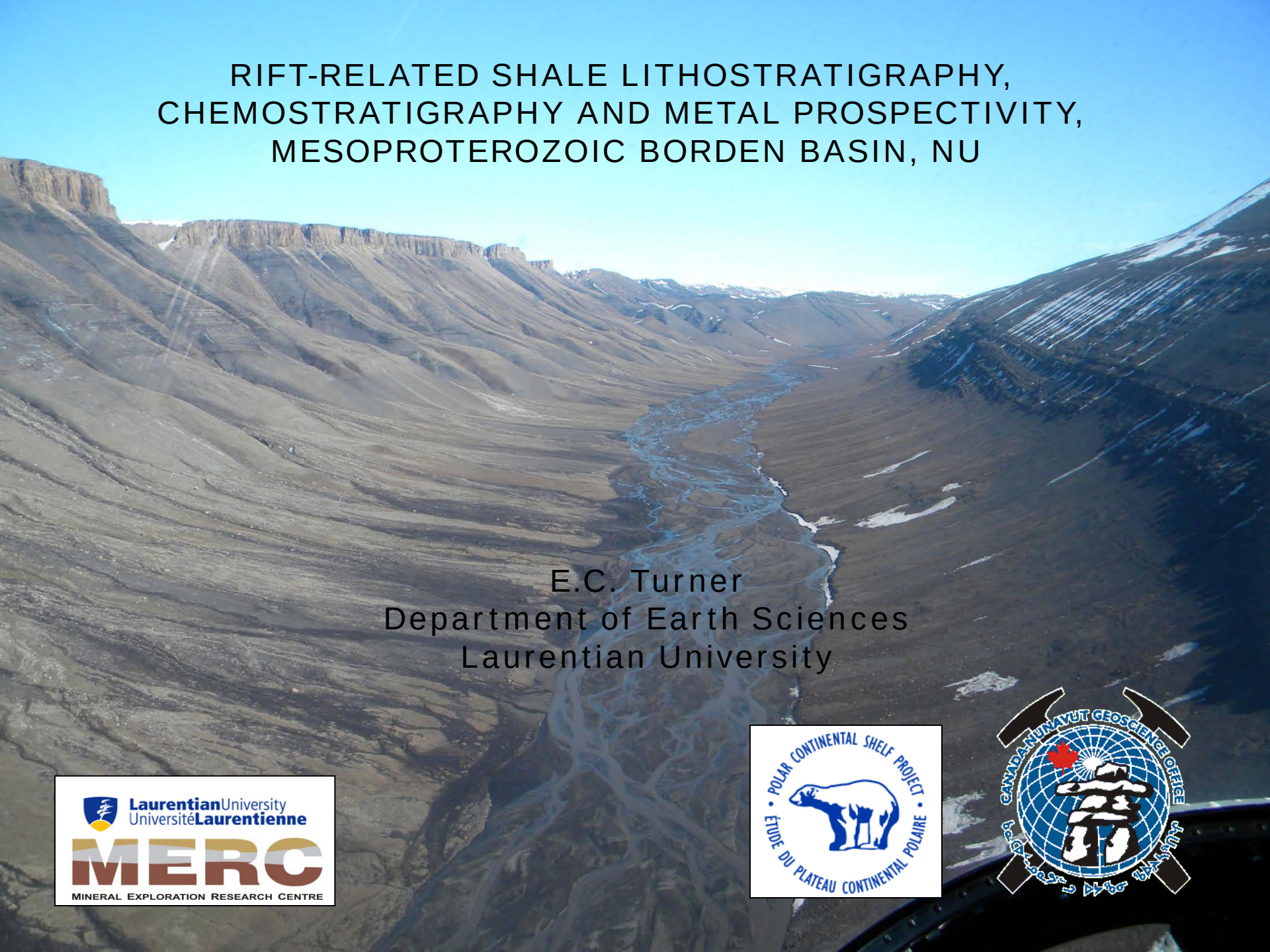
RIFT-RELATED SHALE LITHOSTRATIGRAPHY, CHEMOSTRATIGRAPHY AND METAL PROSPECTIVITY, MESOPROTEROZOIC BORDEN BASIN, NU



