

Geophysical constraints on the geology and mineral potential of the Livingstone Creek area, south-central Yukon



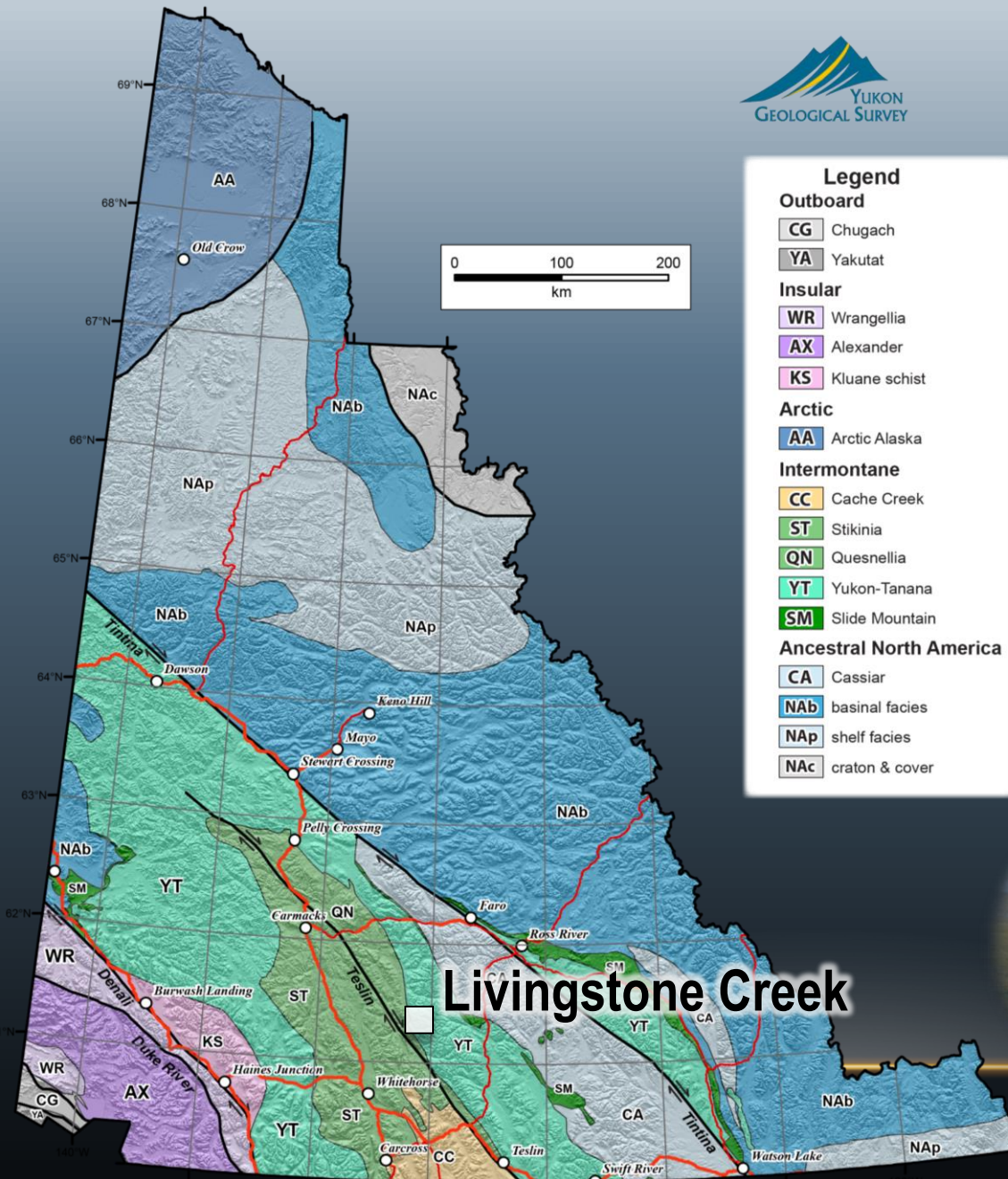
M. Colpron¹, D. Hildes², S. Casselman¹, J. Bond¹

1- Yukon Geological Survey, 2- Aurora Geosciences



Livingstone Creek

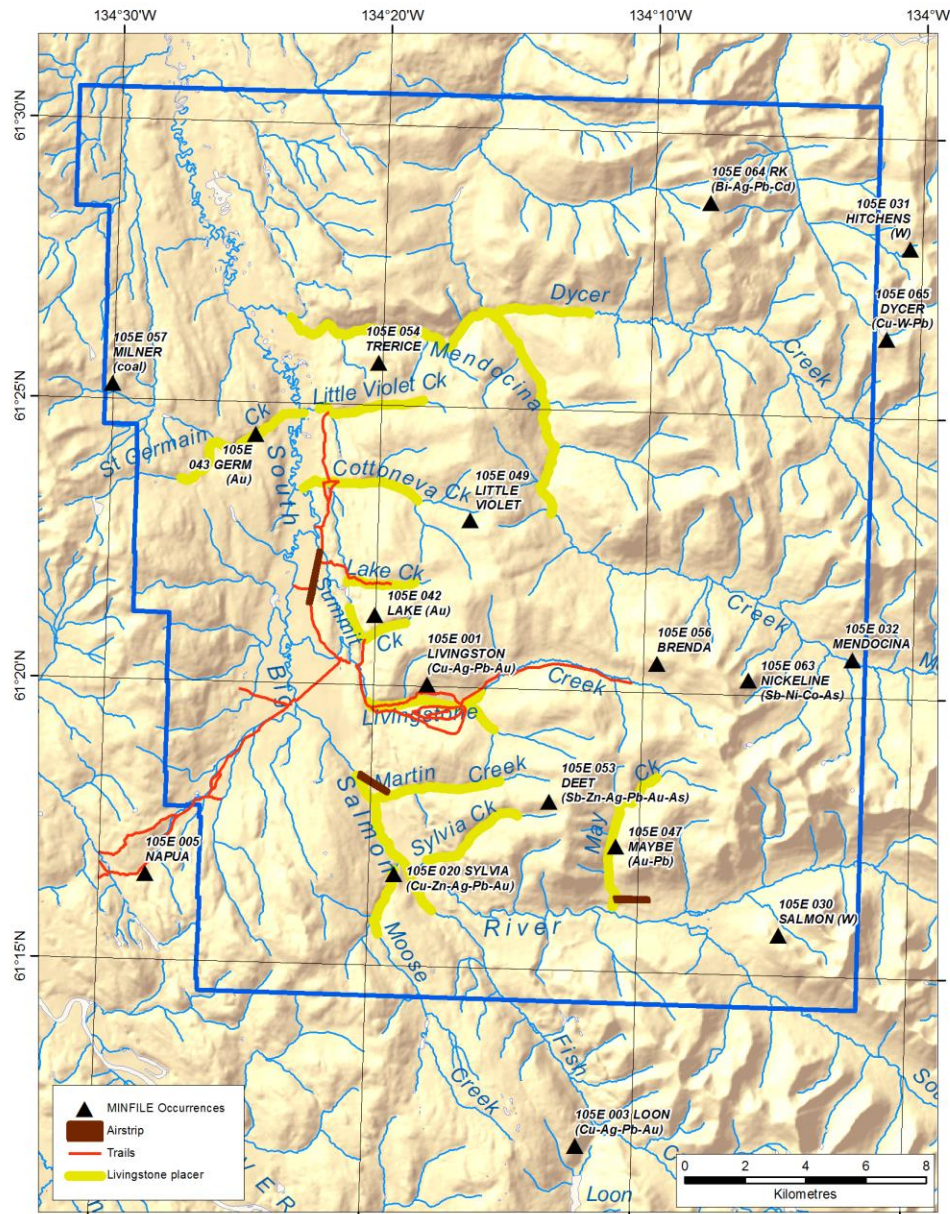
- ◆ ~80 km NE of Whitehorse as the crow flies...
- ◆ Accessed by air (3 landing strips)
- ◆ Livingstone Trail (winter road)
- ◆ Underlain primarily by Yukon-Tanana terrane



Upper Livingstone Creek

Livingstone Creek

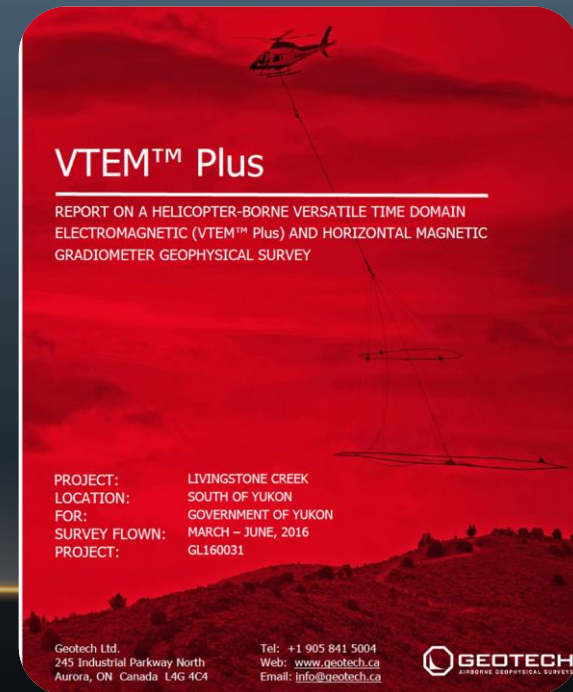
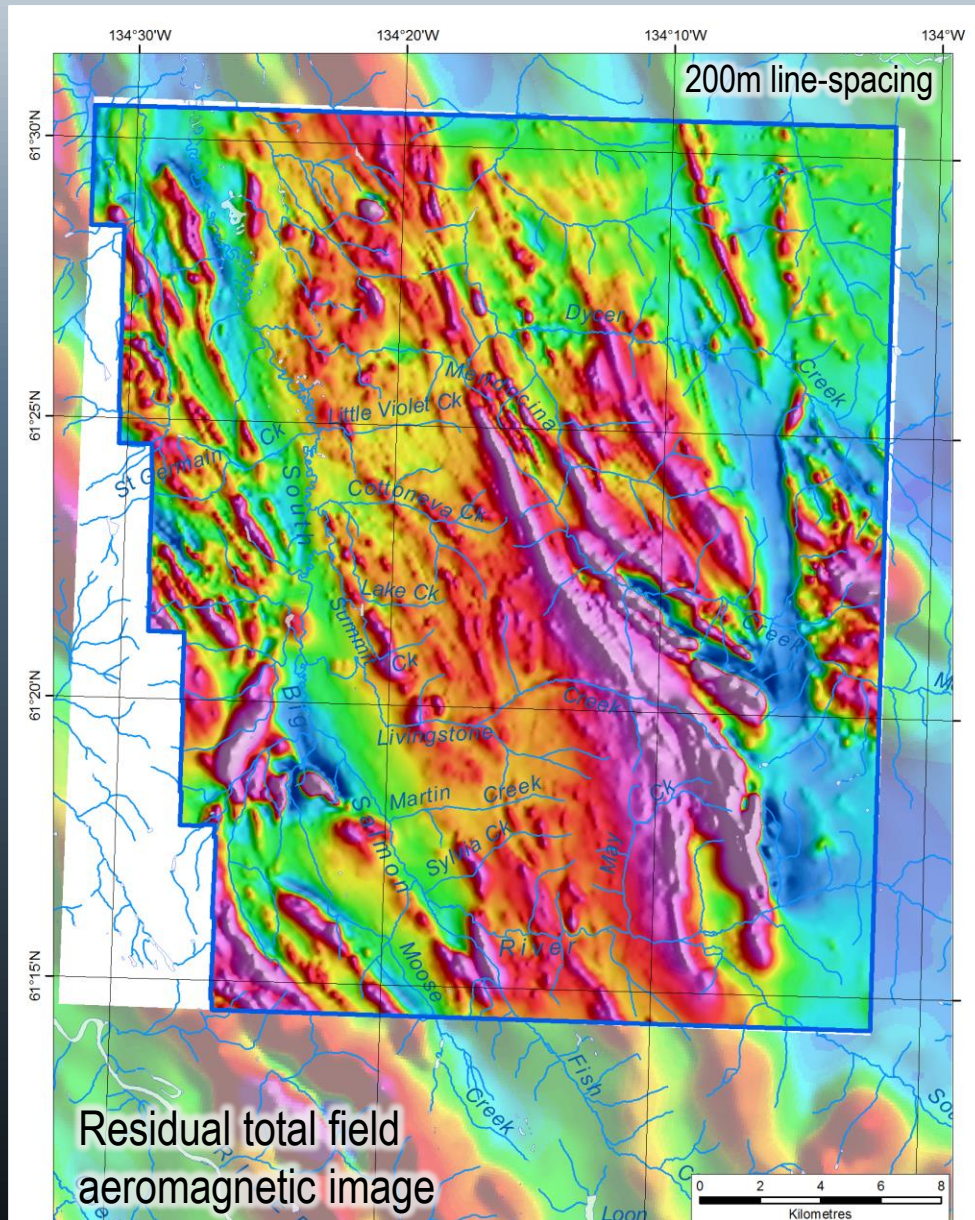
- ◆ Placer deposits discovered around the time of the Gold Rush
- ◆ Characterized by coarse gold
- ◆ Settlement occupied 1898 to late 1930s
- ◆ Elusive lode source, underexplored
- ◆ Focus of bedrock mapping by YGS in 2004-05



