

Structural evolution of the Ptarmigan Fiord area, South Baffin Island

Timothy Chadwick

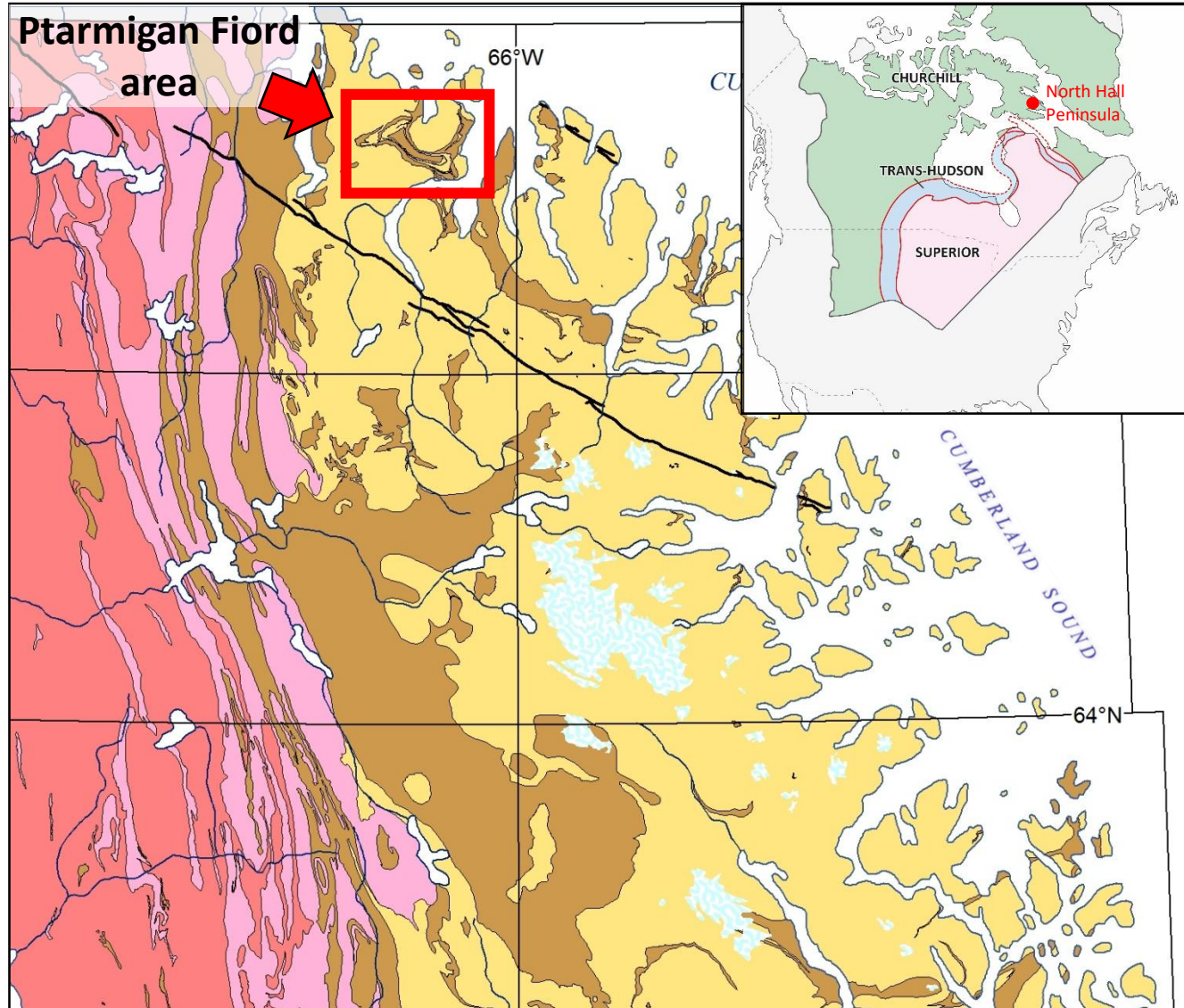
Nunavut Mining Symposium



Carleton
UNIVERSITY



Ptarmigan Fiord, Hall Peninsula (Trans-Hudson Orogen)




Geology of Northern Hall Peninsula (Steenkamp and St-Onge, 2014)

Paleoproterozoic granitoids

 Opx±Cpx granitoids (1872-1852 Ma*)

Paleoproterozoic cover

 Amphibolite-facies sedimentary rocks, amphibolite, calcsilicate, ironstone, mafic-ultramafic sills (1967 Ma*)

 Granulite-facies sedimentary rocks & Grt±Bt leucogranite (1.9-2.3 Ga*)