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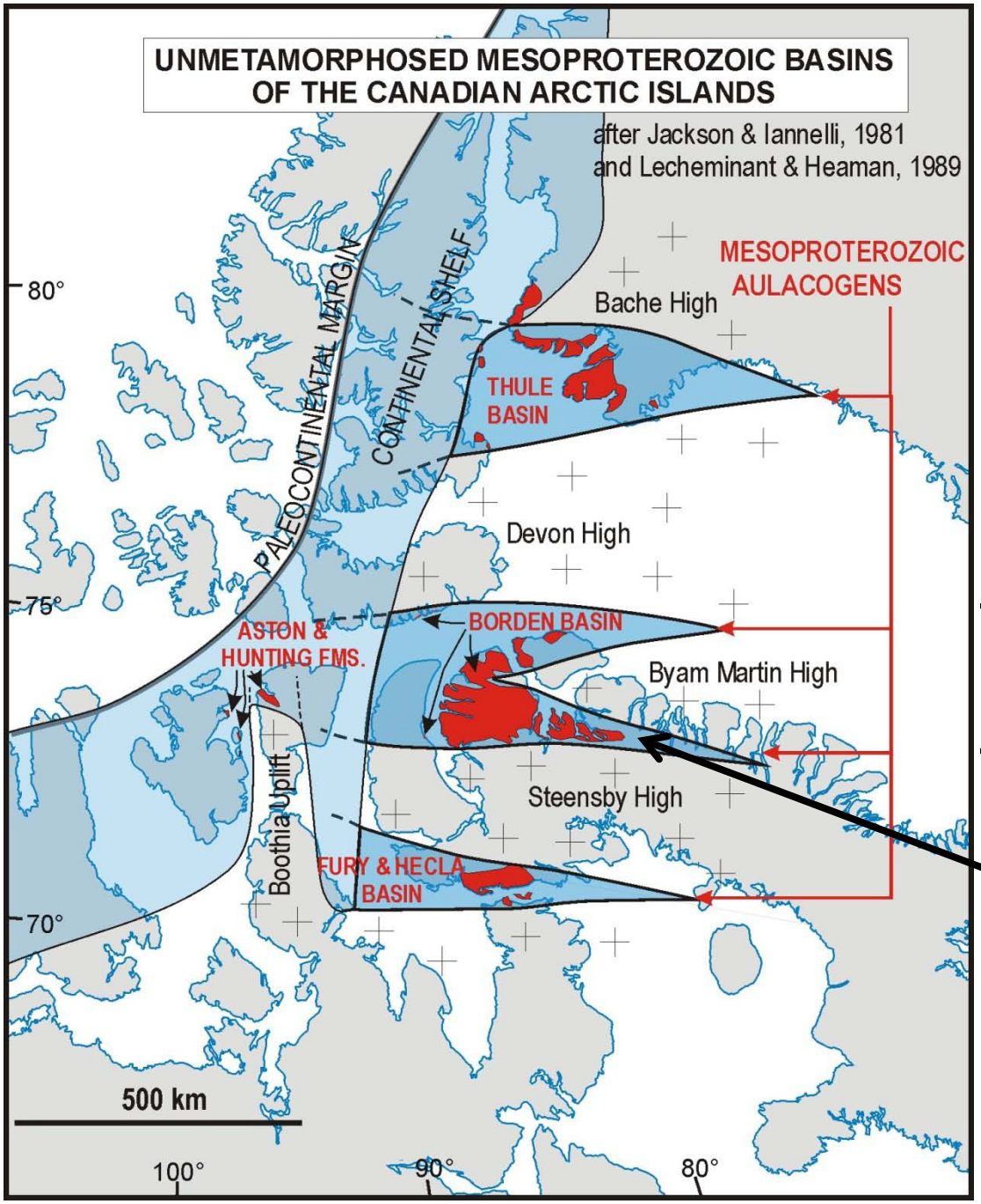
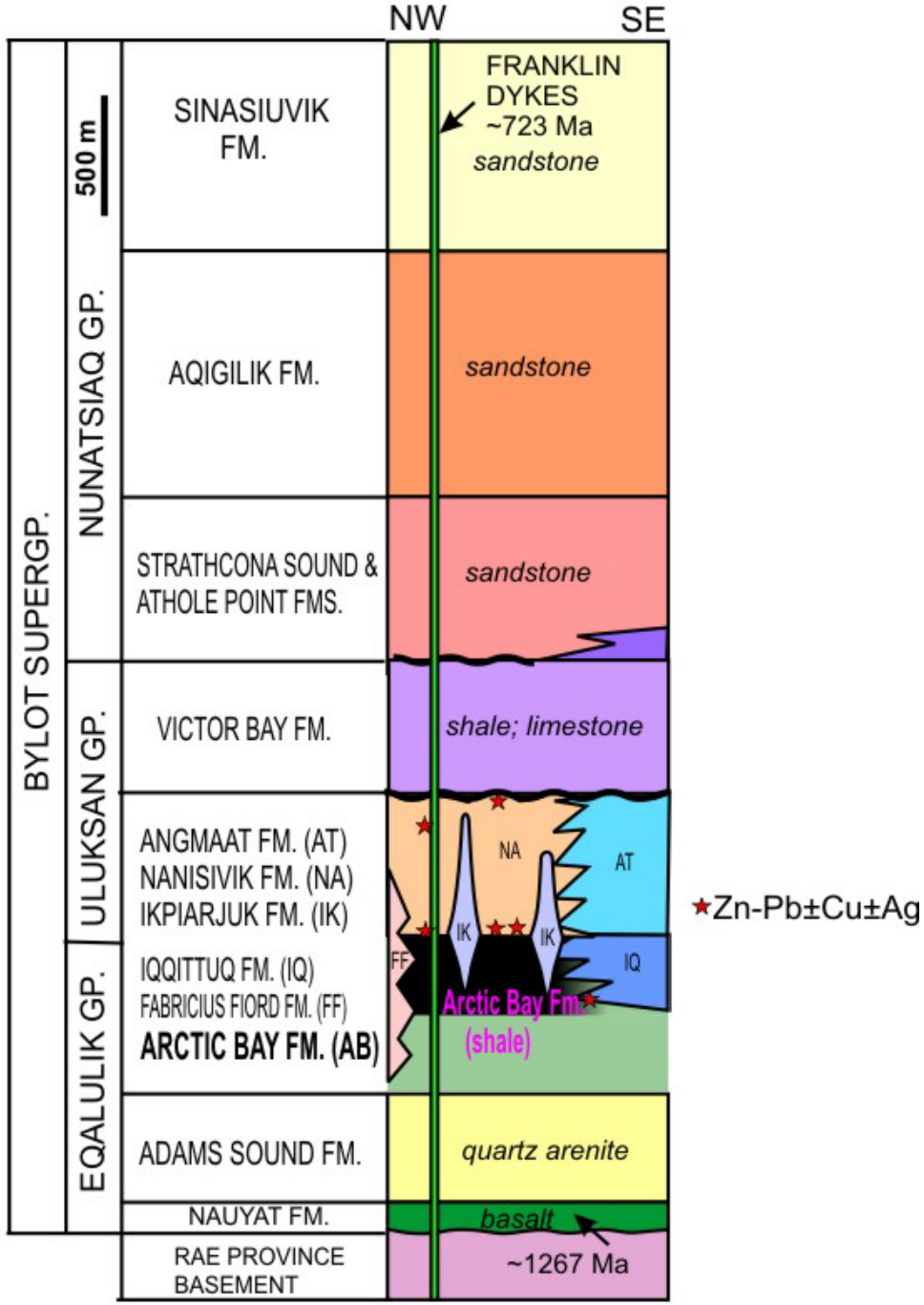


THE BYLOT BASINS

- extension associated with Mackenzie igneous event ~1270 Ma

Borden Basin

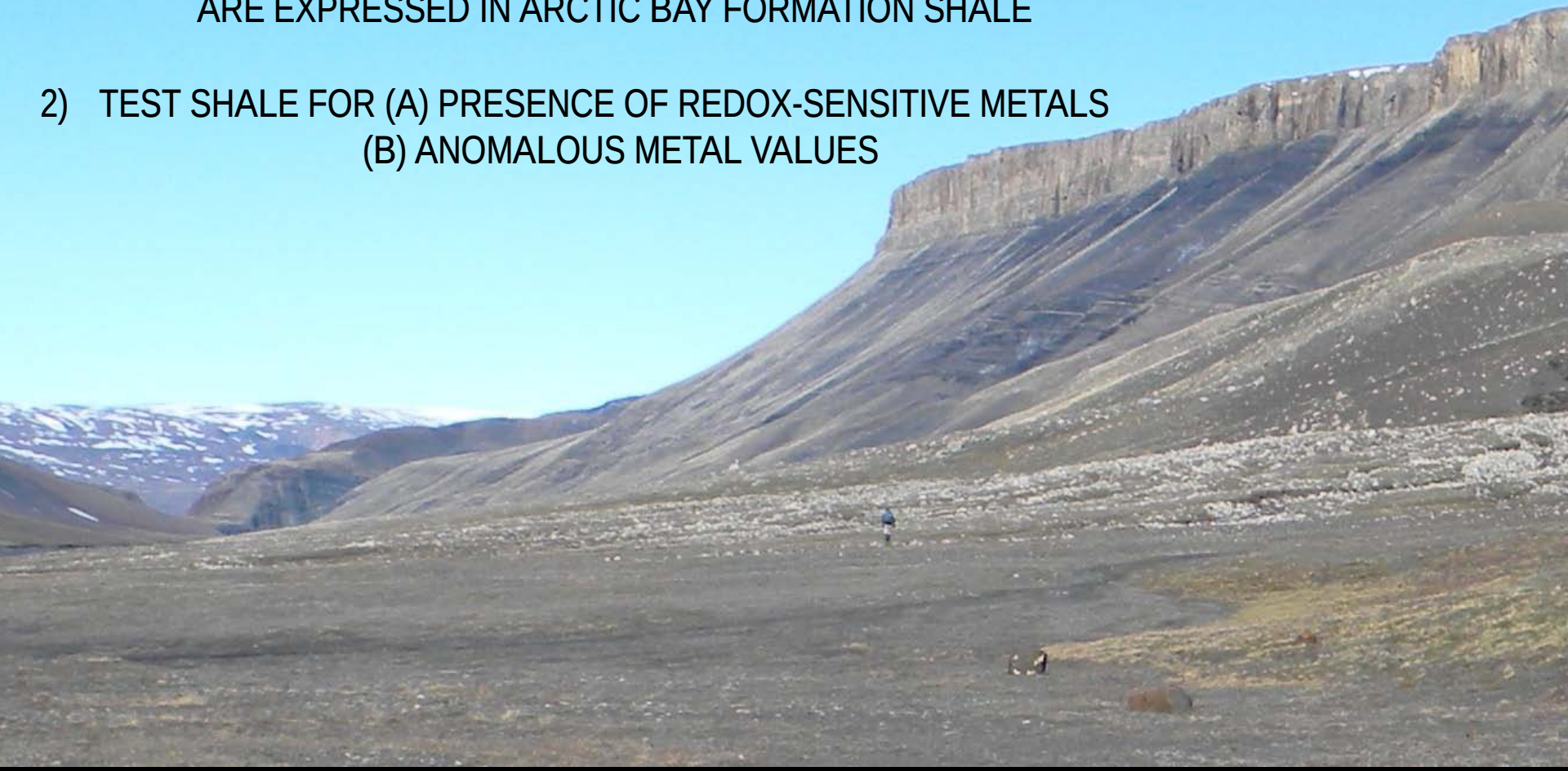
Milne Inlet Graben (MIG)