Little Violet Creek, c. 2005
Photo by Charlie Roots

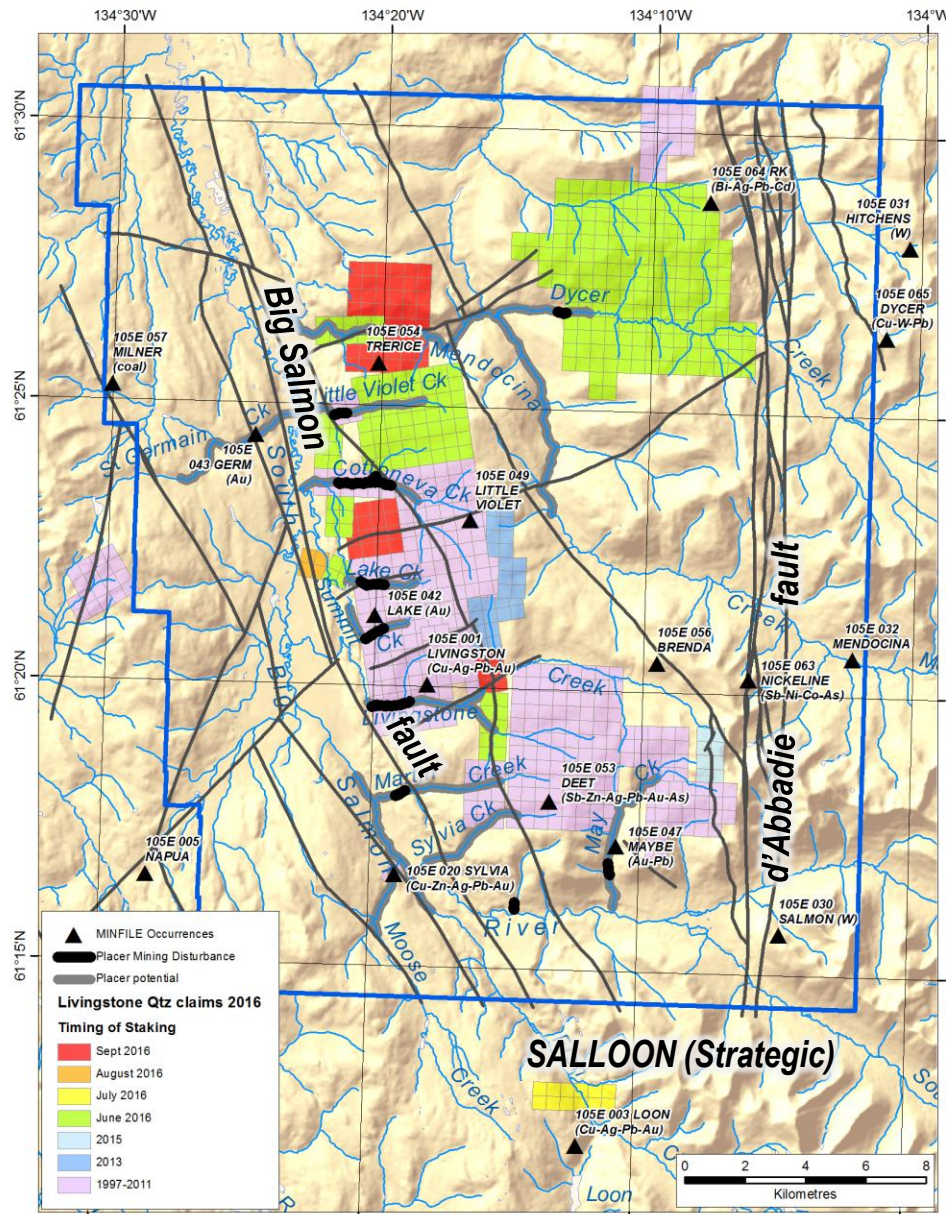
2016 Survey

- ◆ VTEM + Mag ('Dreamcatcher')
- ◆ Acquired by GeoTech Ltd.
- ◆ March-June 2016
- ◆ SINED-YGS funding
- ◆ GSC managed contract
- ◆ YGS Open File 2016-34 & 35
GSC Open File 8084 & 8085



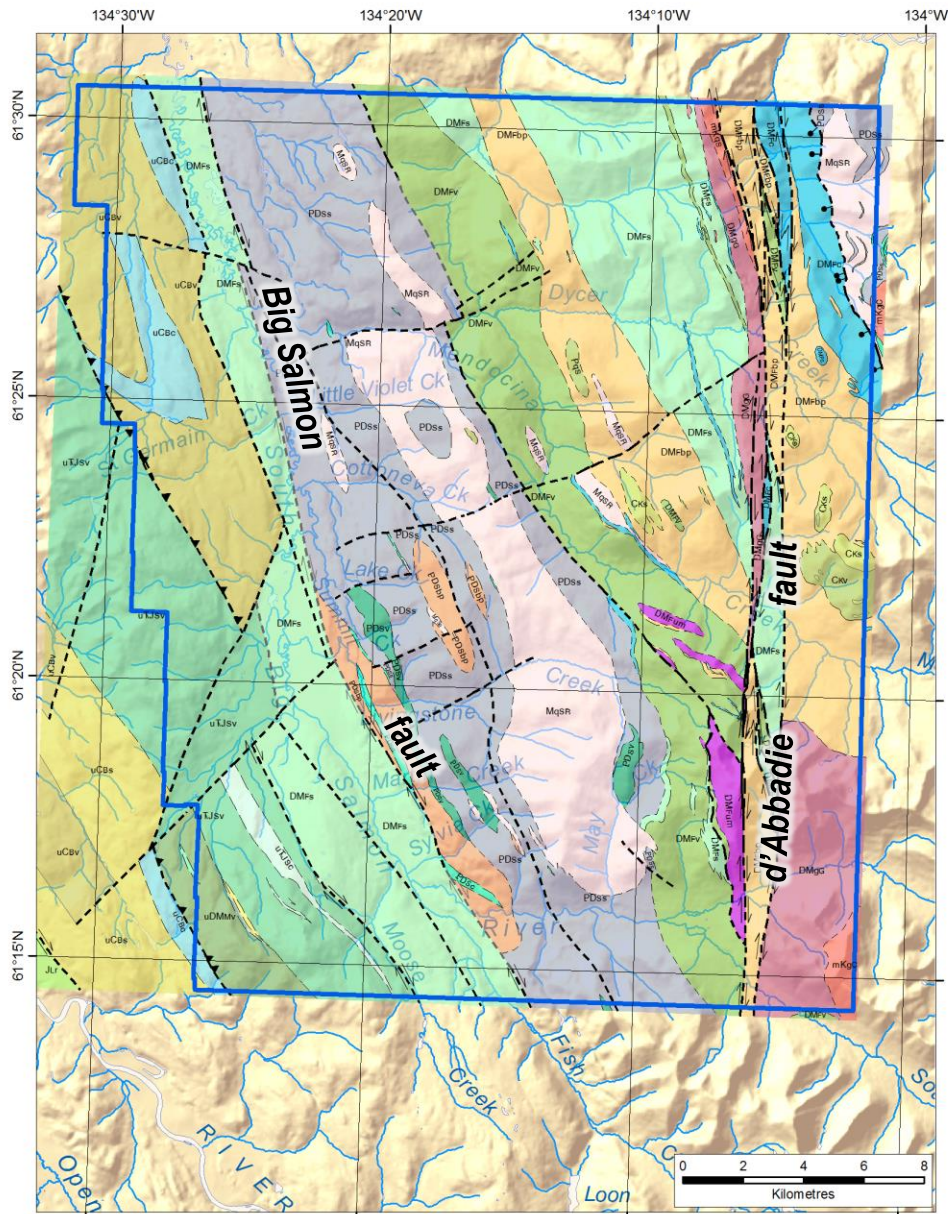
Livingstone district

- ◆ Bounded by two major strike-slip faults (Big Salmon & d'Abbadie)
- ◆ Limited hard-rock exploration, intermittent placer mining
- ◆ to the south, Salloon Property (Strategic Metals Ltd.) along Big Salmon fault
 - ◆ 30.23 m of 128.46 g/t Ag, 0.40% Cu (Oct. 2016)



