# ICAM8 Abstracts
## Arctic foreland fold & thrust belts & foreland basins

### The Caledonian Deformation Front beneath the Barents-Kara Shelf

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The Caledonides in Scandinavia (58-71 N) provide unambiguous evidence of vast distances of nappe displacement from WNW to ESE onto the Baltoscandian platform of continent Baltica. The thrust sheets are very thin (up to a few km). Geophysical data, particularly magnetic anomalies, along the entire Caledonian front in Scandinavia, characterize the Precambrian crystalline basement; they can be followed from beneath the thrust front of the orogen at least 100 (in places 200) km into the hinterland, their signatures being little disturbed by the Caledonian nappes.

The Caledonian thrust front strikes NE-wards, out into the Barents shelf, overriding the NW-SE-trending Trollfjorden-Komagelva fault zone -- the deformation front of the late Neoproterozoic Timanide Orogen. The Caledonian thrust sheets, perhaps including deformed Devonian foreland basin molasse, are covered by thick latest Palaeozoic and younger formations. Farther west, a Caledonian suture(s) separates the characteristic Laurentian margin lithologies on Svalbard and Bear Island from the Timanian lithologies and structure of northwesternmost Russia. Thus, the character of the magnetic (and perhaps other) anomalies of the Barents shelf may well be truncated by Caledonian sutures, but are unlikely to be influenced by the thin Caledonian allochthons. Interpretations of where the Caledonian deformation front is located beneath the Barents-Kara shelf, reaching from northern Norway to Severnaya Zemlya, should be based on the exposed geology and drillhole data, e.g. on Franz Josef Land (Knudsen et al, this meeting).

## Brookian Foreland Basin Response: From Sediment-Starved During Thrusting To Filled During Extensional Exhumation


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Although redeformed by Cenozoic contractional deformation, the framework elements of Early Cretaceous north-directed arc-continent collision are easily discerned in the Brooks Range. Key elements include a metamorphic hinterland in the southern Brooks Range, an imbricated foreland consisting of a stacked series of thin-skinned allochthons in the northern Brooks Range, and the adjacent Colville foreland basin underlying the North Slope to the north. Associated sedimentary deposits include lower Neocomian syntectonic thin-bedded turbidites and olistostromes capping the allochthons, post-deformational Hauterivian-Albian wedgetop units consisting of northward-thinning locally conglomeratic fan-delta deposits, and a thick Albian and younger eastward prograding slope and deltaic foredeep wedge that fills the Colville Basin.

Sedimentary facies, sandstone petrography, and detrital zircon U-Pb data indicate that the syntectonic units are thin and were shed locally from the uppermost allochthons (including ophiolite) and longitudinally from sources of Uralian sediment to the west. The wedgetop deposits consist of sand-rich deposits composed of Uralian detritus, suggesting derivation from reworked syntectonic deposits. Early foredeep deposits were derived from Uralian sources to the west but after 107 Ma changed to dominantly metamorphic sources from the Brookian hinterland. Together these indicate the Brooks Range was a sediment-starved submarine orogen during thrusting but became emergent in the Aptian and Albian as thrusting gave way to extensional exhumation in hinterland areas.

## Cenozoic structural geology of Banks Island, western Canadian Arctic Archipelago, N.W.T.


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Banks Island is the westernmost island of the Canadian Arctic Archipelago and is situated near the continental margin of North America towards the Canada Basin of the Arctic Ocean. Until now, little was known about tectonic structures on Banks Island and their possible relationships to the tectonic evolution of the continental margin. Field and seismic data indicate that sedimentary rocks on Banks Island have been affected by extensional movements creating abundant normal faults. Fieldwork on Banks Island during the summer of 2016 showed that Devonian, Cretaceous and Paleogene deposits on northern Banks Island are characterized by a number of local, restricted deformation zones that we interpret to indicate both dextral and subordinate sinistral strike-slip deformation along NNE-SSW striking structures parallel to the continental margin of Banks Island. The presence of Cenozoic strike-slip deformation on Banks Island extends the area of known Cenozoic strike-slip along the continental margin southwestward from where it had been previously documented in northern Ellesmere Island. Field observations indicate norma1 faulting took place before and after the strike-slip deformation. The observation of strike-slip motion on Banks Island suggests a component of strike slip over the whole Paleogene North American margin.

Poster session.