NW
SE
BYLOT SUPERGP.
500 m
NUNATSIAQ GP.
ULUKSAN GP.
EQALULIK GP.
SINASIUVIK FM.
FRANKLIN DYKES ~723 Ma
sandstone
AQIGILIK FM.
sandstone
STRATHCONA SOUND & ATHOLE POINT FMS.
sandstone
VICTOR BAY FM.
shale; limestone
ANGMAAT FM. (AT)
NANISIVIK FM. (NA)
IKPIARJUK FM. (IK)
IQQITTUQ FM. (IQ)
FABRICIUS FIORD FM. (FF)
ARCTIC BAY FM. (AB)
NA
AT
IK
IK
IQ
FF
Arctic Bay Fm.
(shale)
ADAMS SOUND FM.
quartz arenite
NAUYAT FM.
basalt
RAE PROVINCE BASEMENT
~1267 Ma
★Zn-Pb±Cu±Ag

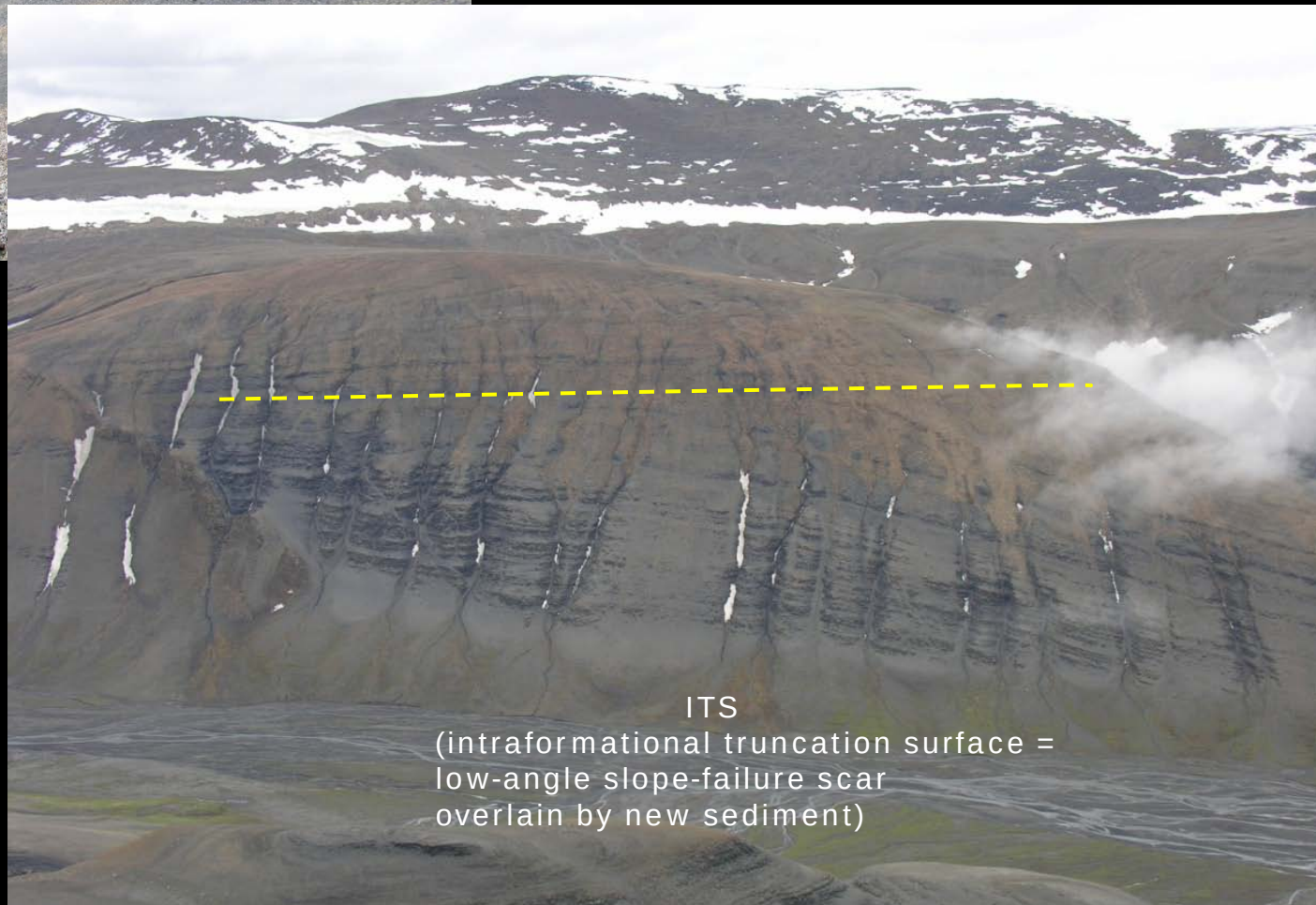
FIELD OBJECTIVES:

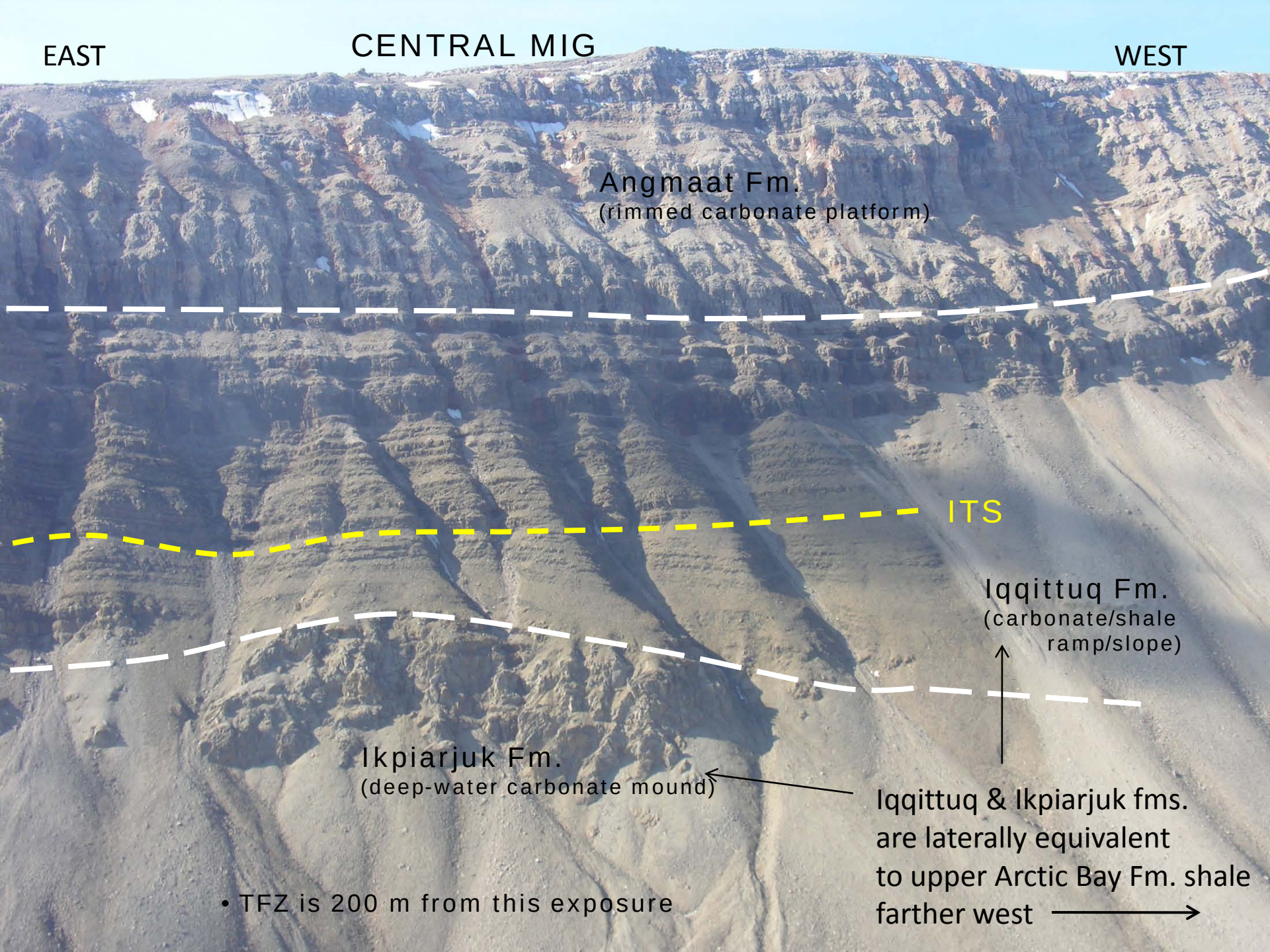
1) DETERMINE WHETHER PRECONDITIONS FOR SEDEX-TYPE MINERALISATION ARE EXPRESSED IN ARCTIC BAY FORMATION SHALE

2) TEST SHALE FOR (A) PRESENCE OF REDOX-SENSITIVE METALS
(B) ANOMALOUS METAL VALUES



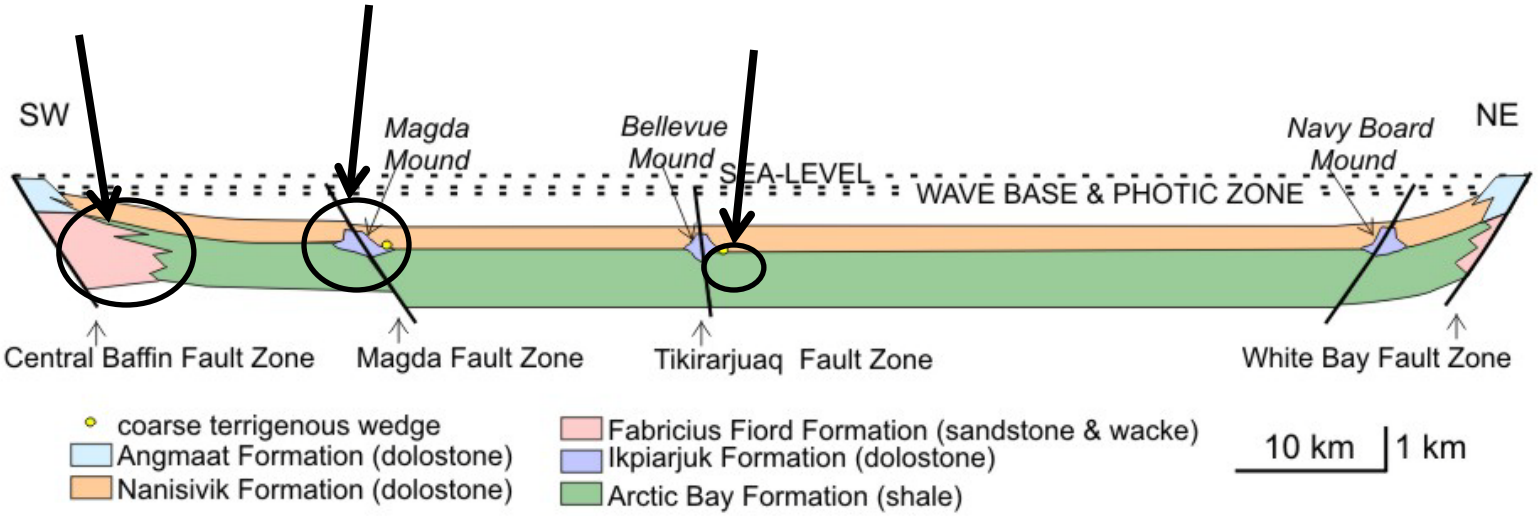
SHALE VALLEY, western MIG
• immediate vicinity of intra-graben fault