d'Abbadie fault, looking south

Bedrock Geology



MID-CRETACEOUS

■ granodiorite, granite

QUESNELLIA

UPPER TRIASSIC TO LOWER JURASSIC

■ uTJsc SEMENOF: limestone

■ uTJsv SEMENOF: basalt, andesite

UPPER CARBONIFEROUS

■ uCBs BOSWELL: slate, phyllite, greywacke, chert

■ uCBv BOSWELL: altered basalt, volcanic breccia

■ uCBc BOSWELL: limestone

■ uDMmv MOOSE: basalt, greenstone

YUKON-TANANA

MIDDLE PERMIAN

■ Pqs SULPHUR CREEK: foliated quartz monzonite gneiss

CARBONIFEROUS

■ CKv KLINKIT: intermediate to mafic volcanic rocks

■ CKs KLINKIT: clastic rocks

LATE DEVONIAN TO MISSISSIPPIAN

■ Mqsr SIMPSON RANGE - foliated granite, granodiorite

■ DMgg GRASS LAKES: augen granite

DEVONIAN TO MISSISSIPPIAN

■ DMfu FINLAYSON: serpentinite, metagabbro

■ DMfc FINLAYSON: carbonate, marble

■ DMfs FINLAYSON: siliciclastic and metavolcaniclastic rocks

■ DMfbp FINLAYSON: carbonaceous phyllite, quartzite; chert

■ DMfv FINLAYSON: mafic volcanic rocks

LATE PROTEROZOIC AND PALEOZOIC

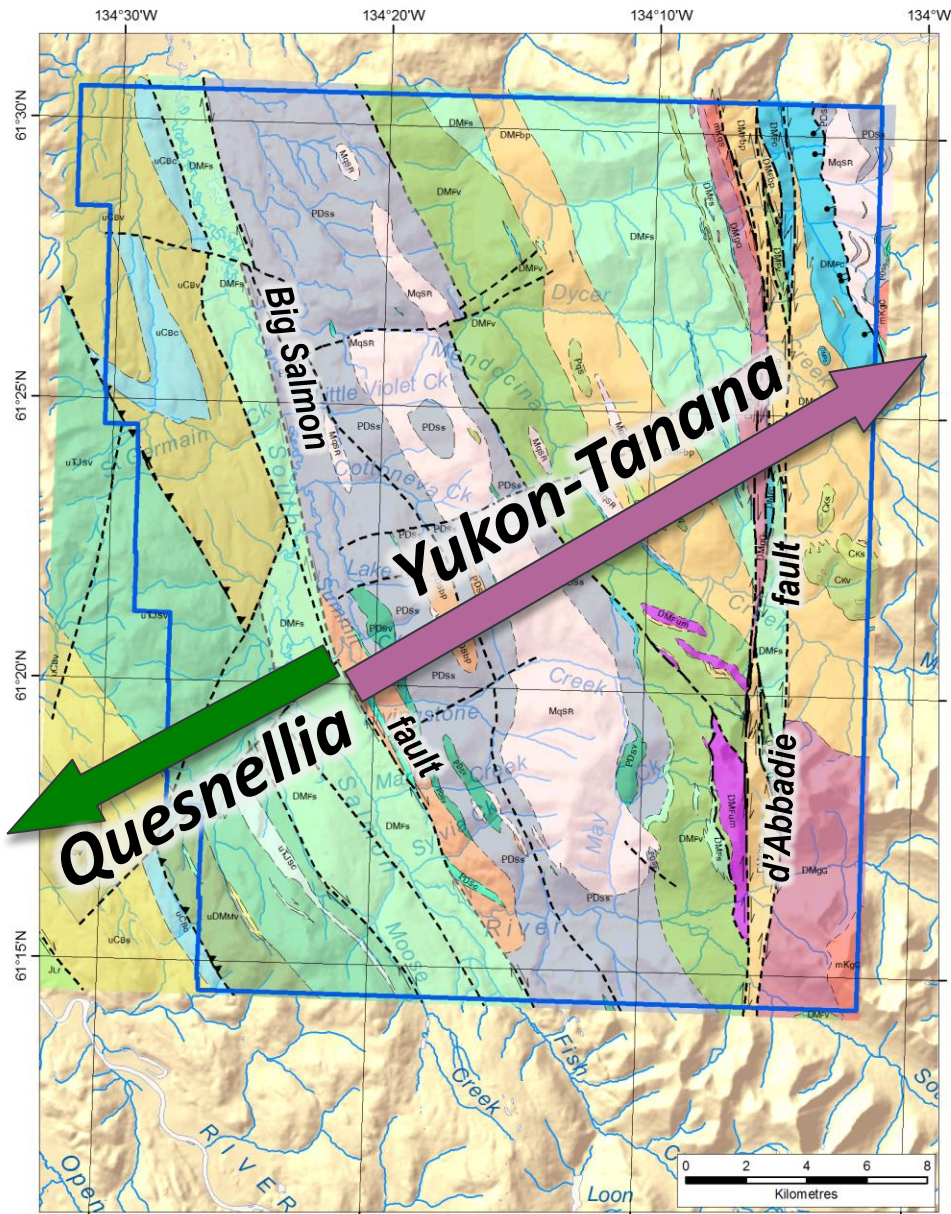
■ PDSv SNOWCAP: amphibolite

■ PDSbp SNOWCAP: marble

■ PDsc SNOWCAP: marble

■ PDss SNOWCAP: metaclastic rocks, quartzite

Bedrock Geology



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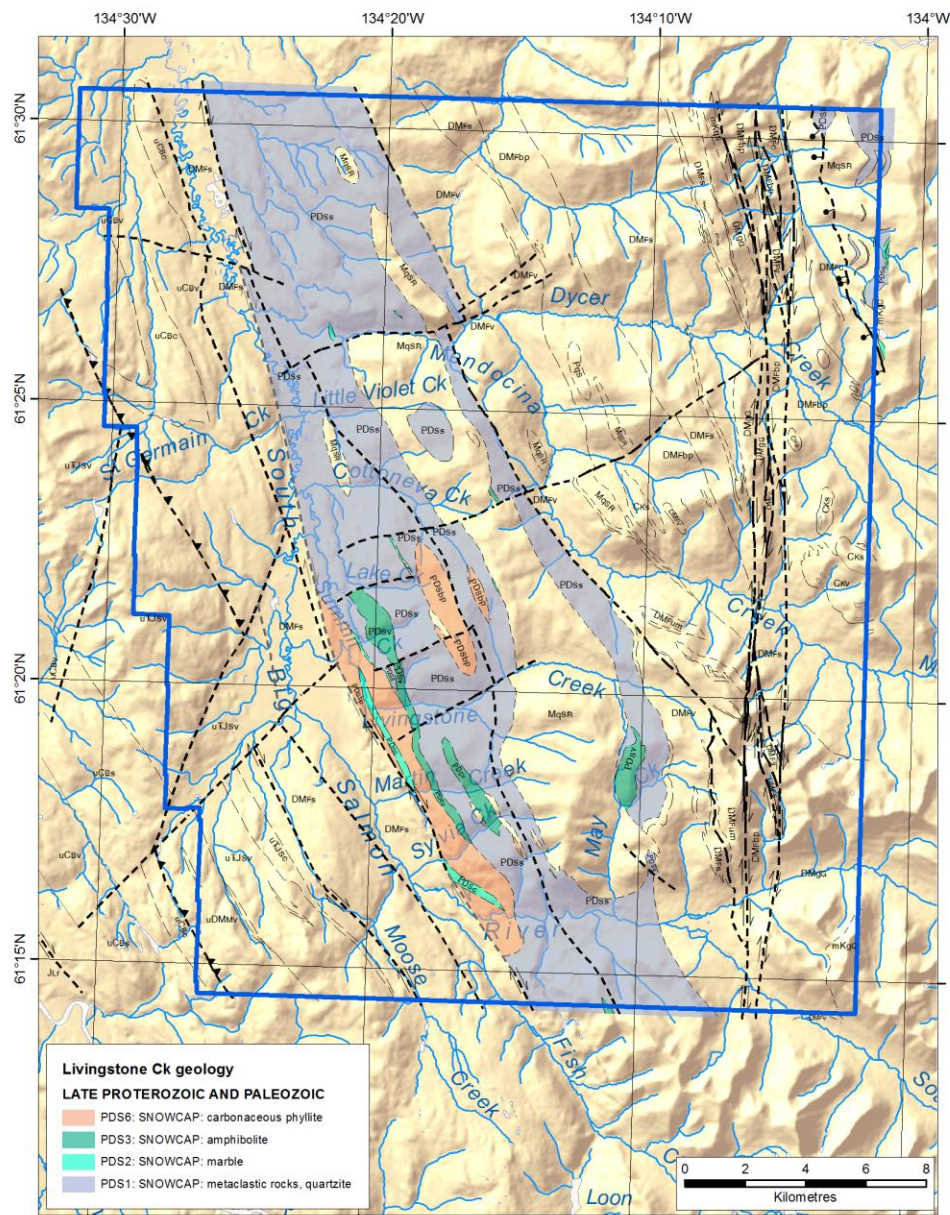
■ PDSc SNOWCAP: marble

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Yukon-Tanana

Snowcap assemblage

- ◆ Metasedimentary basement to Yukon-Tanana
- ◆ Quartzite, psammitic schist, graphitic phyllite
- ◆ Subordinate Chl schist (OIB), amphibolite (MORB), marble

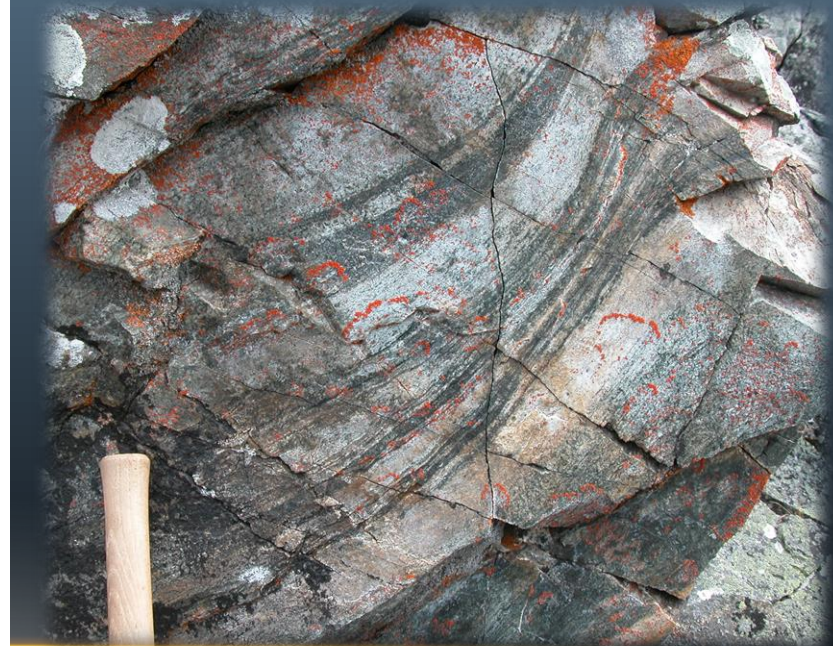
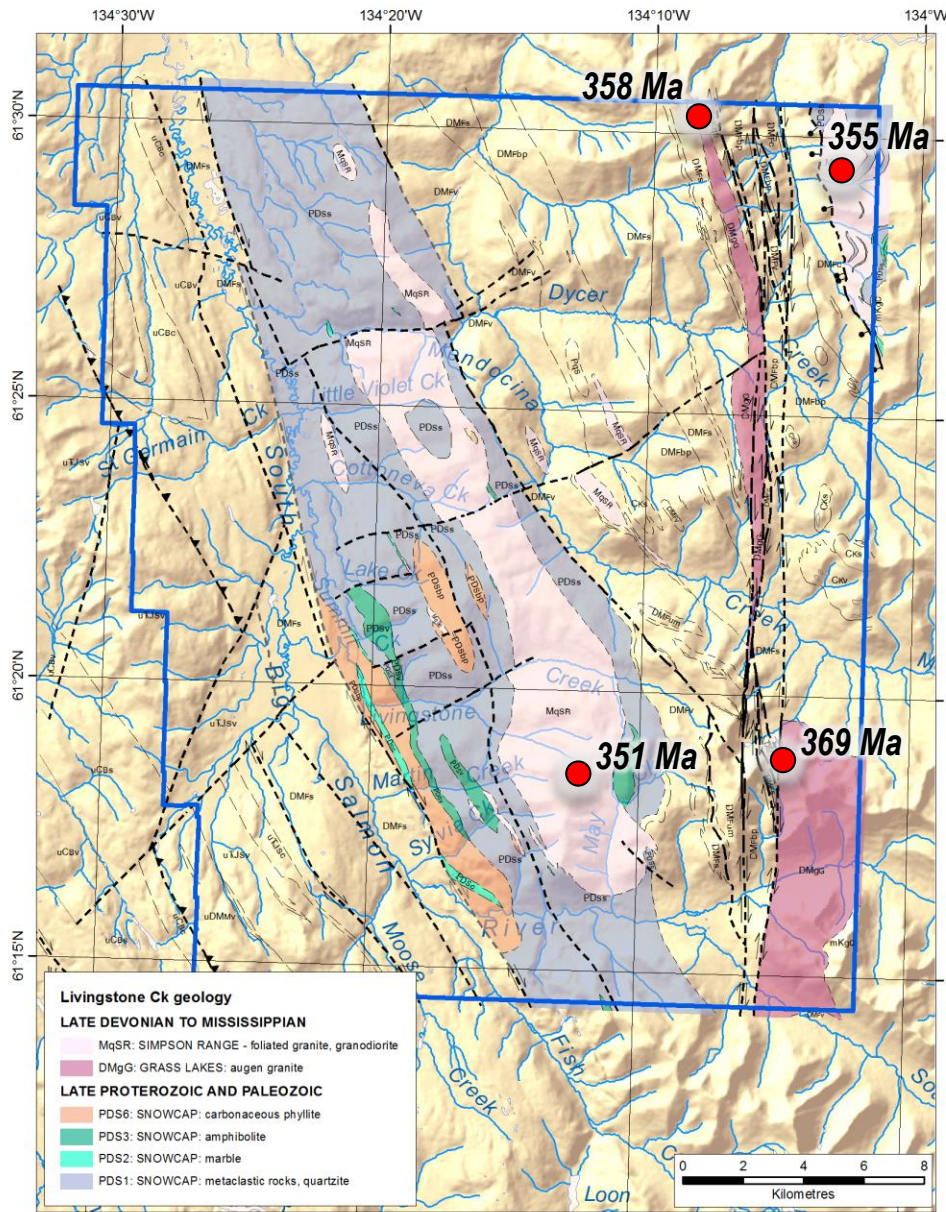


Snowcap quartzite / pelite

Yukon-Tanana

Snowcap assemblage

- ◆ Continental margin assemblage
- ◆ Intruded by Mississippian tonalite - granodiorite

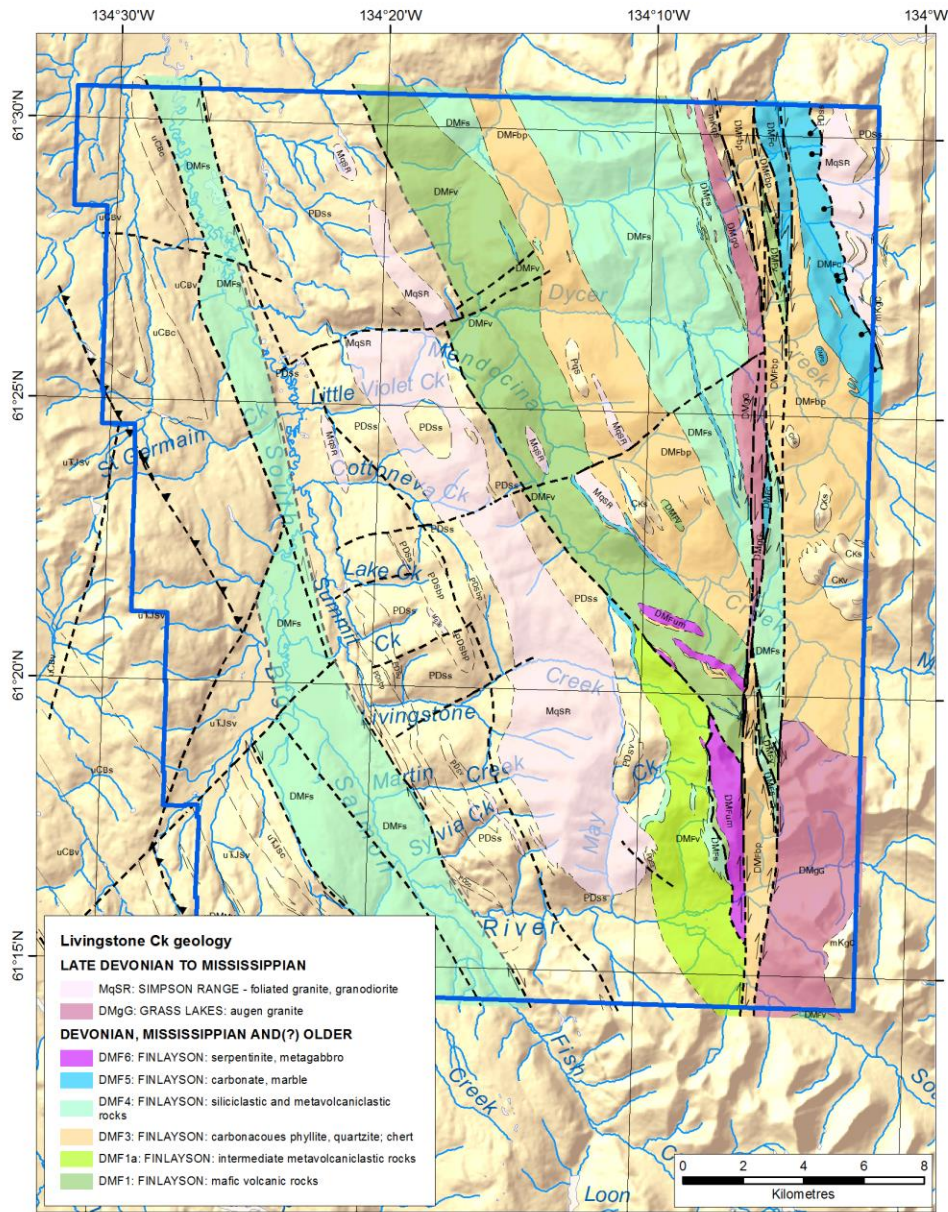


Tonalitic orthogneiss, Simpson Range suite

Yukon-Tanana

Finlayson assemblage

- ◆ Upper Livingstone Creek
- ◆ Volcaniclastic rocks
- ◆ Minor greenstone, felsic schist and marble
- ◆ Arc assemblage