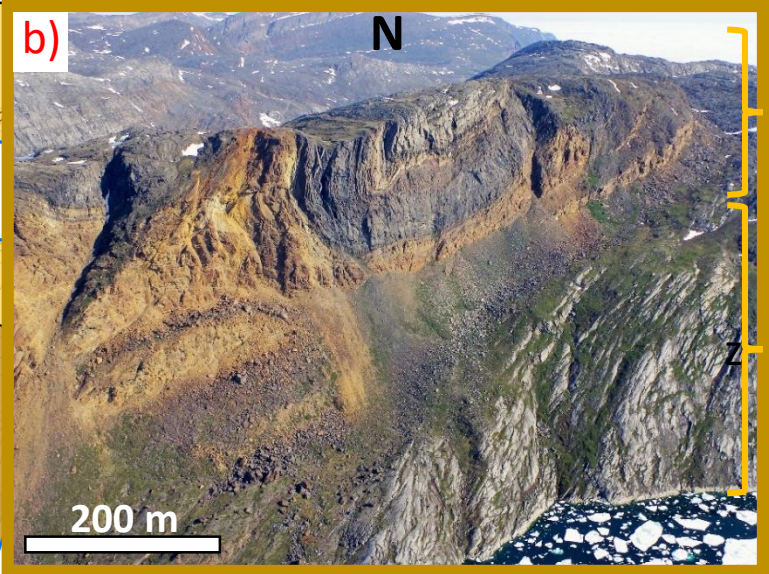
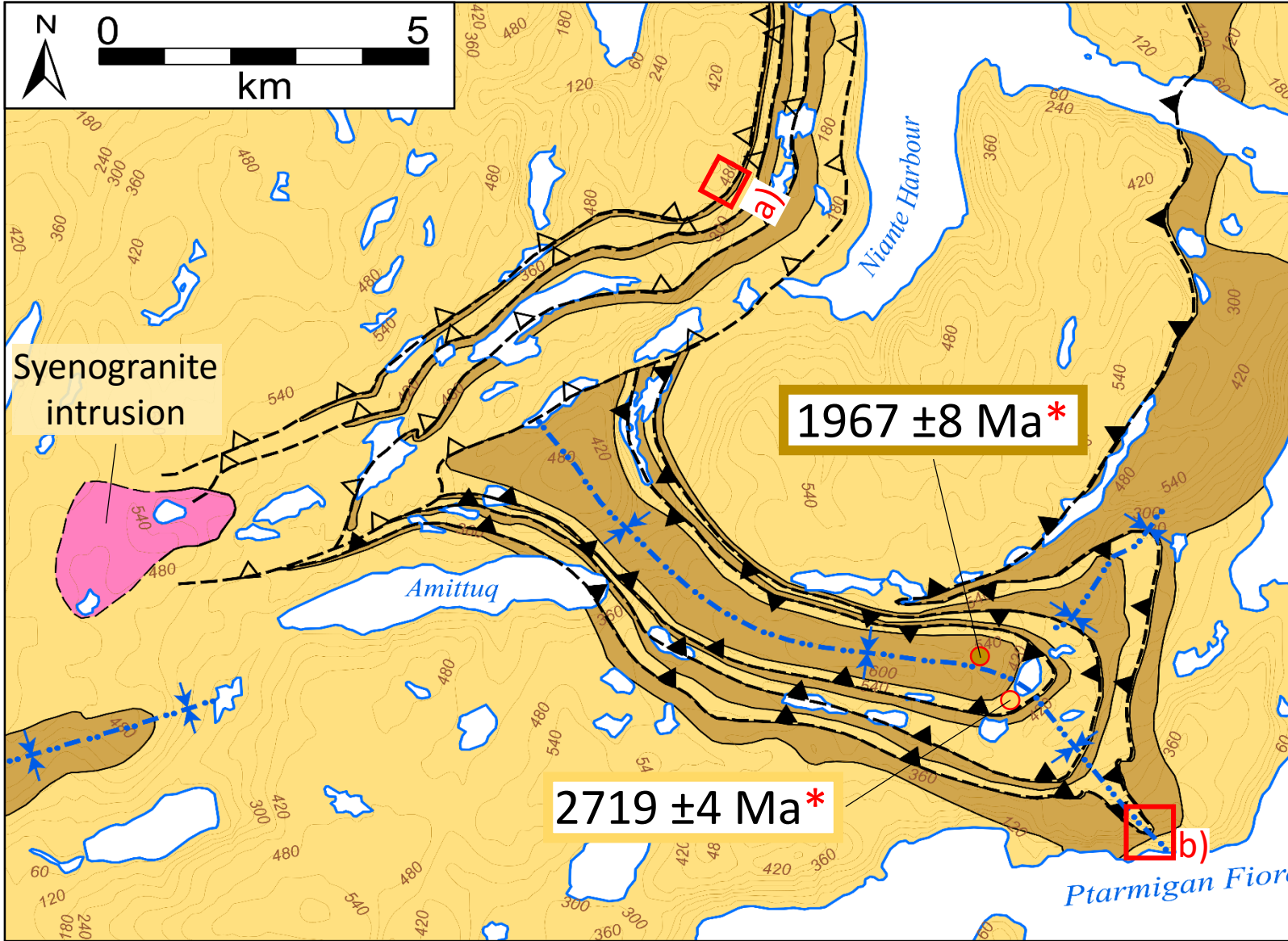
Neoarchean basement

 Orthogneiss (2832 – 2719 Ma*)

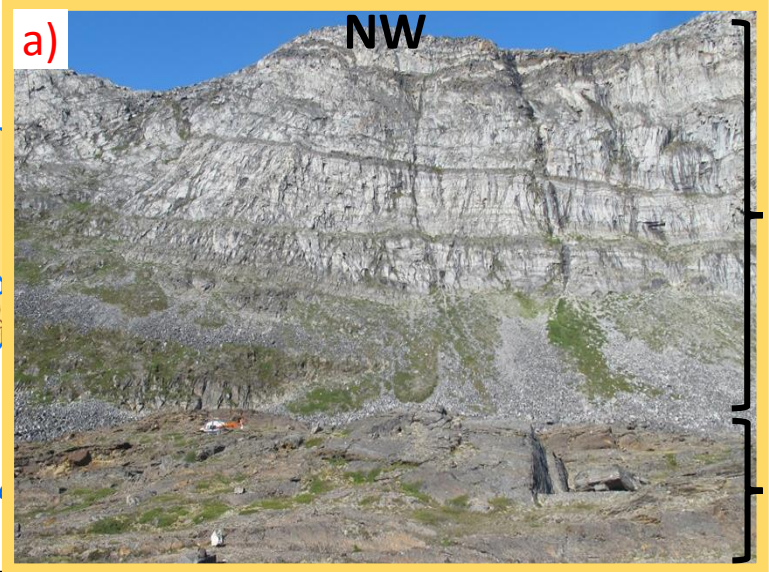
* U-Pb zircon ages (Rayner, 2014).