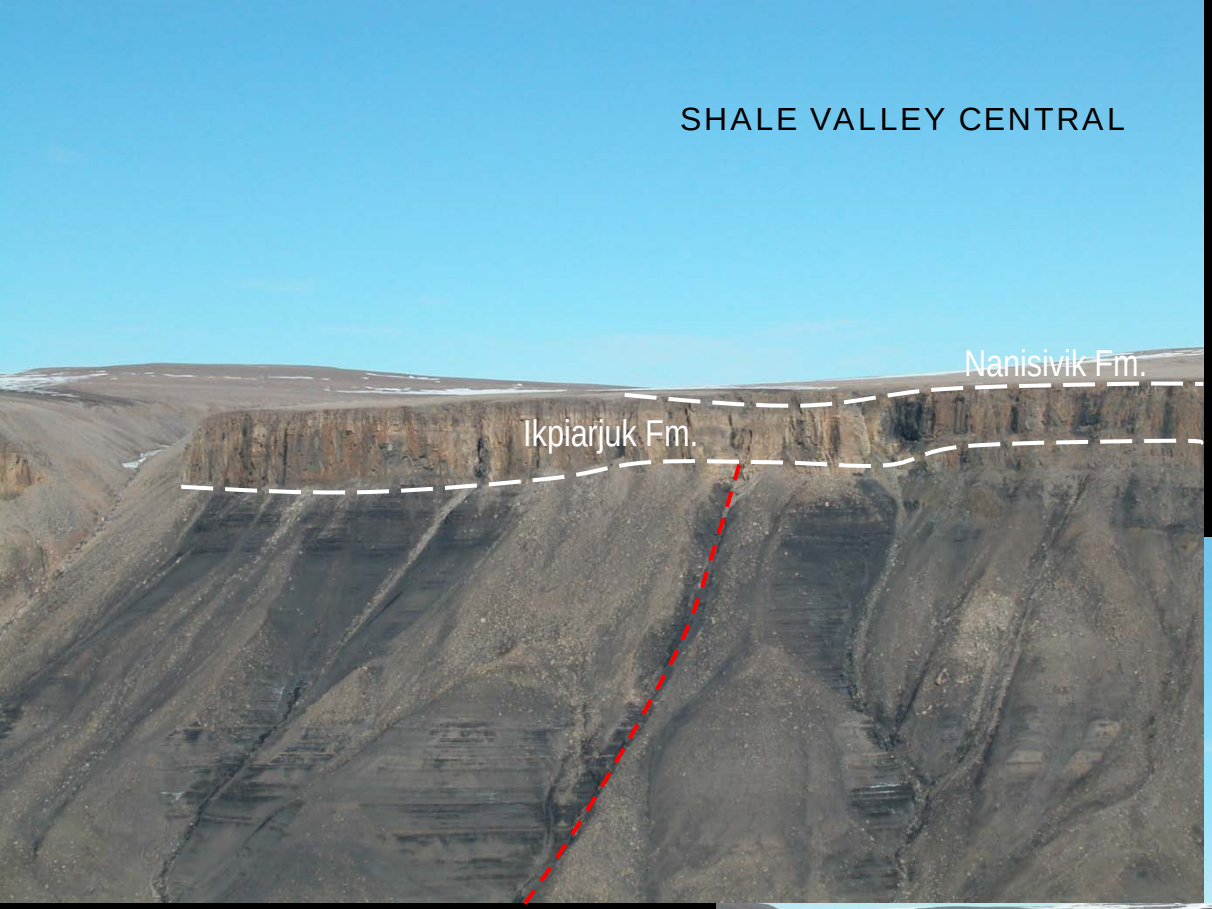

EAST
CENTRAL MIG
WEST
Angmaat Fm.
(rimmed carbonate platform)
ITS
Iqqittuq Fm.
(carbonate/shale
ramp/slope)
Ikpiarjuk Fm.
(deep-water carbonate mound)
Iqqittuq & Ikpiarjuk fms.
are laterally equivalent
to upper Arctic Bay Fm. shale
farther west
• TFZ is 200 m from this exposure

SYNSEDIMENTARY TECTONISM:

- graben-margin fan-deltas (Fabricius Fiord Fm.)
- ITSs in deep-water environments near synsedimentary faults
- deep-water carbonate mounds (Ikpiarjuk Fm.)