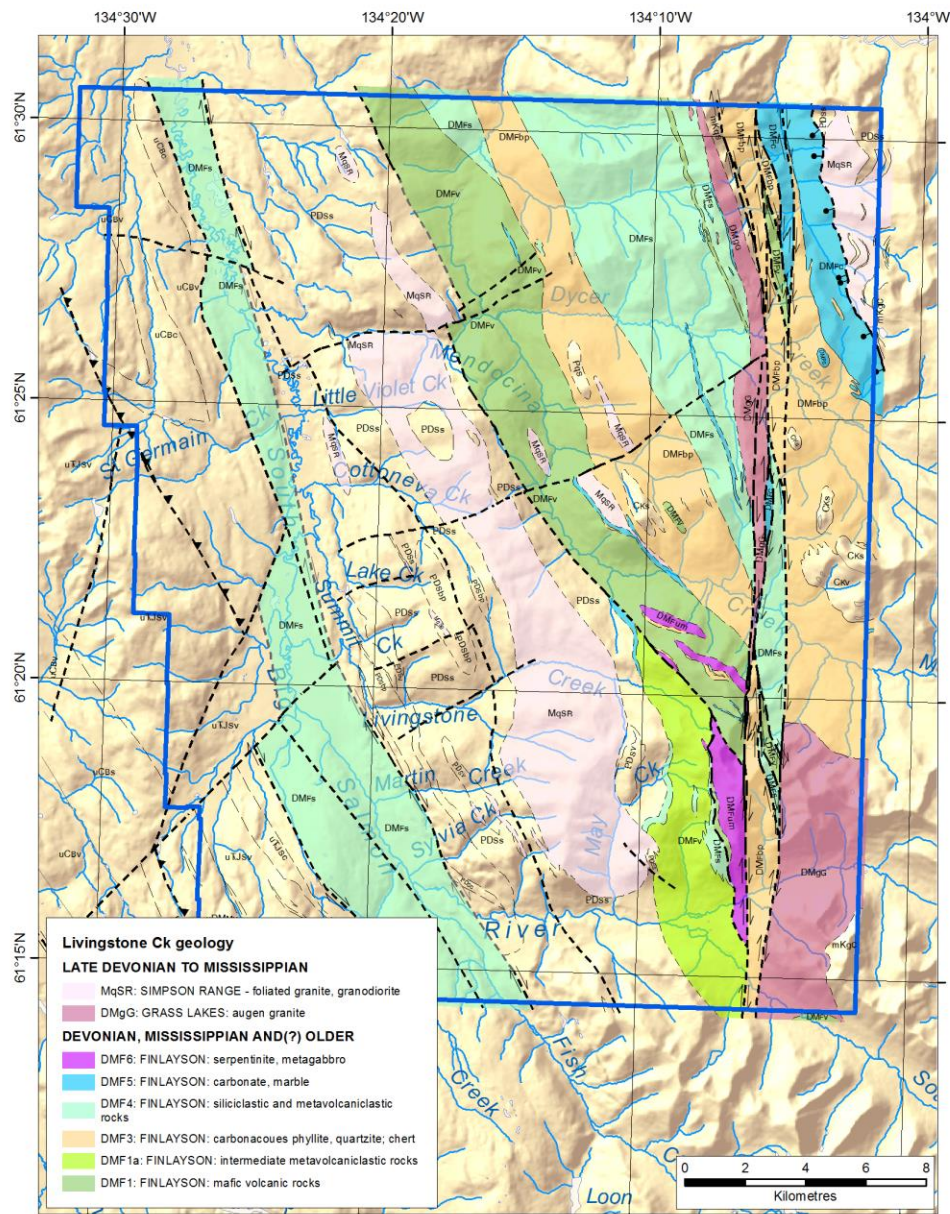


Chloritic schist exposed near the headwaters of Livingstone and May creeks

Yukon-Tanana

Finlayson assemblage

- ◆ along Mendocina Creek
- ◆ Greenstone (MORB), gabbro and serpentinitized peridotite
- ◆ Minor carbonaceous phyllite
- ◆ Peridotite massif, headwater of Livingstone Creek

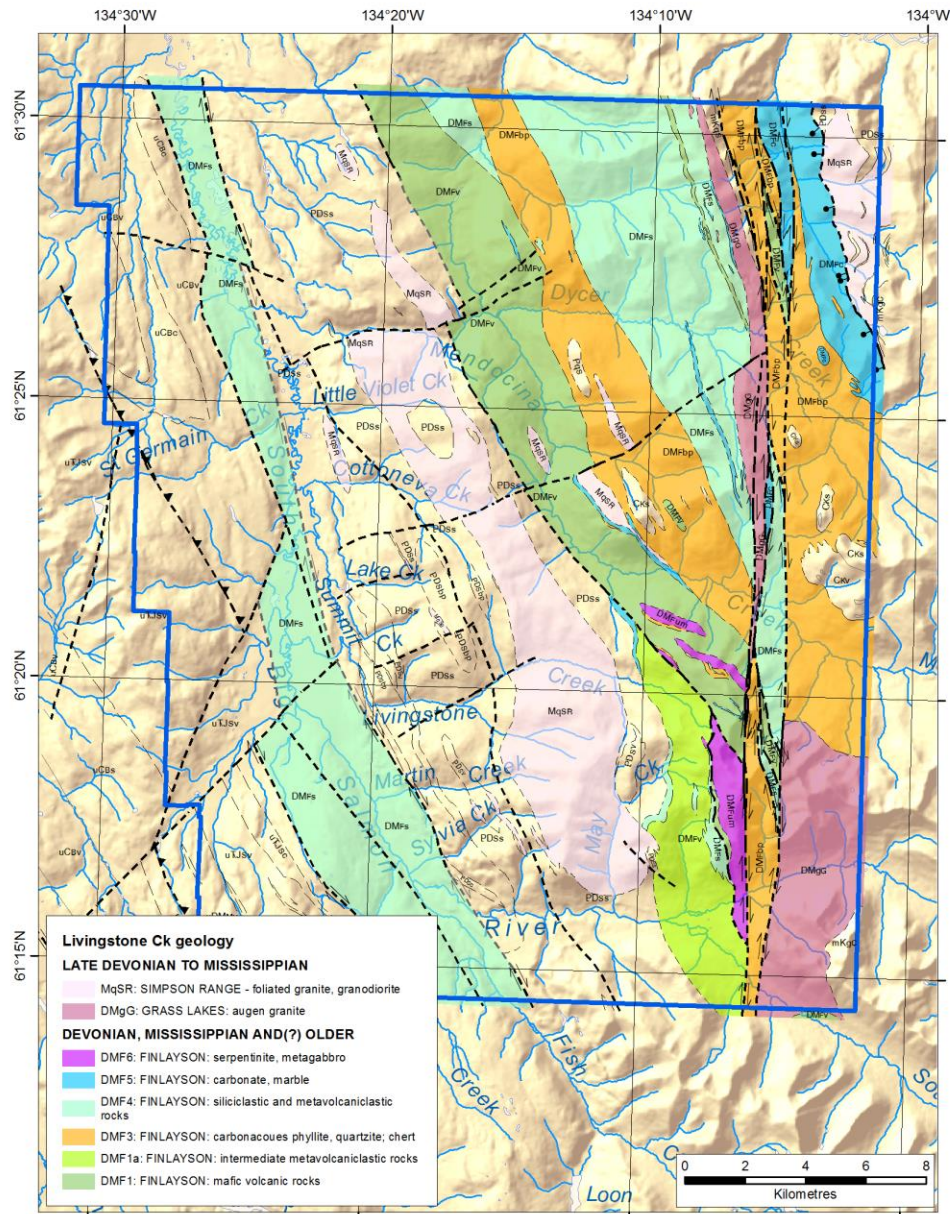


Greenstone exposed between Mendocina and Livingstone creeks

Yukon-Tanana

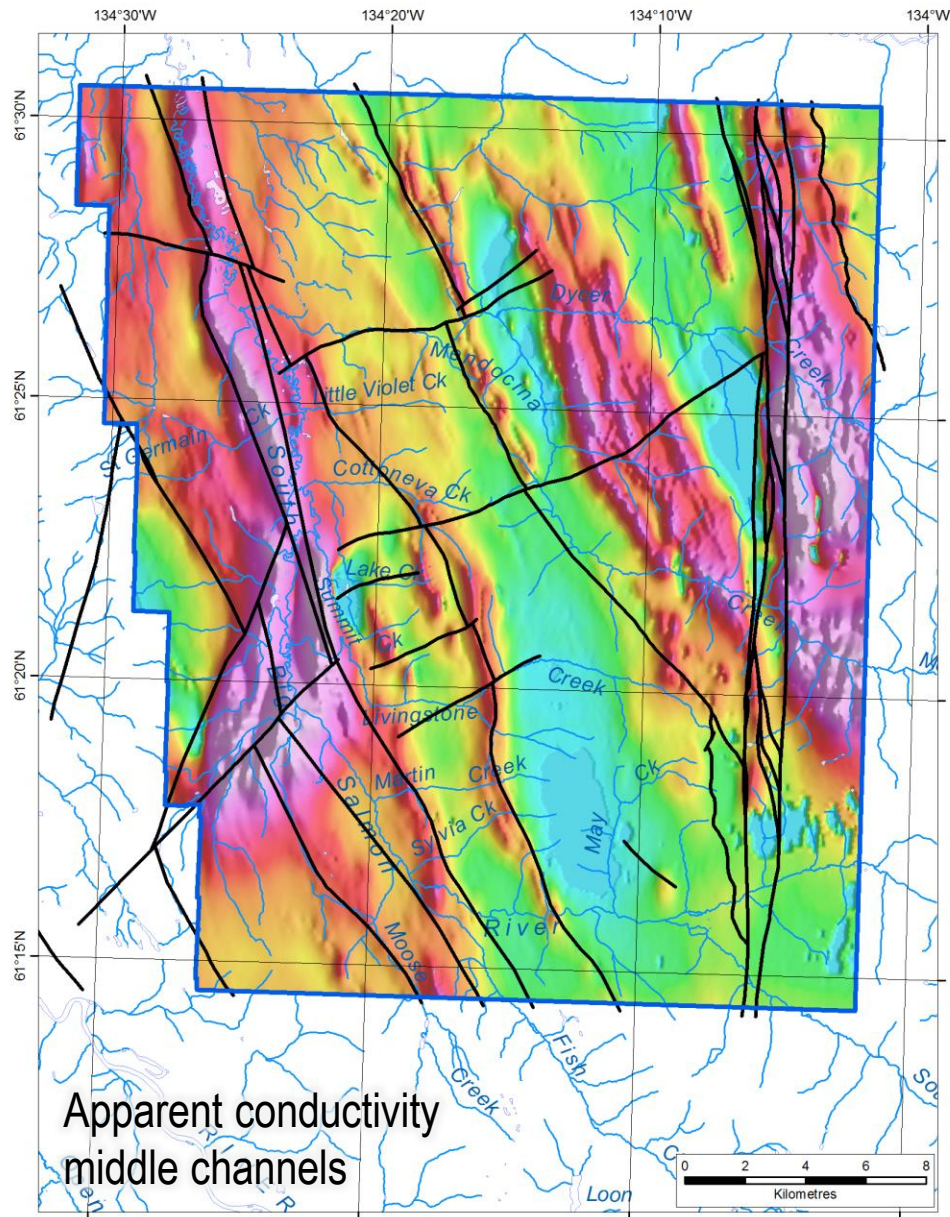
Finlayson assemblage

- ◆ Mendocina and Dycer Creek
- ◆ Carbonaceous (graphitic) phyllite, micaceous quartzite, marble



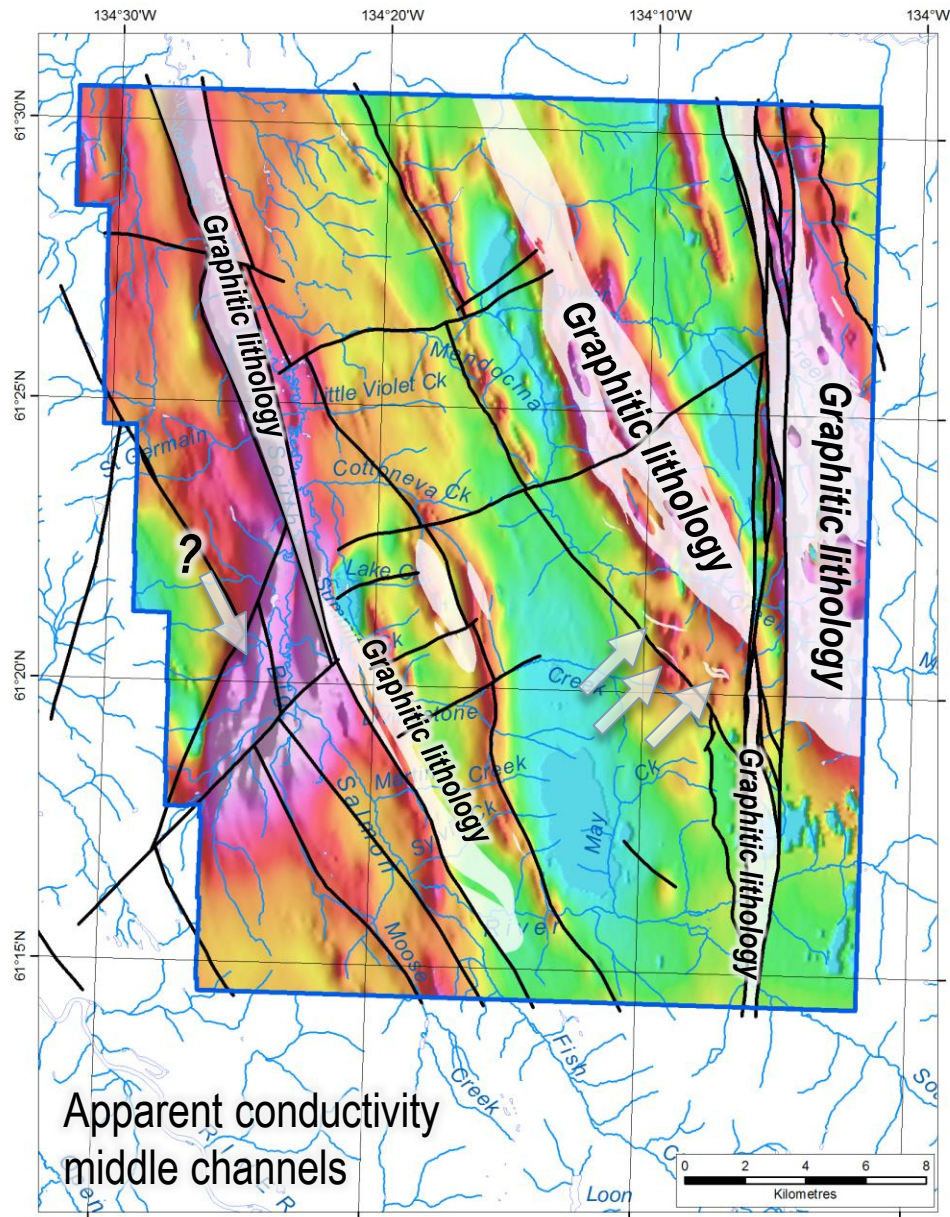
Graphitic phyllite and marble along Dycer Creek