Neoarchean Basement

Paleoproterozoic cover



Cover
Basement

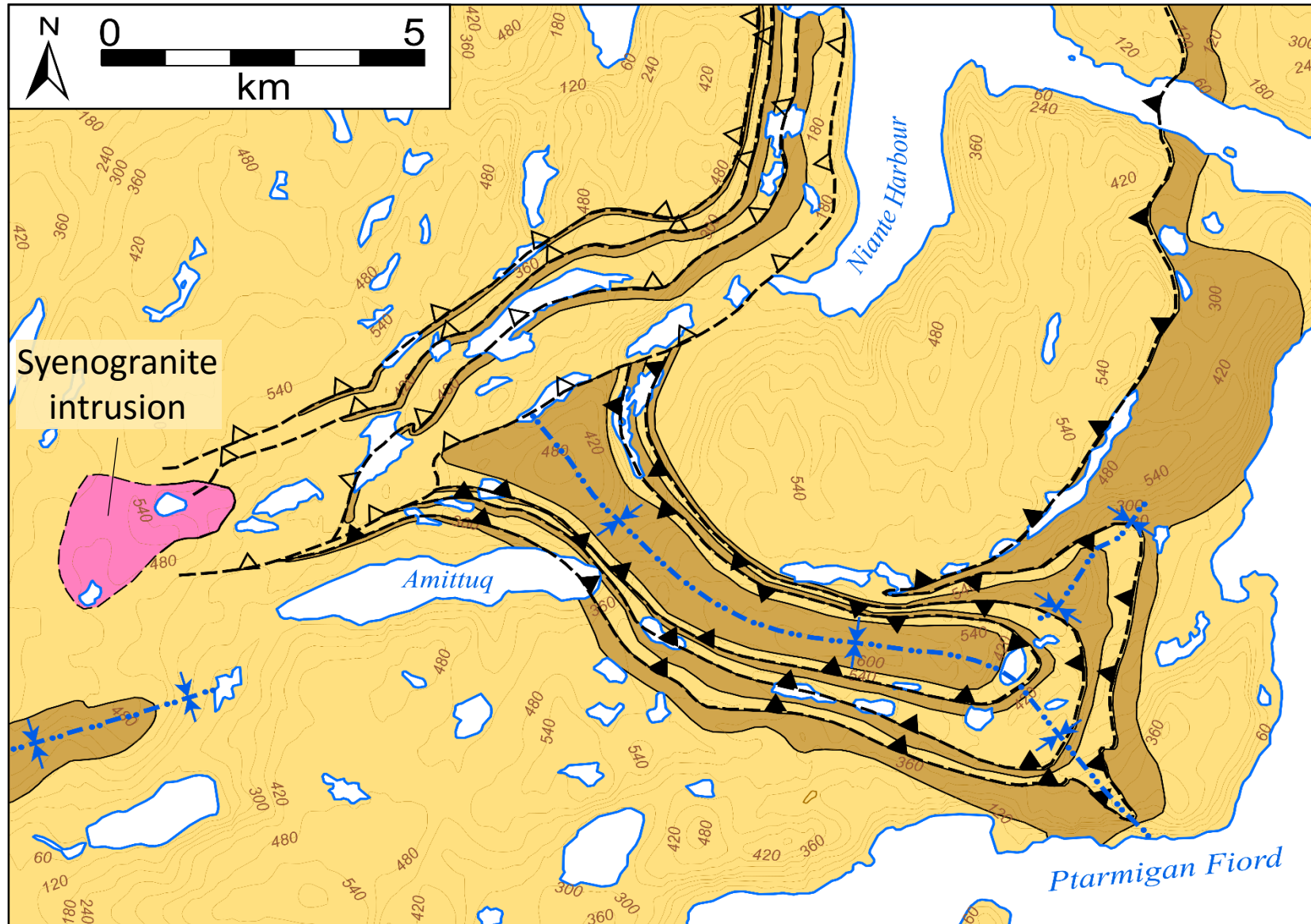


Basement
Cover

Modified from Chadwick et al., 2015

*Rayner, 2014

Purpose: understanding the structural geometry and history



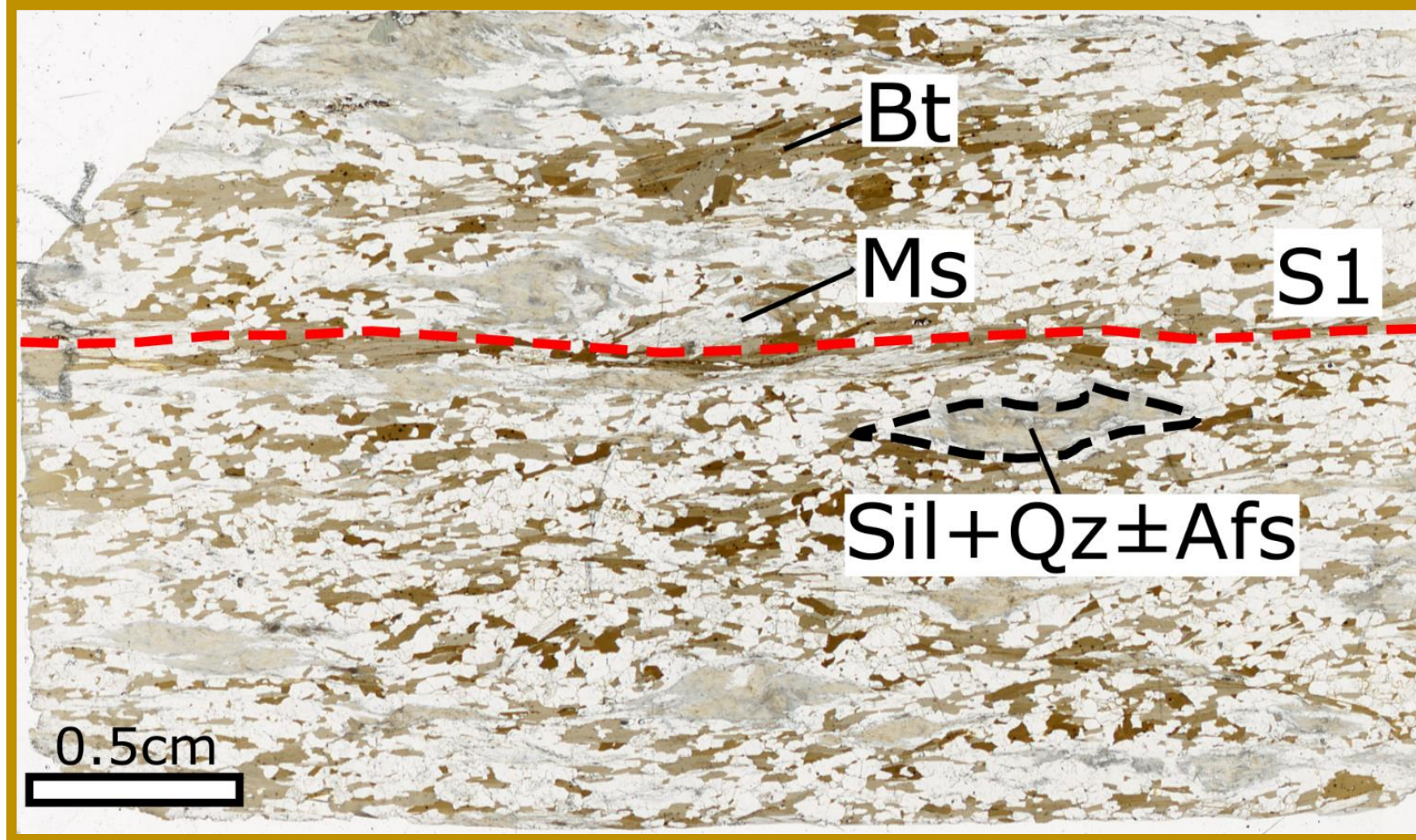