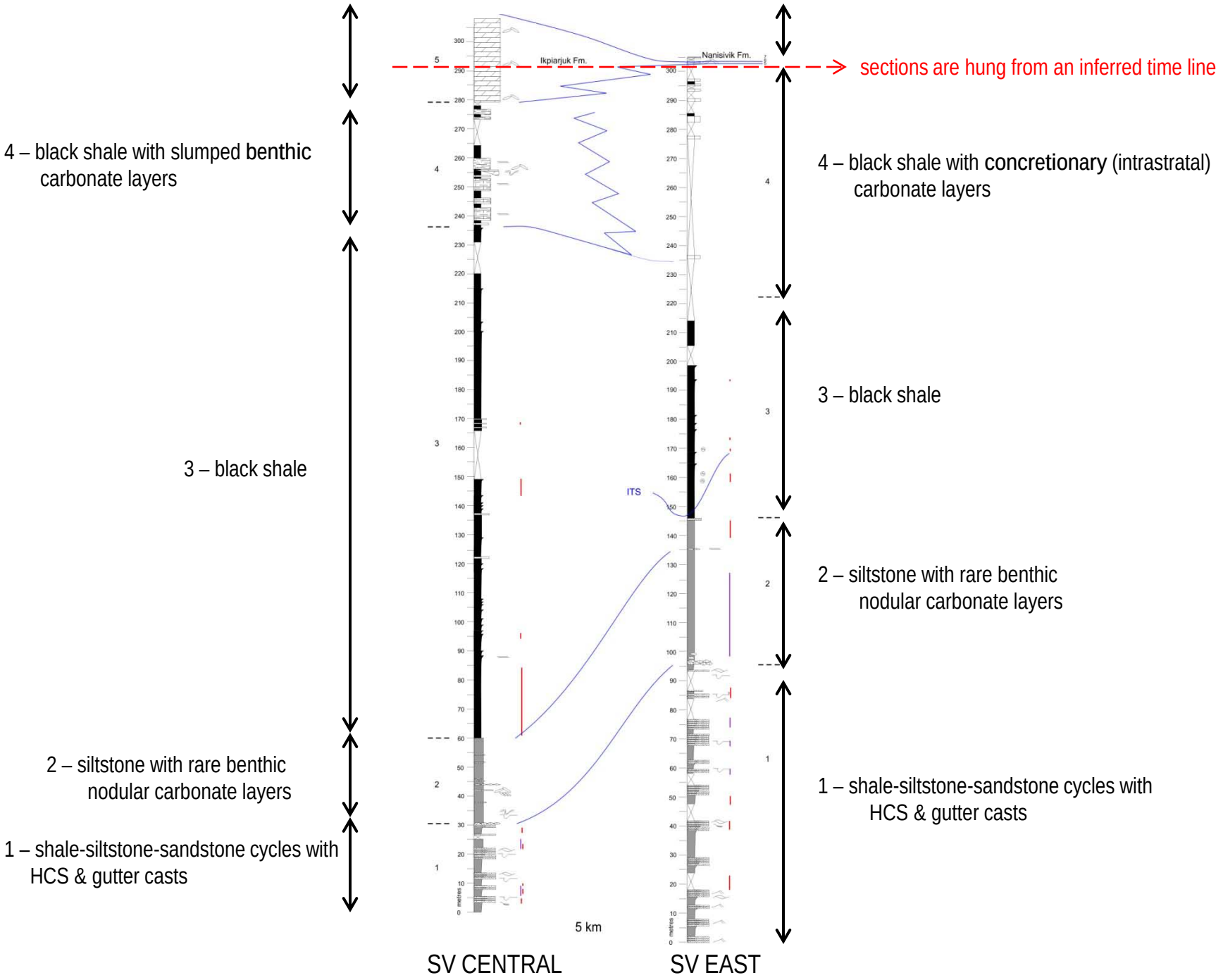


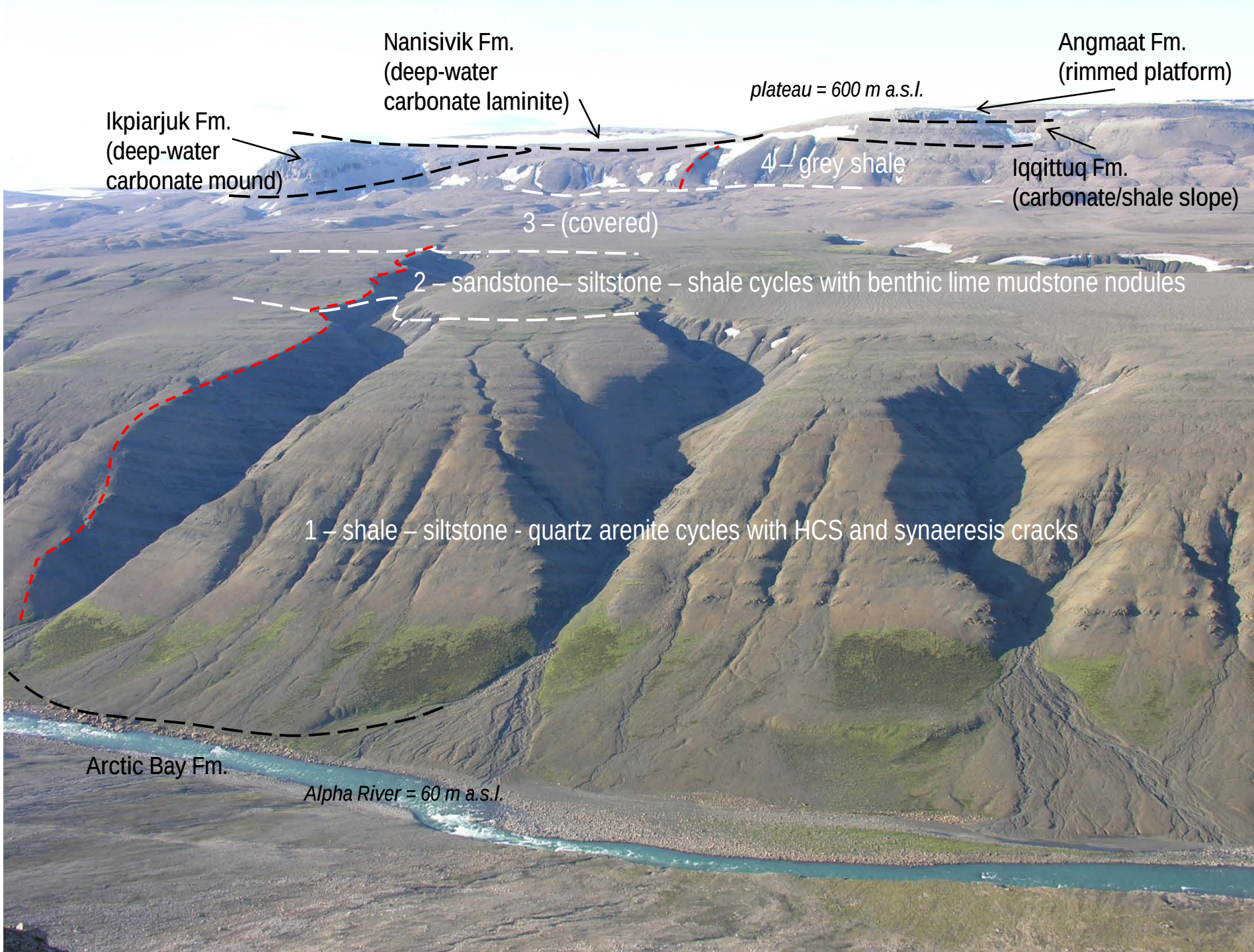
- rifting to form grabens began during deposition of Arctic Bay Formation, not earlier!



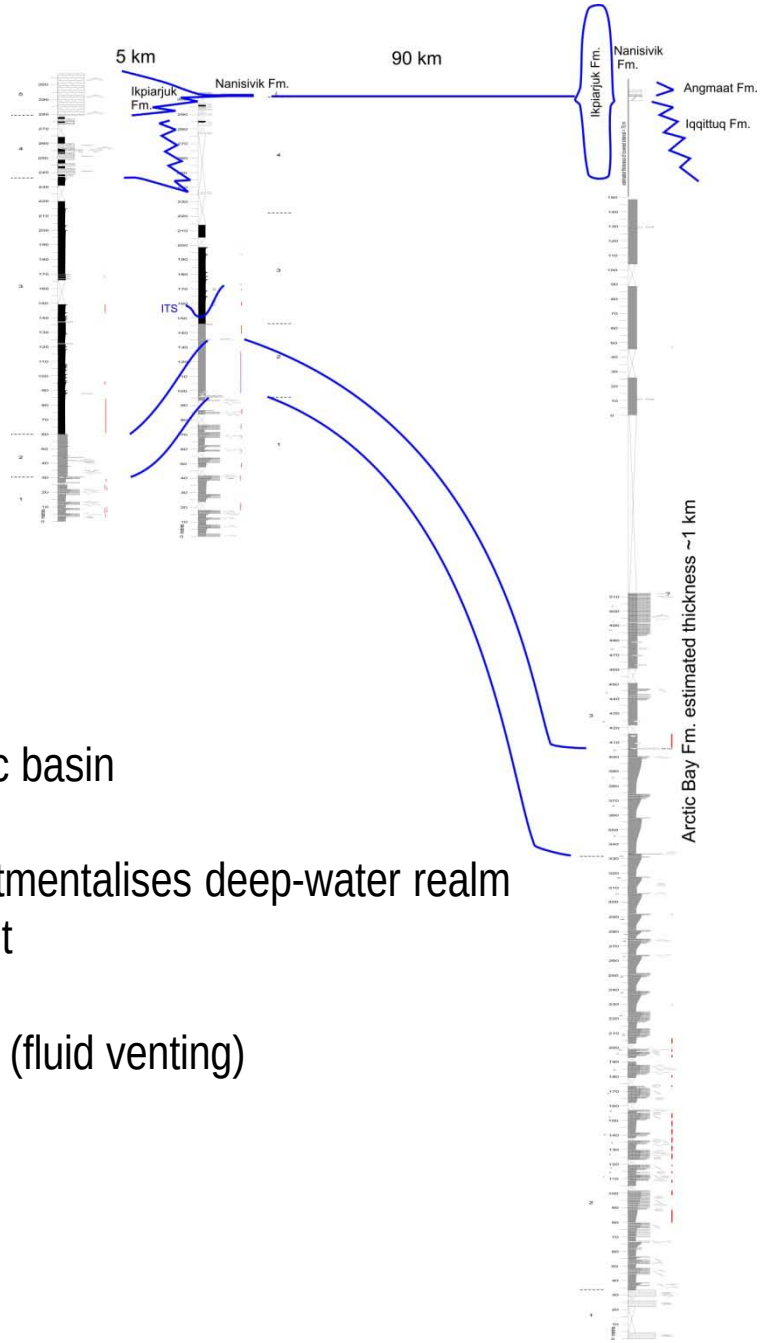
ARCTIC BAY FM. STRATIGRAPHY

5 km apart


Ikpiarjuk Fm.
Nanisivik Fm.
sections are hung from an inferred time line
4 – black shale with slumped benthic carbonate layers
3 – black shale
2 – siltstone with rare benthic nodular carbonate layers
1 – shale-siltstone-sandstone cycles with HCS & gutter casts
4 – black shale with concretionary (intrastratal) carbonate layers
3 – black shale
2 – siltstone with rare benthic nodular carbonate layers
1 – shale-siltstone-sandstone cycles with HCS & gutter casts
ITS
5 km
SV CENTRAL
SV EAST


Nanisivik Fm.
(deep-water
carbonate laminite)
Angmaat Fm.
(rimmed platform)
plateau = 600 m a.s.l.
Ikpiarjuk Fm.
(deep-water
carbonate mound)
4 – grey shale
Iqqittuq Fm.
(carbonate/shale slope)
3 – (covered)
2 – sandstone– siltstone – shale cycles with benthic lime mudstone nodules
1 – shale – siltstone - quartz arenite cycles with HCS and synaeresis cracks
Arctic Bay Fm.
Alpha River = 60 m a.s.l.