Graphitic lithology



Graphitic phyllite along Dycer Creek

Graphitic lithology

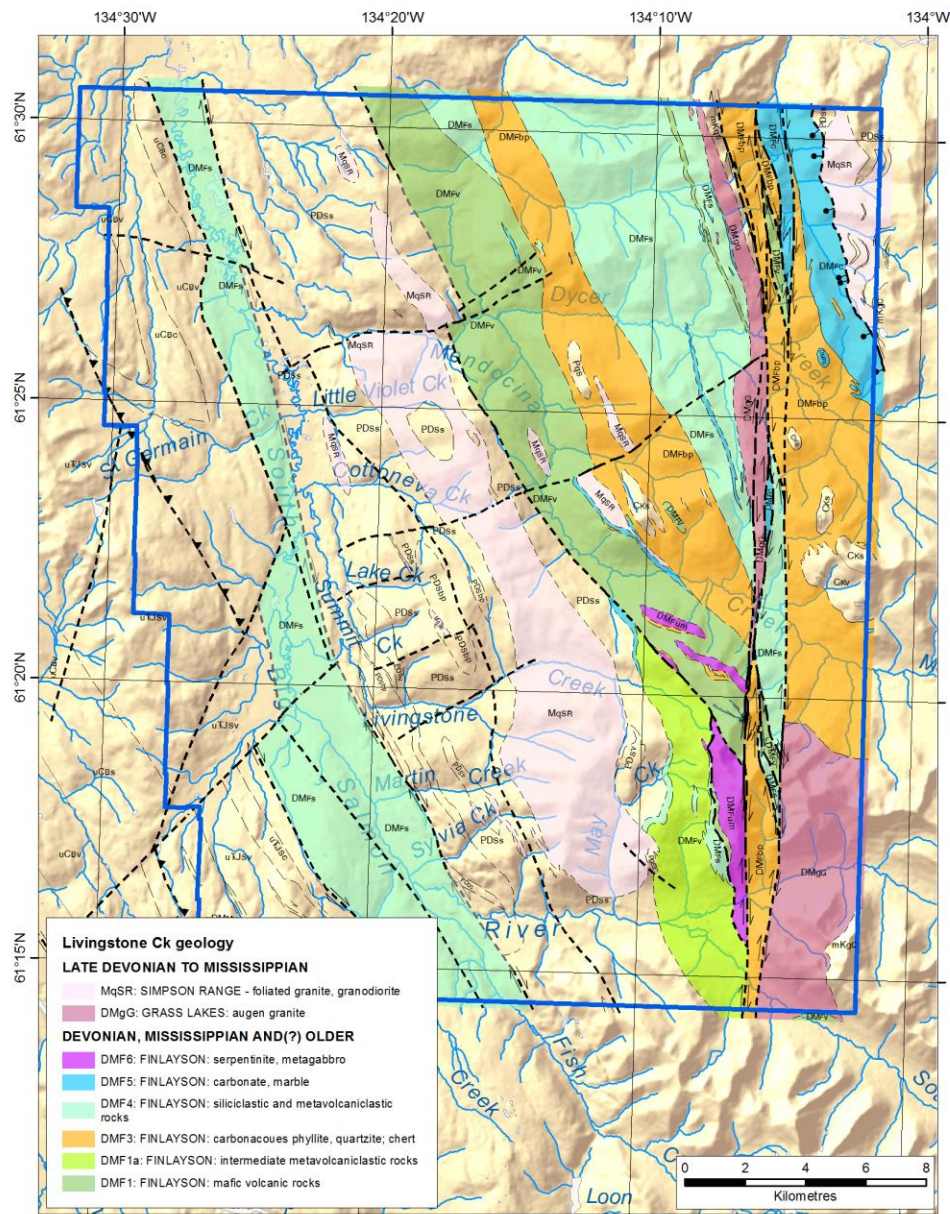


Graphitic phyllite along Dycer Creek

Yukon-Tanana

Finlayson assemblage

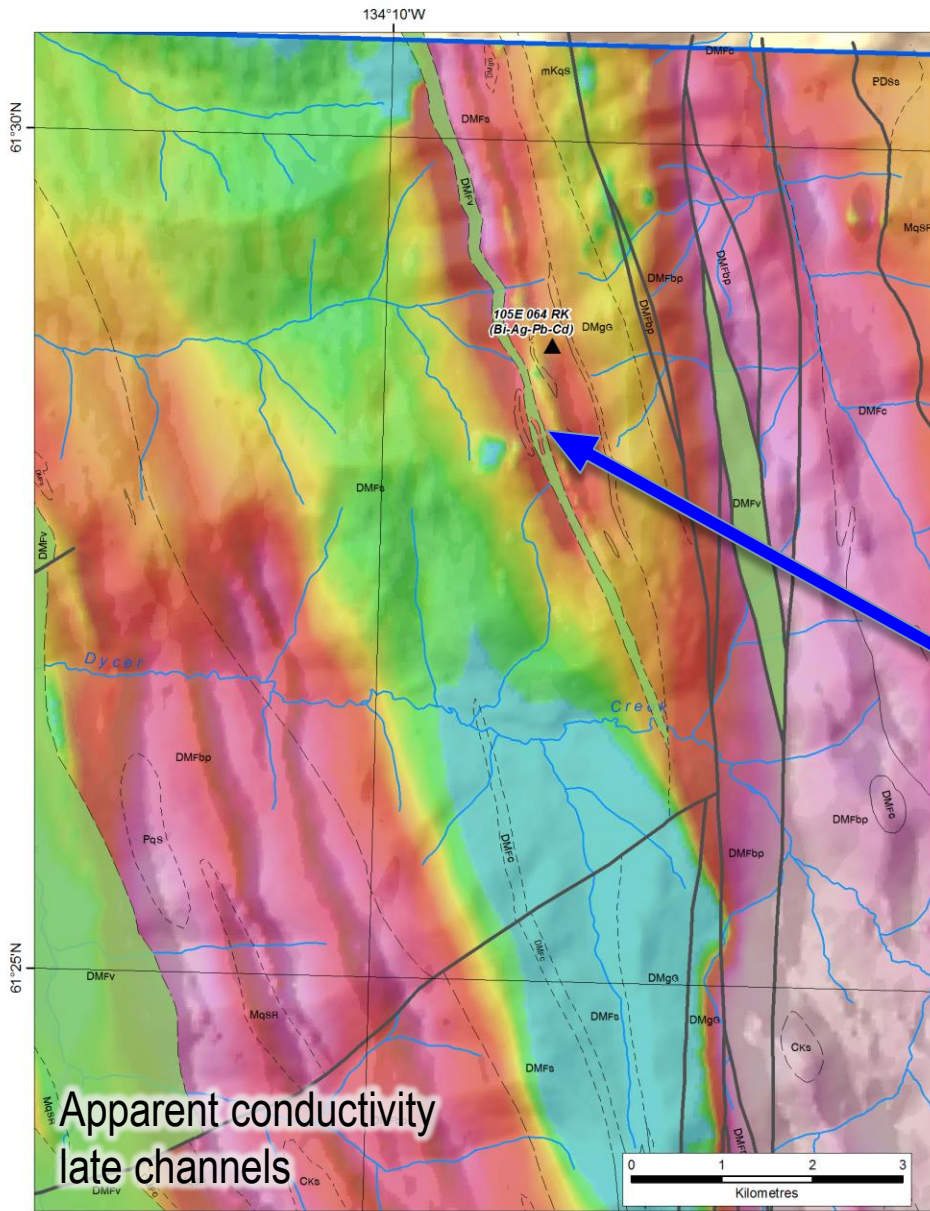
- ◆ Mendocina and Dycer Creek
- ◆ Carbonaceous (graphitic) phyllite, **micaceous quartzite**, marble



Micaceous quartzite north of Dycer Creek

Yukon-Tanana

- ◆ local, highly strained greenstone
- ◆ strong conductor
- ◆ nearby polymetallic veins



Sheared greenstone north of Dycer Creek

UTM Zone 8, 546 228E, 6 816 345N (NAD83)

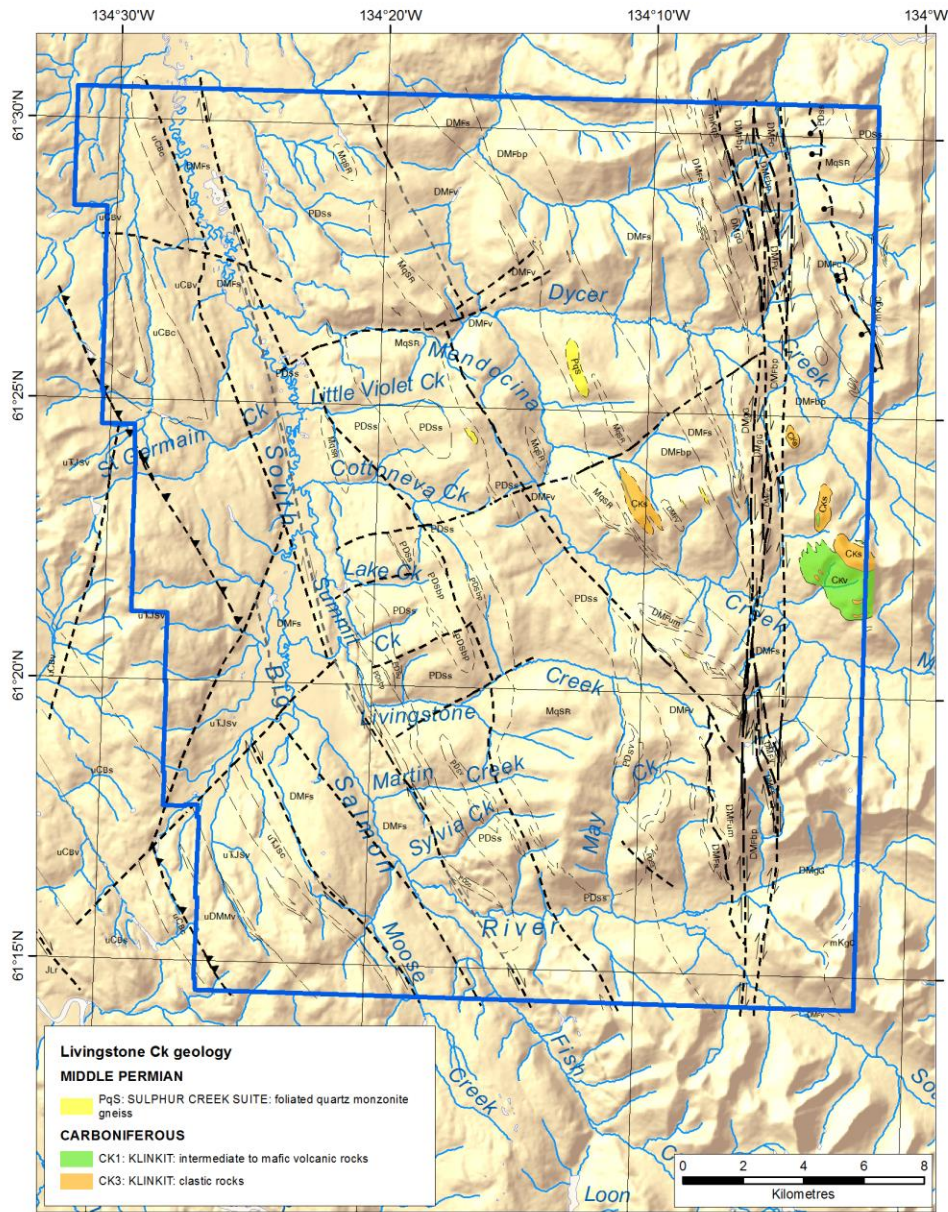


Mineralized quartz vein at the RK showing (MINFILE 105E 064);
inset, close-up of galena mineralization.