**Origin of
basement cover
imbrication:
thrust repetition
and/or polyphase
folds??**

**Three generations
of structures in
the area**

D_1 : S_1 dominant foliation (syn-metamorphic)



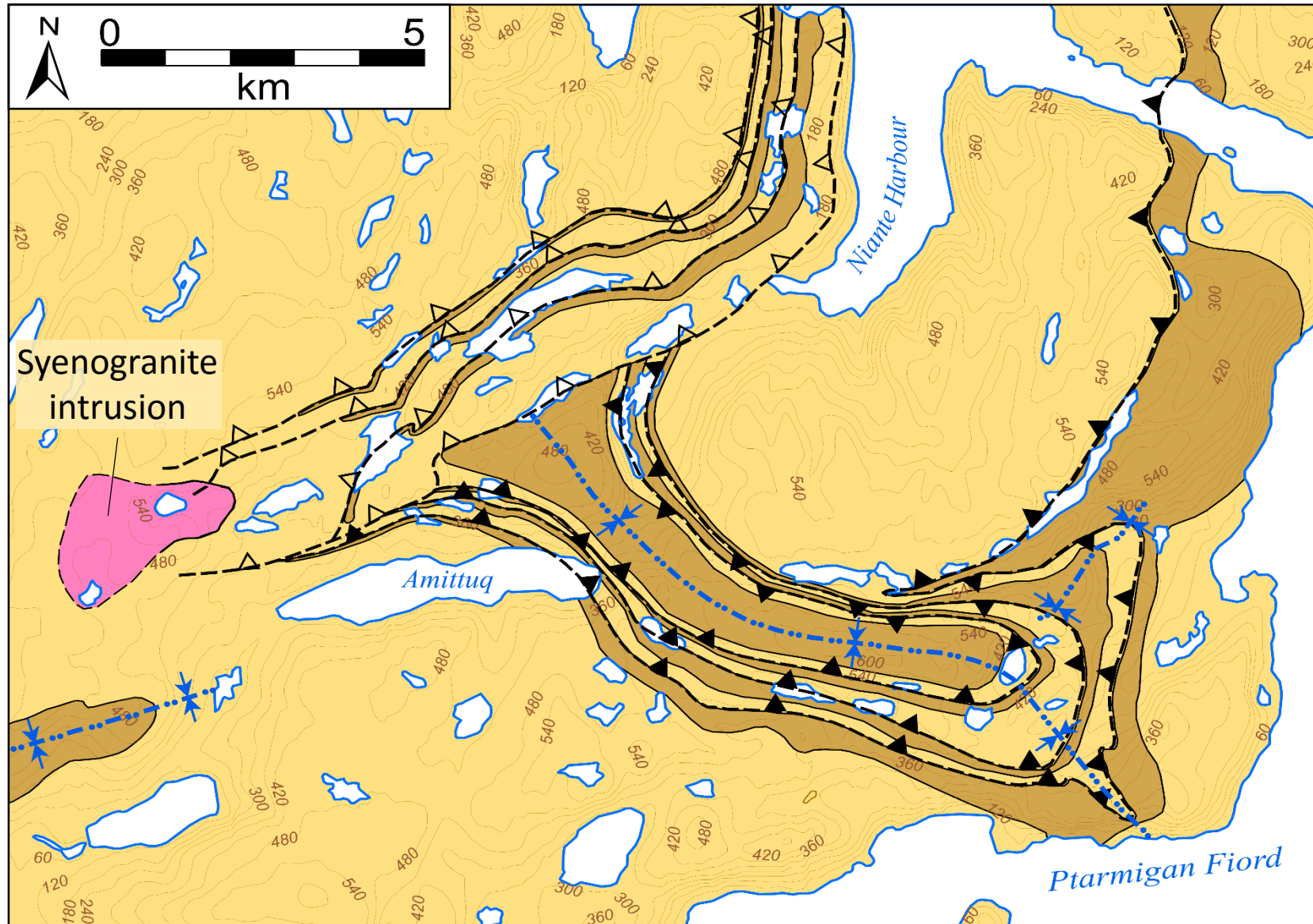
D_1 : S_1 dominant foliation (syn-metamorphic)