## Preliminary tectonic map of the central and southwestern Pearya Terrane, Ellesmere Island, Canada


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The Pearya Terrane is a 350 km long and 100 km wide geotectonic unit situated at the north coast of Ellesmere Island. It consists of five Mesoproterozoic to Paleozoic structural units with a different geological history than the Neoproterozoic and Paleozoic Franklinian Basin to the south, that represents the northern margin of Laurentia. The final collision of the Pearya Terrane and Laurentia took place during the Ellesmerian Orogeny, prior to the Early Carboniferous. The Pearya Terrane is penetrated by a large number of ductile and brittle fault zones resulting in a complex mosaic of different tectonic blocks, indicating that Pearya was already a composite terrane before collision with Laurentia. Most of the pre-Ellesmerian fault zones were re-activated during the Ellesmerian Orogeny as SE-and SW-directed steep, often ductile, reverse faults. Present day, the Pearya Terrane is dominated by a complex system of up to 500 m wide, brittle strike-slip faults zones predominantly parallel to the continental margin. Those faults have affected Carboniferous through Triassic cover rocks of the post-Ellesmerian Sverdrup Basin, Cretaceous dikes, plutons and volcanic rocks and Paleocene sediments on Wootton Peninsula, indicating that the Paleogene Eurekan deformation controlled the present day structure of the Pearya Terrane. It should be noted that the Eurekan tectonic episodes were characterized by opposing sinistral and dextral motions parallel to the continental margin before the final break-up of Laurasia and the separation of Greenland and Svalbard after the Eocene/Oligocene.

# Evolution of the southern Chukotka margin based on sedimentary record of the Late Jurassic – Early Cretaceous basins


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The accumulation of the Upper Jurassic-Lower Cretaceous deposits on the southwestern edge of Chukotka microplate occurred under the influence of processes related to its convergence with an active margin of Siberia. The South Anyui Ocean and the Kulpolney Island Arc located between the two margins. E.L. Miller based on a comparison of the first results of U-Pb dating of detrital zircon from the J3-K1 deposits (6 samples) came to the conclusion about existence in the study area an extensive foreland basin at Late Jurassic – Early Cretaceous (Miller at al. 2008). After more detailed research we suppose two stages of sedimentation: Oxfordian-Kimmeridgian and Tithonian-Valanginian.

The Oxfordian-Kimmeridgian arcosic sandstones accumulated on the southwestern edge of the Chukchi microplate due to erosion of the Precambrian granitoids and the Triassic clastic rocks located mainly in the north in modern coordinates. At the Tithonian time, sediment transport direction were changed to northerly because of the accretion of the Kulpolney Island Arc to the southwestern edge of Chukotka. As a result of the oceanic crust subduction under the Chukchi microplate, a continental arc was formed. The suprasubduction volcanic complexes contaminated with crustal material became the main source for the Tithonian greywackes. The Lower Cretaceous deposits continued to accumulate due to erosion of the Jurassic volcanic complexes and recycling of the Triassic and the Oxfordian-Kimmeridgian clastic rocks.

# Zircon provenance studies along the Alatna River in the Brooks Range, Alaska.

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The provenance and tectonic affinity of the metasedimentary and metaigneous rocks making up the Brooks Range, Alaska, will help reveal the nature of the opening of the Amerasian basin in the Arctic Ocean. One hypothesis suggests that Alaska was juxtaposed with Canada and Greenland and later separated in a rotational fashion to form the Amerasian basin. If the rotational hypothesis holds true, rocks derived from these terranes should compose the Brooks Range. By analysing zircon from the Brooks Range metasedimentary and metaigneous rocks, U–Pb dates and trace elements are used to identify the provenance.

The Brooks Range is a fold-and-thrust belt striking parallel to the Alaska Arctic margin and is cut by rivers perpendicular to the orogenic strike. The Alatna River flows through the Central- and Schist Belts and ends up in the Yukon-Koyukuk Basin. It offers excellent exposure along the riverbanks. Rock samples for U–Pb and trace element analyses were collected with the aim to determine the source rock and maximum depositional age of these sedimentary rocks. Comparing the detrital zircon U–Pb age data to known geological units from the Circum Arctic, it appears that the units with maximum depositional ages of >900 Ma derive from Baltica and Siberia. The younger rocks, with ~300 Ma max depositional ages, are not possible to pair up with a specific source as several known terranes in the Circum Arctic derive from this time span. Zircon trace element data can possibly distinguish the different terranes.