Yukon-Tanana

Klinkit assemblage

- ◆ between Mendocina & Dycer creeks
- ◆ Basalt, quartzite, conglomerate

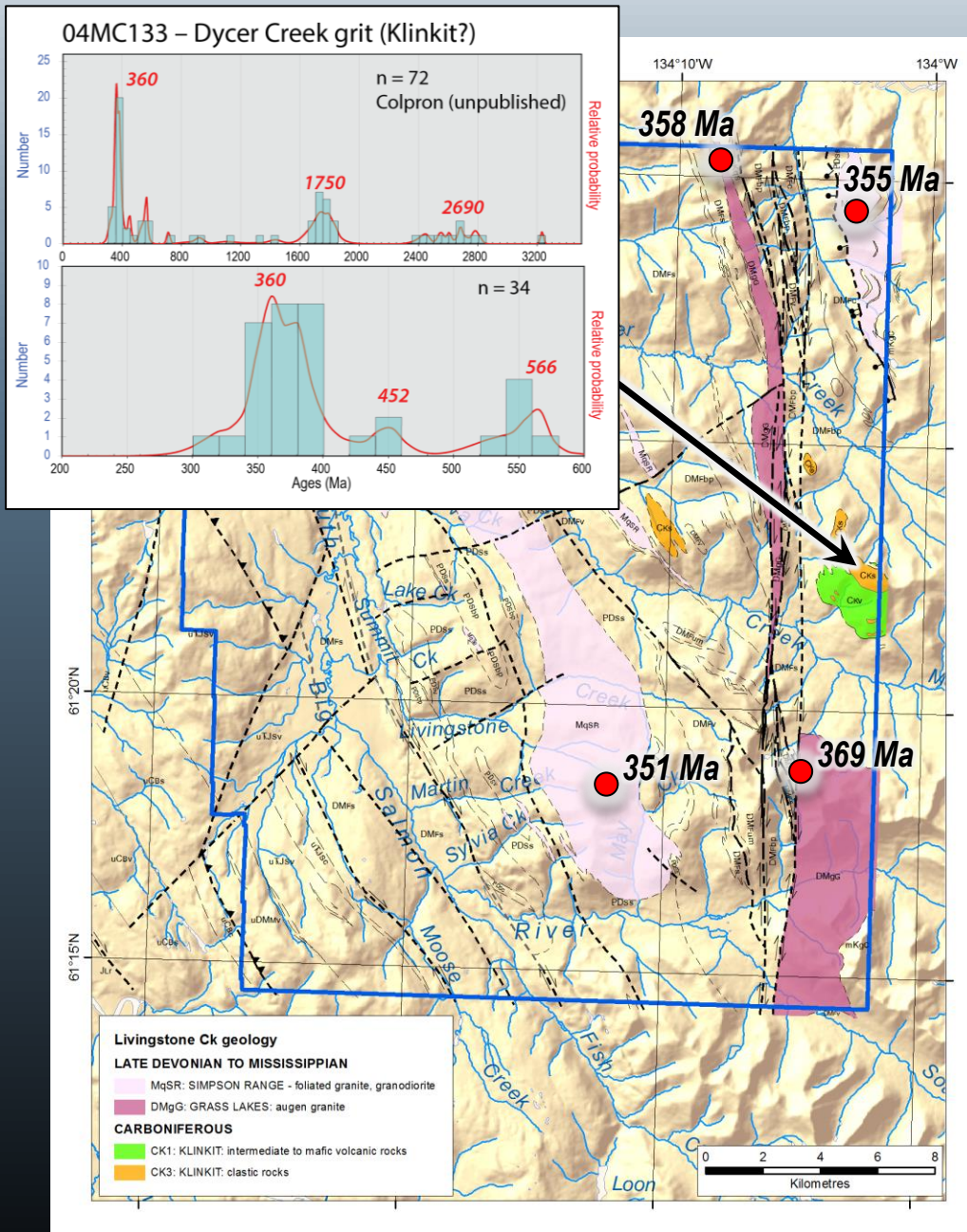


*Klinkit quartzite north of Mendocina Creek,
east of d'Abbadie fault*

Yukon-Tanana

Klinkit assemblage

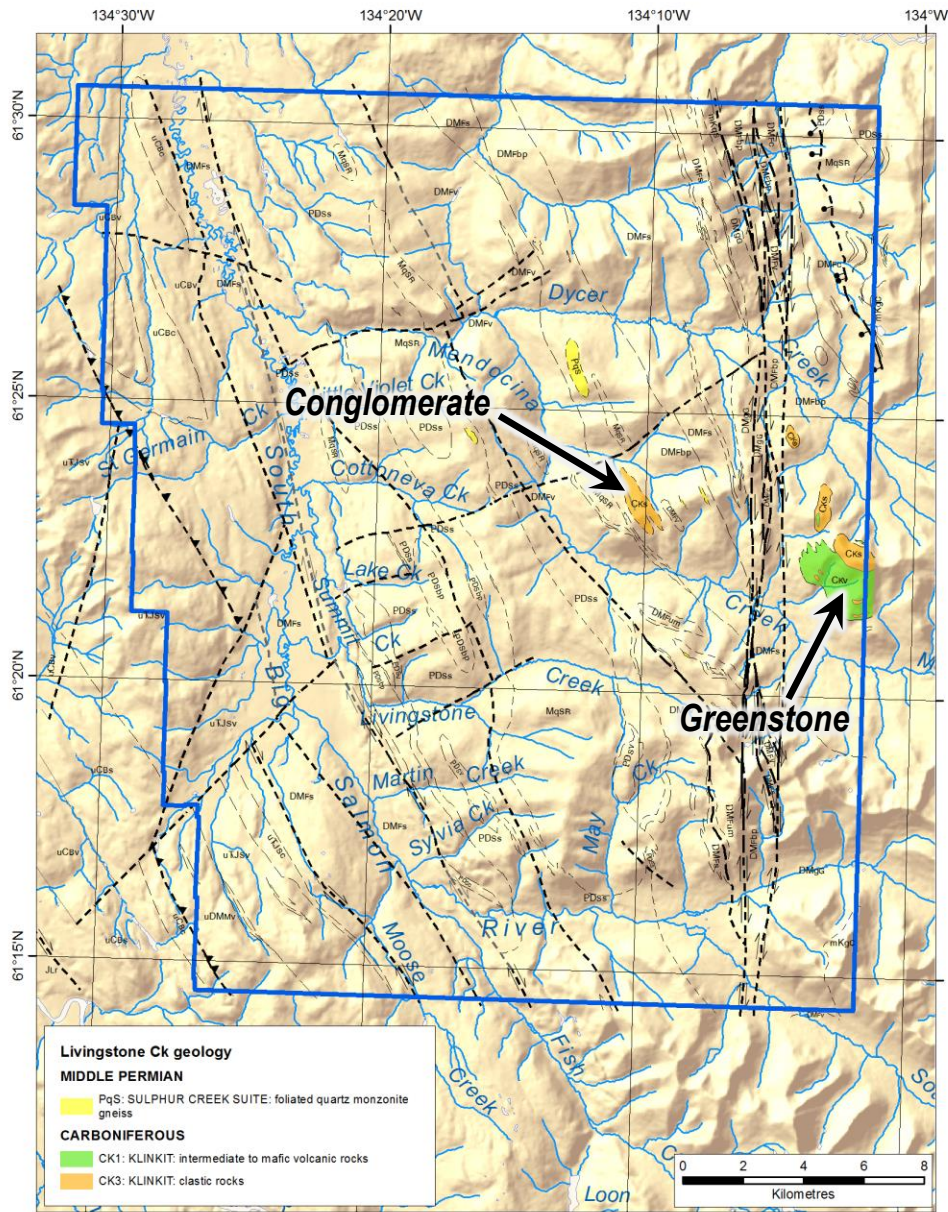
- ◆ Detrital zircons
- ◆ NW Laurentian shield, and...
- ◆ Devonian-Mississippian arc