$S_0 = S_1$

S_1 is migmatitic
with peak T mineral
assemblage

D₂: (T₂ imbrication of basement & cover rocks; S₂ mylonite; F₂)

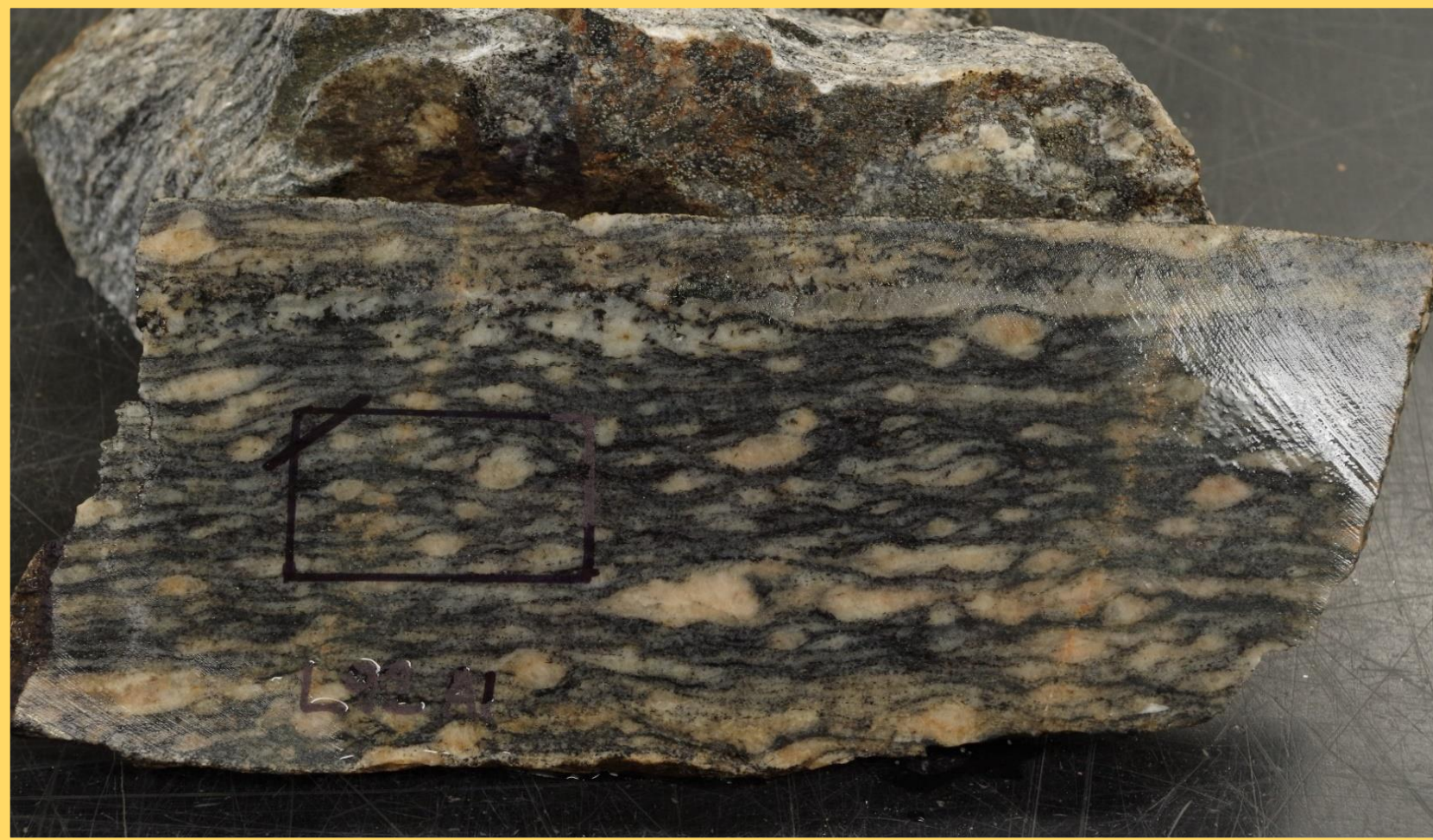


**Sheath fold
development**

**S_{2(myl)} = high-strain
zones; transposed**

S₀+S₁

D_2 : (T_2 imbrication of basement & cover rocks; S_2 mylonite; F_2)

