian and younger strata along a regional unconformity; the detachment ceases to be recognizable in the western Sadlerochit Mountains.. A conjugate set of high-angle faults, probably tear faults contemporaneous with the Weller thrust and an unnamed fault between the Katakturuk Dolomite and underlying Proterozoic clastic and metaclastic rocks, cut the Nanook-Katakturuk structural block and overlying Mississippian to Triassic strata.

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