Klinkit quartzite north of Mendocina Creek,
east of d'Abbadie fault

Yukon-Tanana

Klinkit assemblage



*Klinkit greenstone north of Mendocina Creek,
east of d'Abbadie fault*

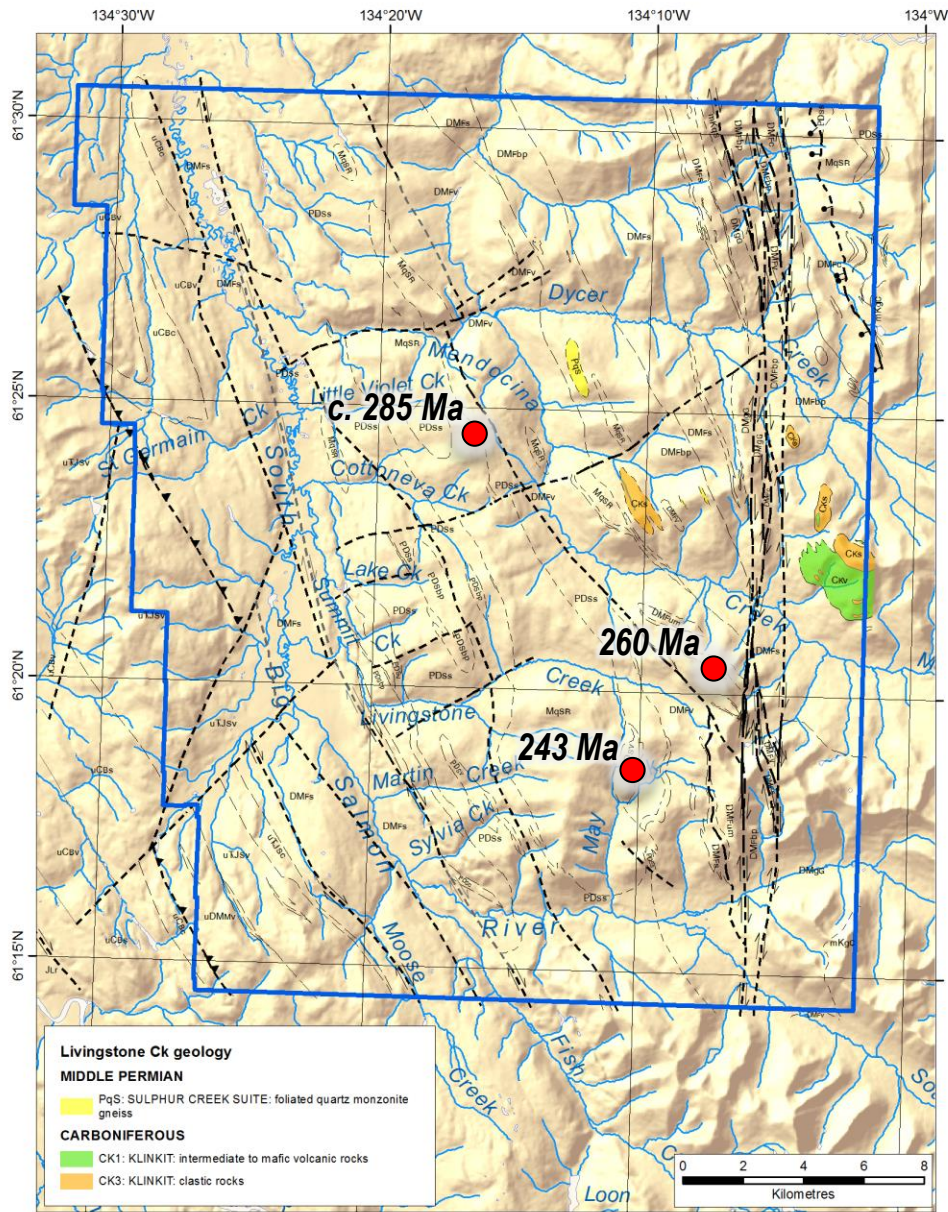


*Basal Klinkit conglomerate north of Mendocina Creek,
west of d'Abbadie fault*

Yukon-Tanana

Permian rocks

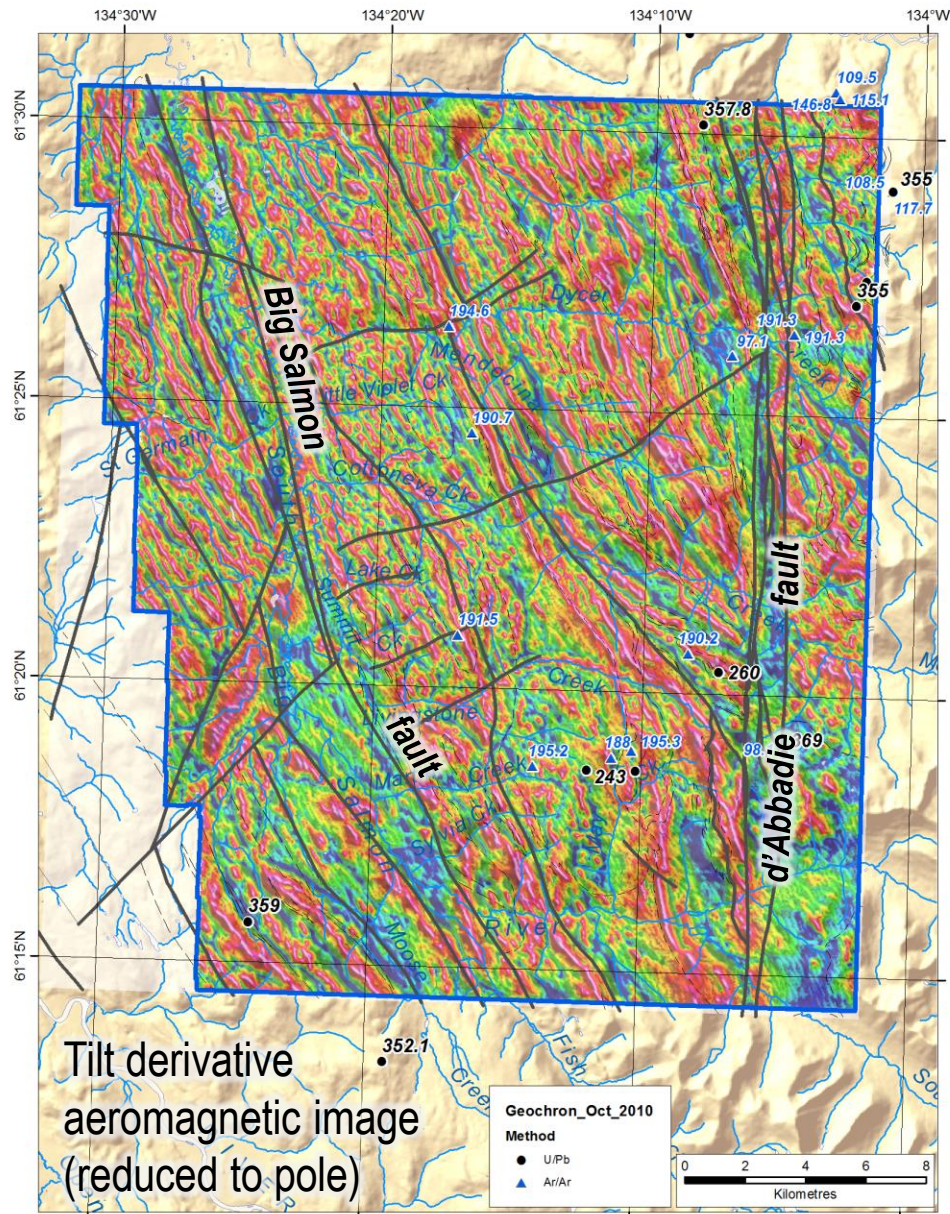
- ◆ Felsic dikes cutting some older fabric
- ◆ Pegmatite veins



c. 285 Ma dikes
cut older foliation
in Snowcap assemblage, west of Mendocina Creek

Structure

- ◆ Strong, NW-striking transposition
- ◆ Steeply to moderately dipping
- ◆ Dominant structural grain in the magnetic and EM data
- ◆ Early Jurassic Ar cooling dates constrain transposition west of d'Abbadie fault
- ◆ Deformation along d'Abbadie in part ca. 96-98 Ma



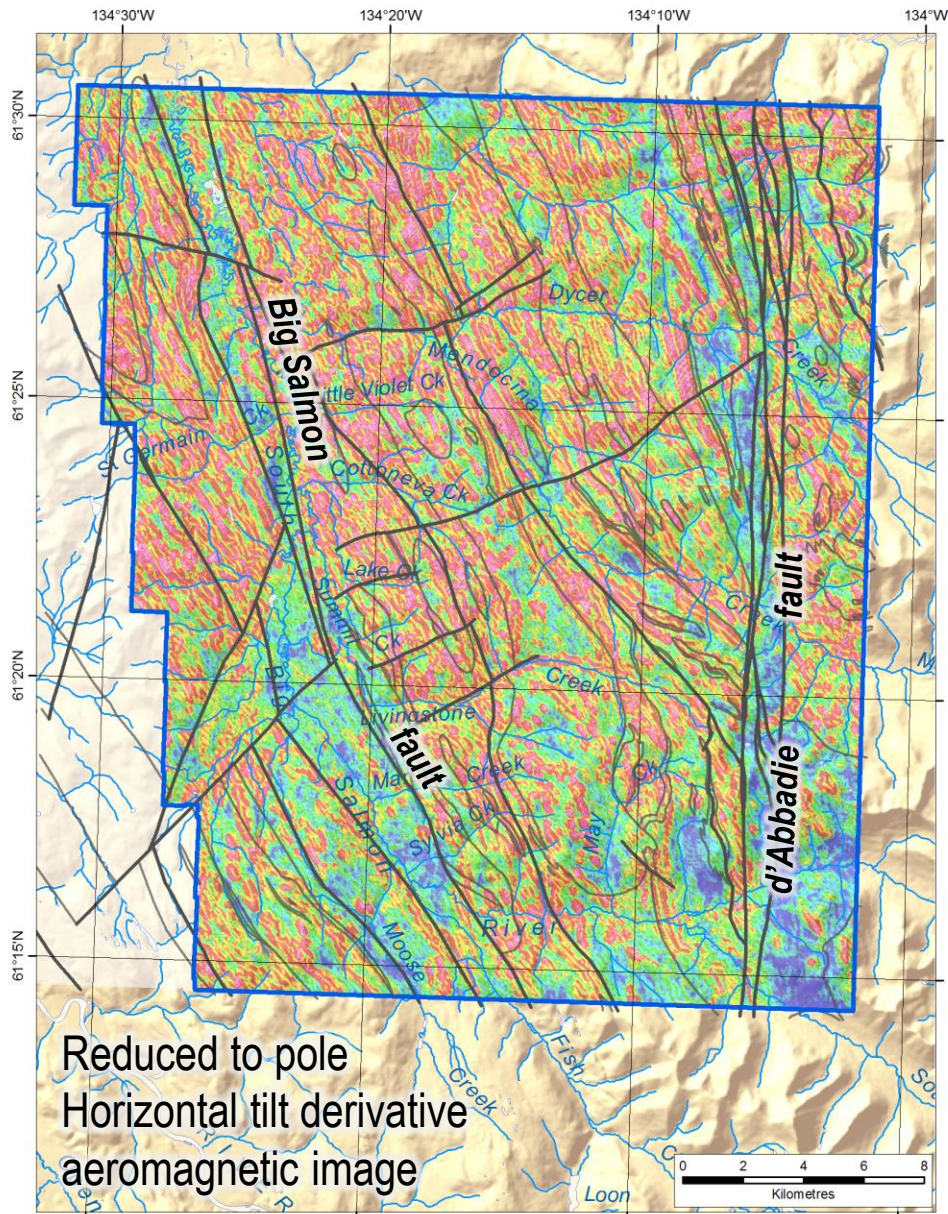
d'Abbadie fault



Last Peak granite – ca. 96 Ma

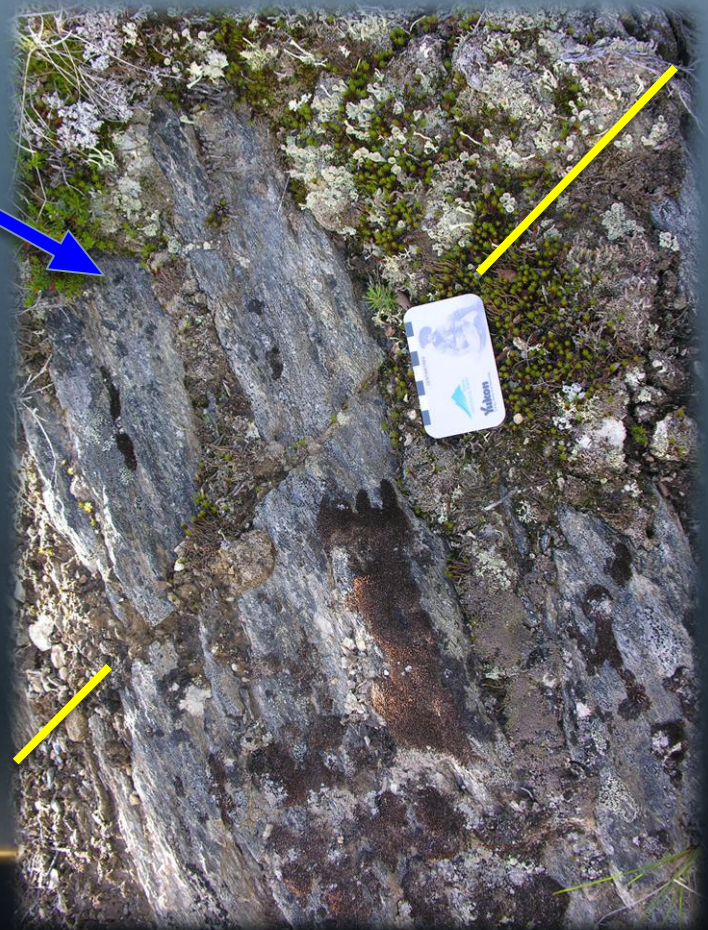
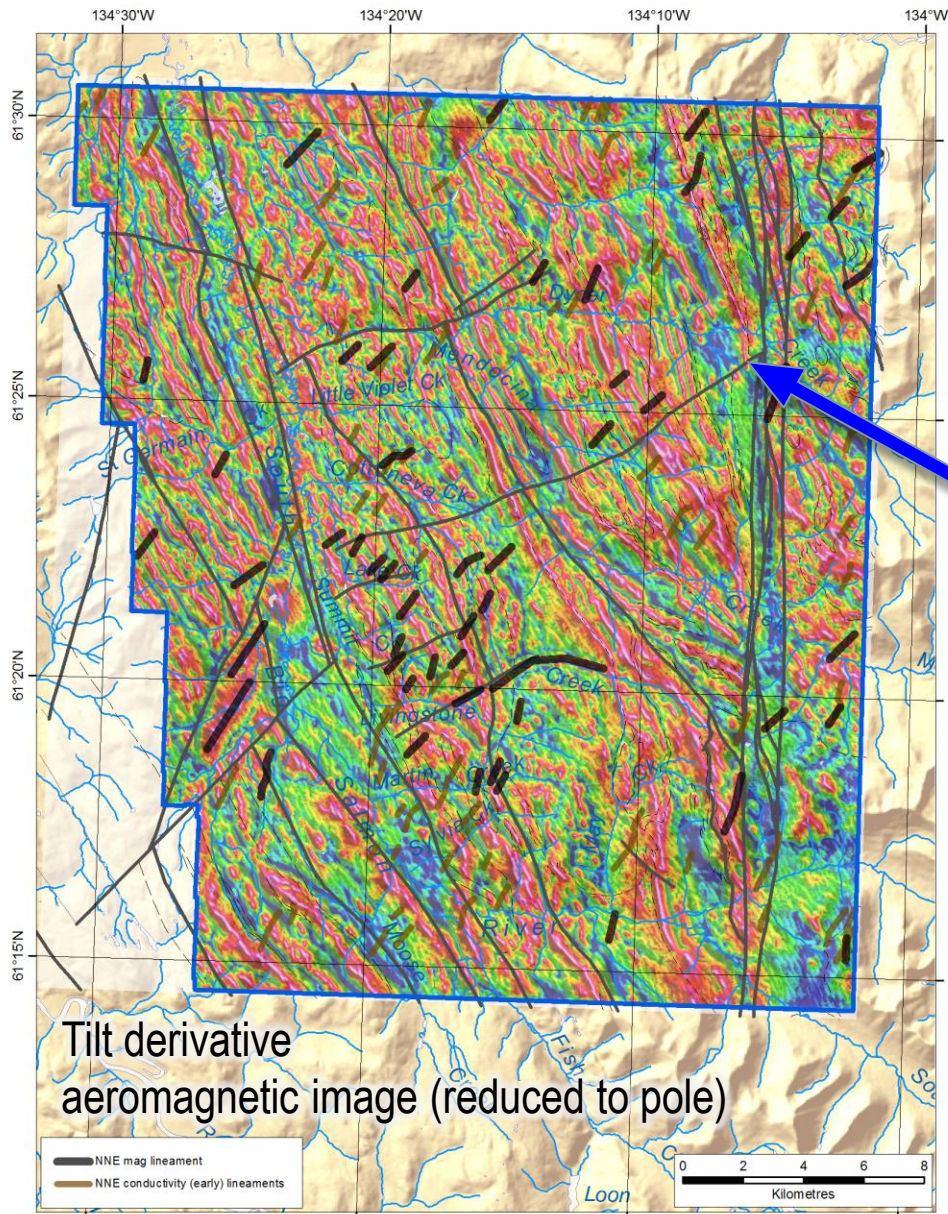
Geophysical survey

- ◆ Refinement of geological interpretation derived from 2004-05 fieldwork
- ◆ More accurate geological map to be released as Open File