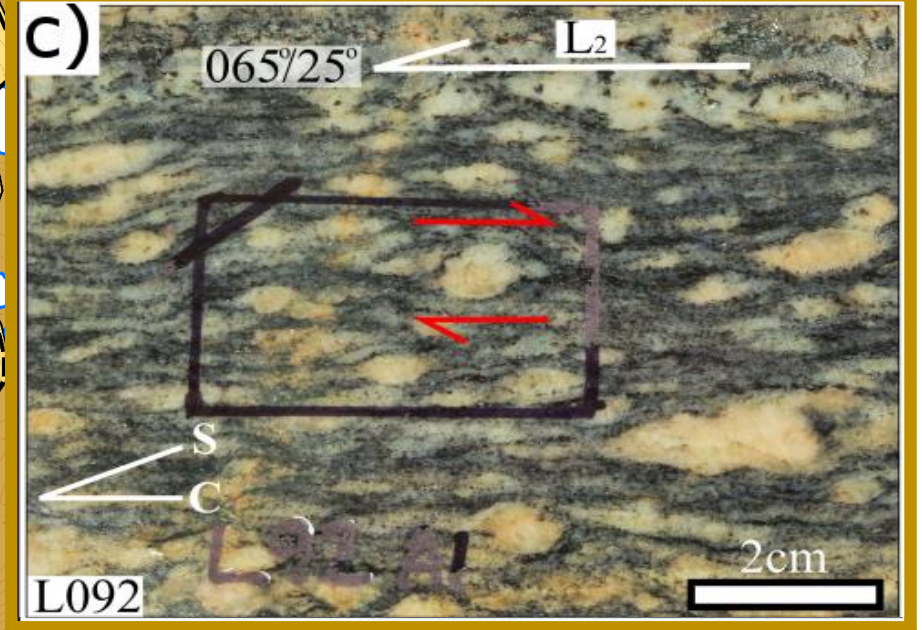
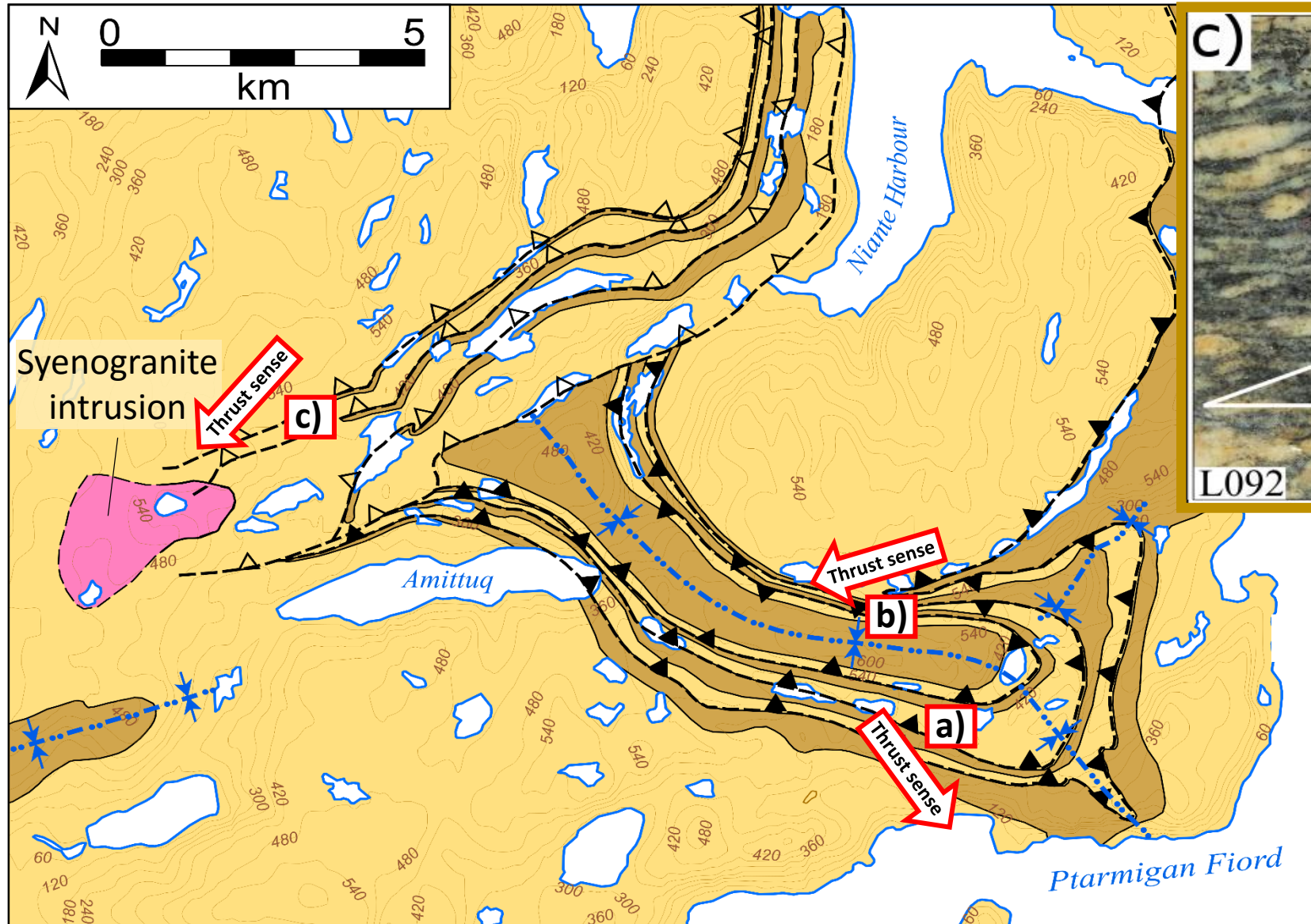