NW



SE

- northwest-ward deepening to euxinic basin

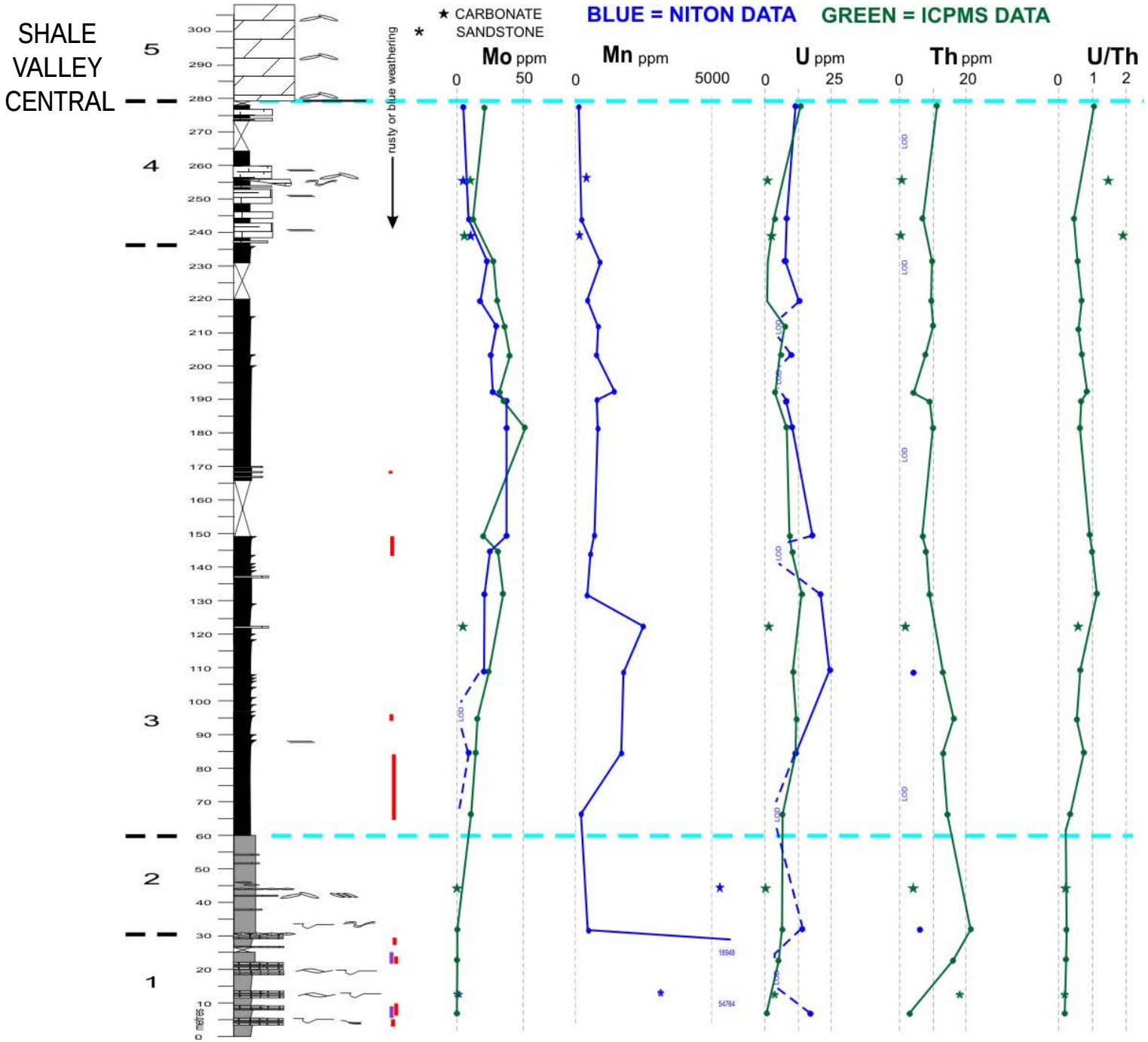
- local basin-floor topography compartmentalises deep-water realm
  - fault-related slope development
  - slope failure
  - deep-water carbonate mounds (fluid venting)

FIELD AND LABORATORY SHALE GEOCHEMISTRY

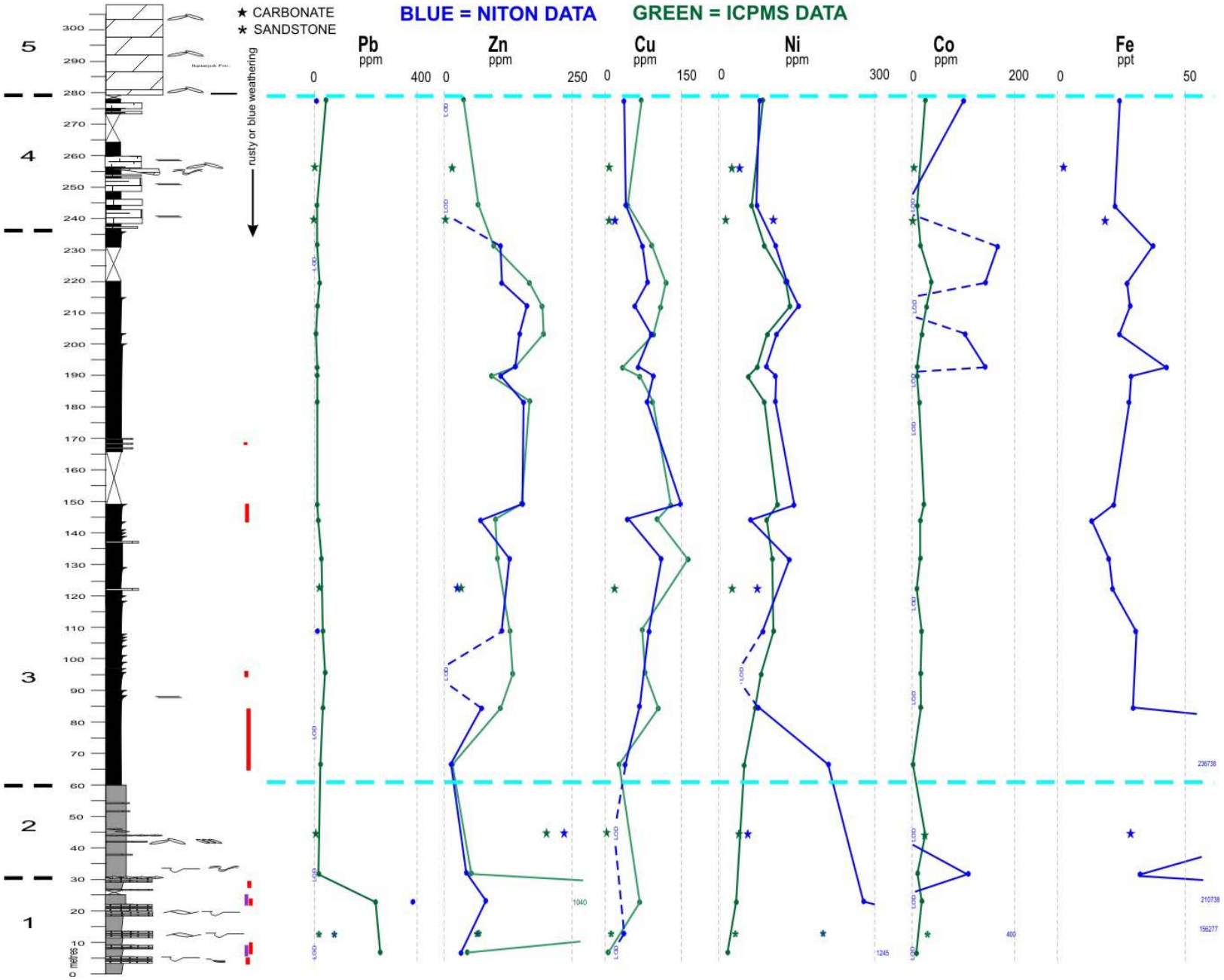
1) IS FIELD-BASED XRF RELIABLE?