L_2 mineral stretching lineation

$S_{2(\text{myl})}$ = high-strain zones; transposed

$S_0 + S_1$

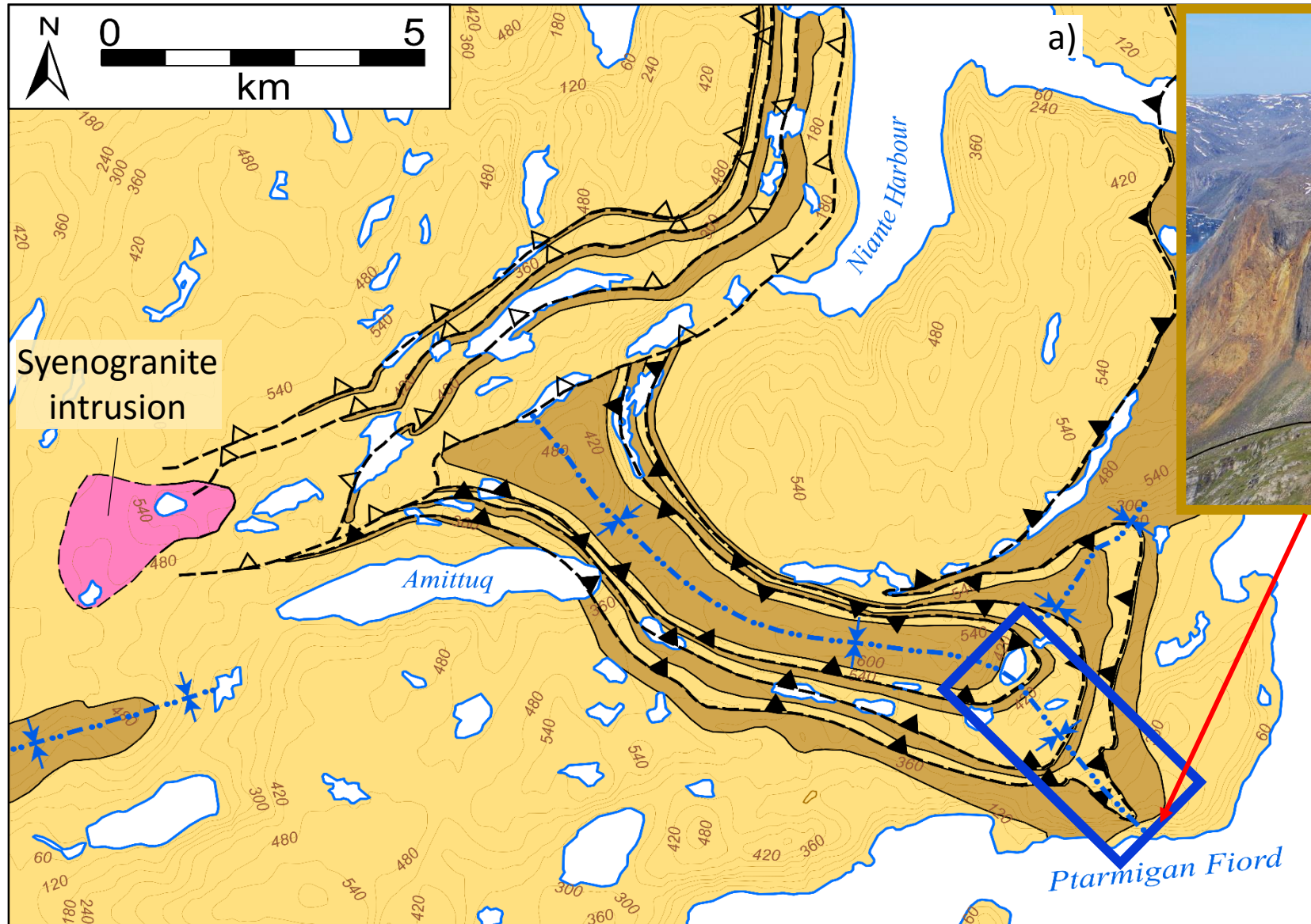
D₂: Mylonites (S_{2(myl)} & L₂) with shear sense indicators



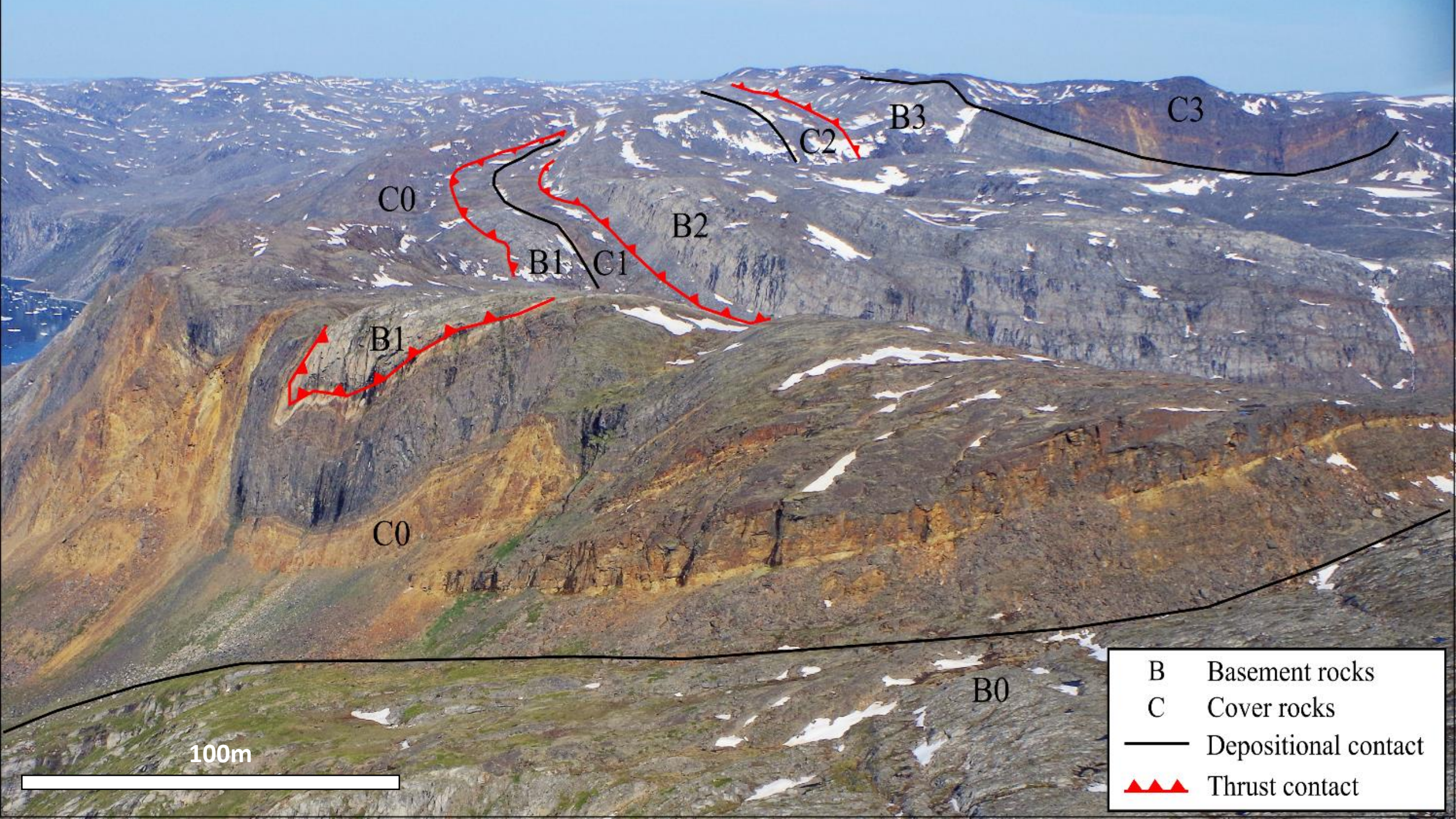
**σ -type porphyroclast
and C-S fabric shear-
sense indicators**