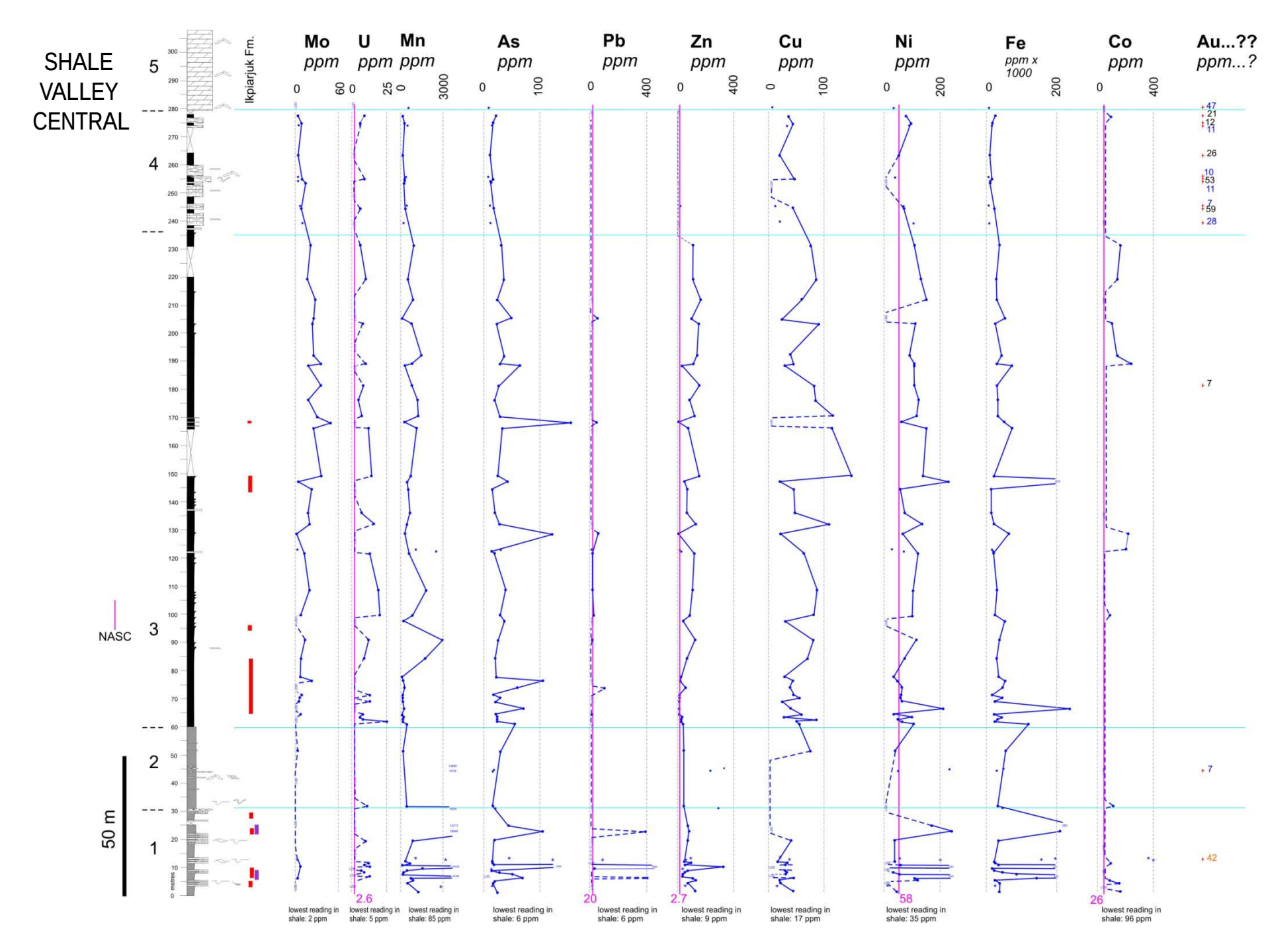
IF SO,

2) WHAT DO THE DATA CONVEY ABOUT BASE-METAL PROSPECTIVITY IN BLACK SHALE INTERVALS?


SHALE VALLEY CENTRAL
★ CARBONATE
SANDSTONE
BLUE = NITON DATA
GREEN = ICPMS DATA
rusty or blue weathering
Mo ppm
Mn ppm
U ppm
Th ppm
U/Th
0
50
5000
25
20
1
2
18948
54764
LOD
meters
1
2
3
4
5

SHALE VALLEY CENTRAL




SHALE
VALLEY
CENTRAL
Ikpiarjuk Fm.
Mo ppm
U ppm
Mn ppm
As ppm
Pb ppm
Zn ppm
Cu ppm
Ni ppm
Fe ppm x 1000
Co ppm
Au...?? ppm...?
NASC
50 m
lowest reading in shale: 2 ppm
lowest reading in shale: 5 ppm
lowest reading in shale: 85 ppm
lowest reading in shale: 6 ppm
lowest reading in shale: 6 ppm
lowest reading in shale: 9 ppm
lowest reading in shale: 17 ppm
lowest reading in shale: 35 ppm
lowest reading in shale: 96 ppm
2.6
20
2.7
58
26

ARCTIC BAY FORMATION AS A POSSIBLE SEDEX-HOSTING BASIN

- ✓ EVIDENCE OF SYNSEDIMENTARY EXTENSION (RIFT or SAG BASIN)
- ✓ DEEP-WATER SEDIMENTATION
- ✓ BASIN EUXINIA
- ✓ BASIN COMPARTMENTALISATION
- ✓ FAVOURABLE SHALE GEOCHEMISTRY
- ✓ EVIDENCE OF SIGNIFICANT FLUID CIRCULATION IN SUBSURFACE

UNCERTAIN:

1) ELEVATED HEAT FLOW
2) ± COEVAL CARBONATE-HOSTED BASE-METAL DEPOSITS
3) ASSOCIATED EVAPORITES
4) MINERALISING EVENT TRIGGERED BY TECTONIC REACTIVATION OF BASIN-CONTROLLING FAULTS

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