**Overall top to the
south shear sense**

F₂ folds deformed basement-cover belts



**Synclinal keel of
gently NW plunging
upright F₂ fold**



C0

B1

C1

B2

C2

B3

C3

B1

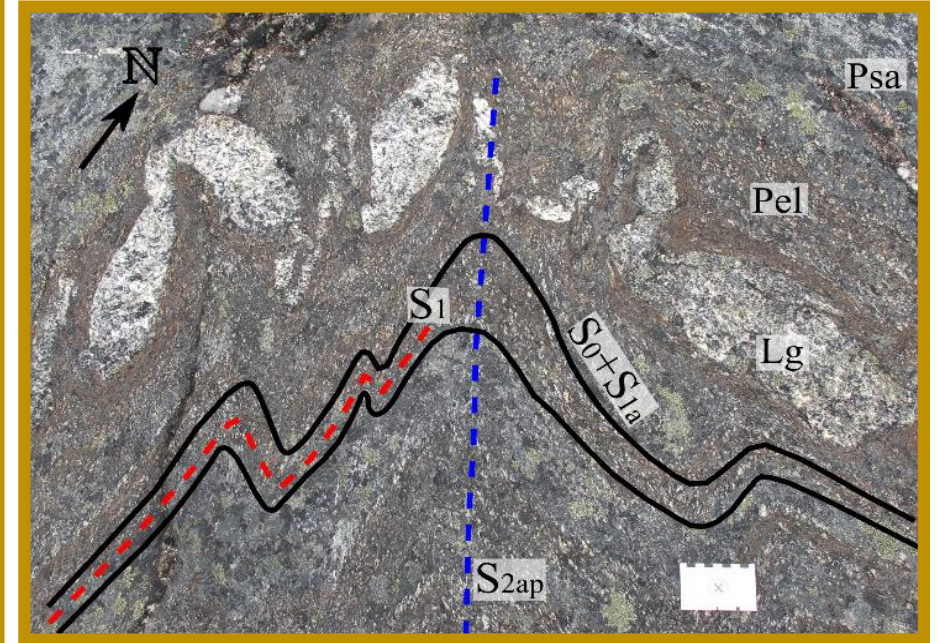
C0

B0

100m

B	Basement rocks
C	Cover rocks
—	Depositional contact
▲▲▲	Thrust contact

F_2 deforms S_0 , S_1 and belts of basement & cover



F_2 in migmatitic
metasedimentary rock

Structural history of the Ptarmigan Fiord area



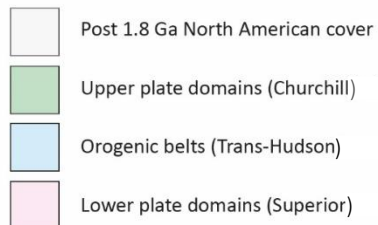
Event	Description	Absolute Ages
D₃	Folding of D₂ deformation	ca. 1800 Ma **
S ₃	Crenulation cleavage	
F ₃	Shallowly NE plunging upright folds	
D₂	Thick-skinned thrusting and folding	ca. 1850 - 1825 Ma **
F ₂	Shallowly E-SE plunging upright folds	
L ₂	Mineral stretching and elongate growth	
S ₂	Mylonitic fabric parallel to thrust contacts	
T ₂	Imbrication of basement and cover units	
D₁	Peak metamorphic event	ca. 1850 - 1825 Ma **
S _{1a}	Metamorphic foliation	
M ₁	Amphibolite-facies metamorphism	
S ₀	Transposed bedding	ca. 1967 ±8 Ma *

* U-Pb zircon ages, Rayner (2014).

** In situ U-Pb monazite ages, Skipton et al. (in press).



Paleoproterozoic deformation history



Modified after St-Onge et al., 2006

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Regional Events	Timing
Terminal collision of THO *	1820-1795 Ma *
Accretion of crustal blocks and arc terranes during amalgamation of upper Churchill plate of THO **	1850 - 1825 Ma **

* St-Onge et al. (2007)

** Skipton et al. (in press)