Geophysical survey

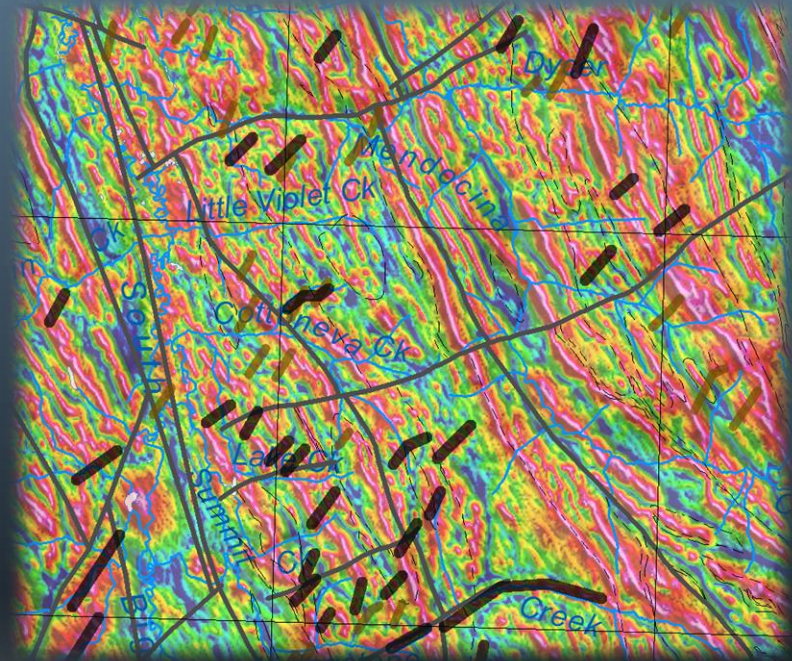
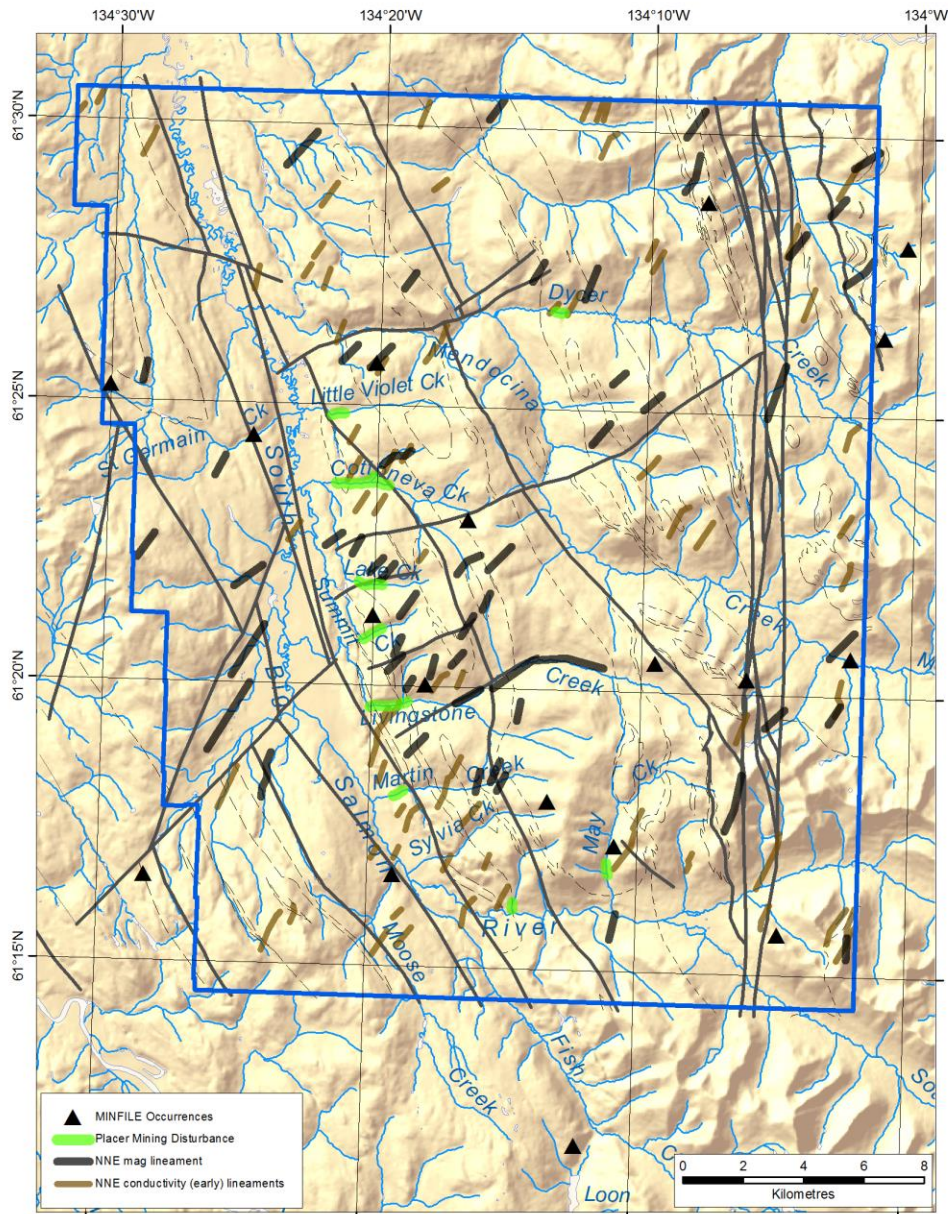
- ◆ NNE-striking brittle structures
- ◆ Breaks in prominent magnetic trends



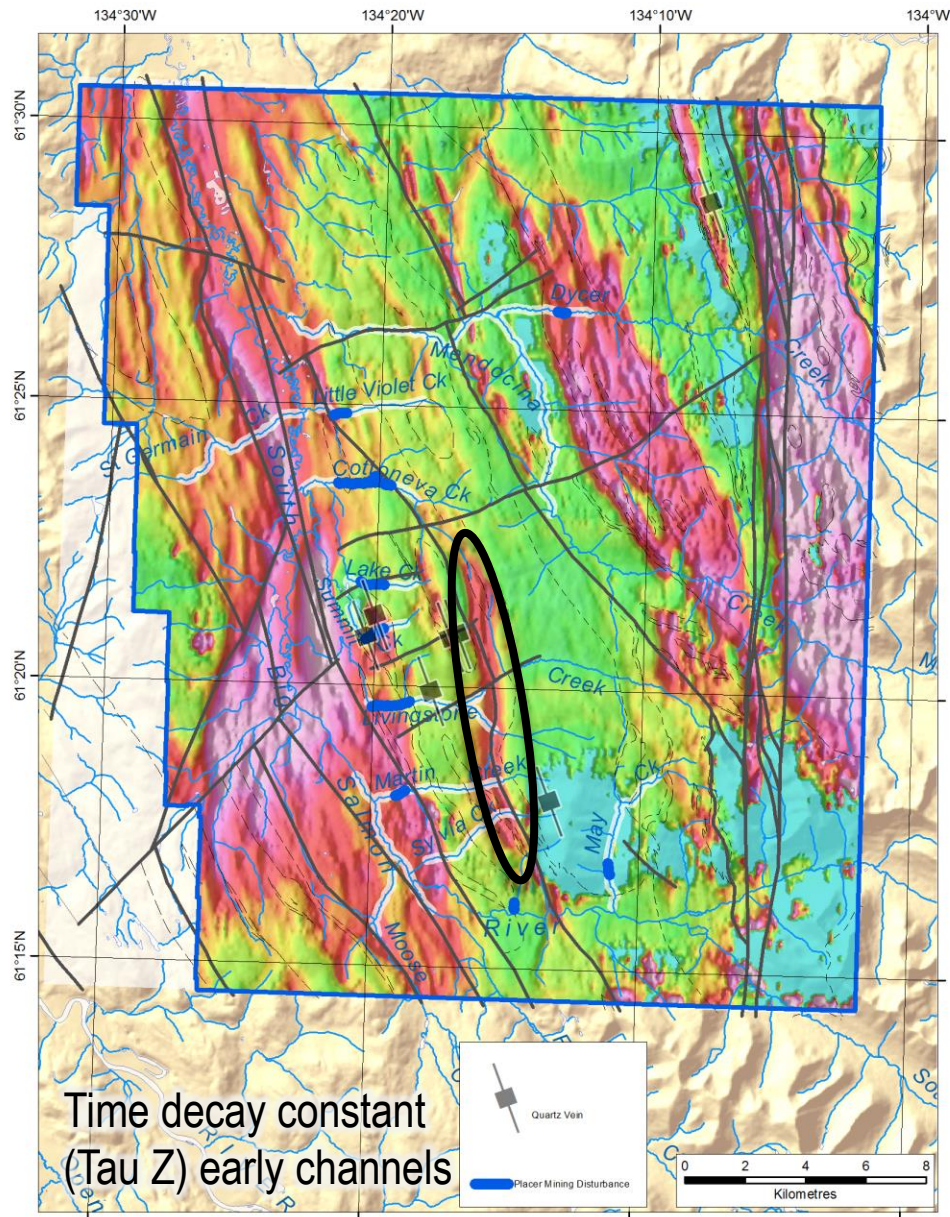
Small NE-striking brittle fault,
south of Dycer Creek

Geophysical survey

- ◆ NNE-striking trends most prominent (\pm) close to known placer creeks...
- ◆ upgrade in Au in qtz veins near NNE faults...



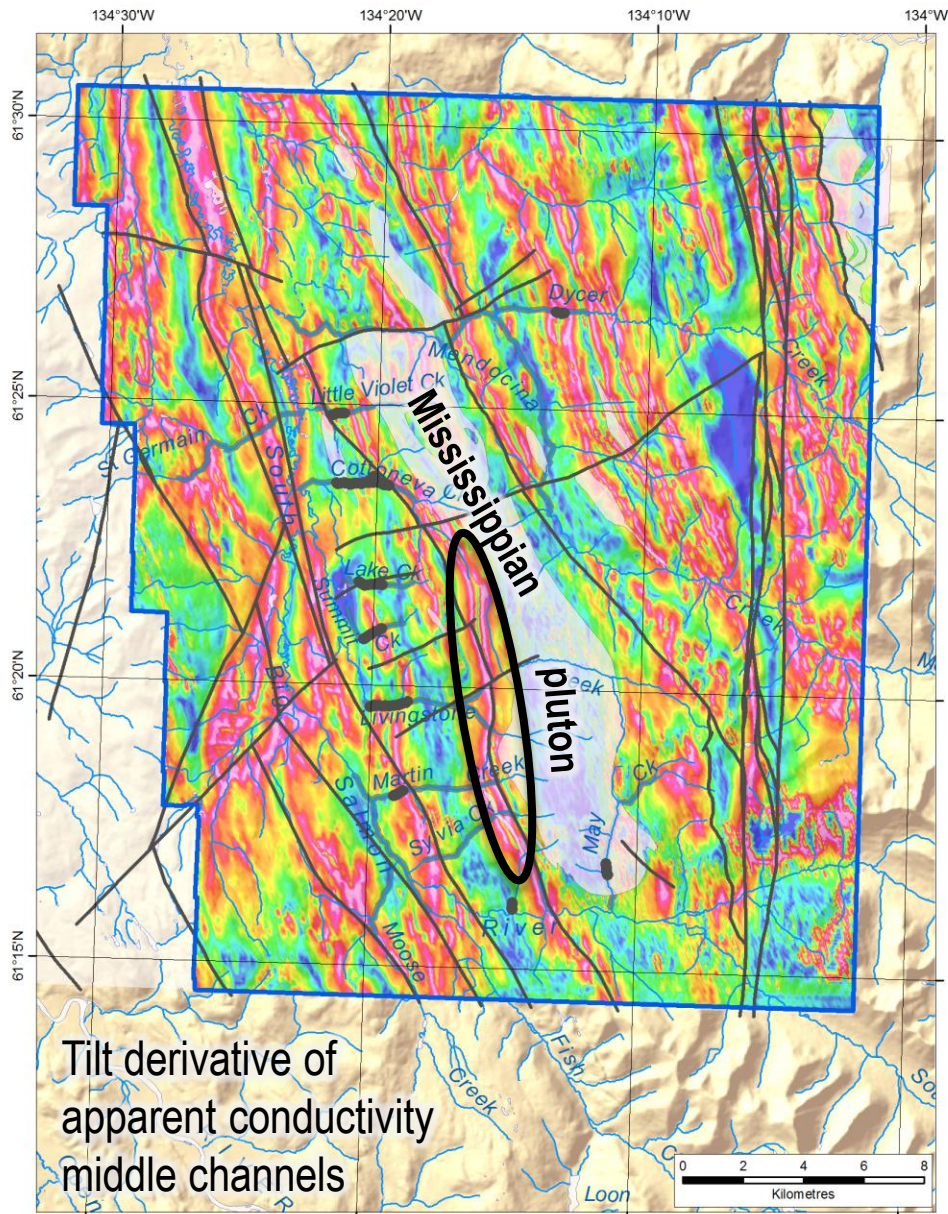
Quartz veins (\pm vg)



Quartz-carbonate vein at the
headwater of Summit Creek

EM conductor

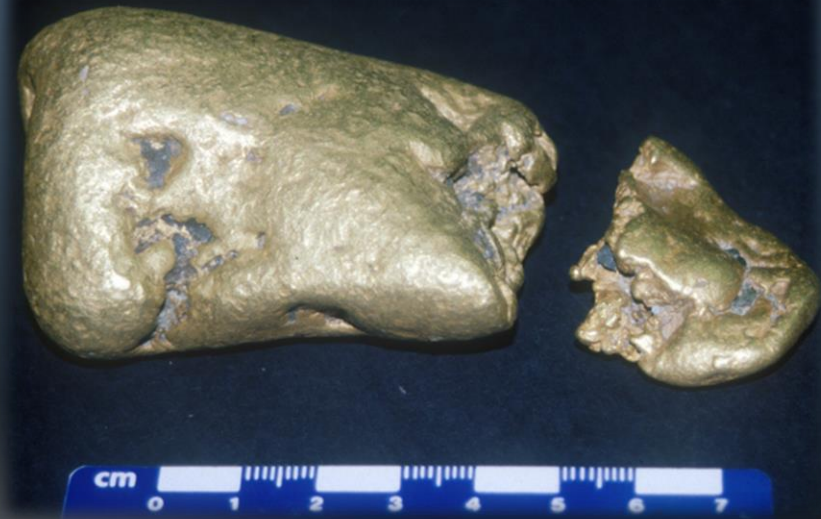
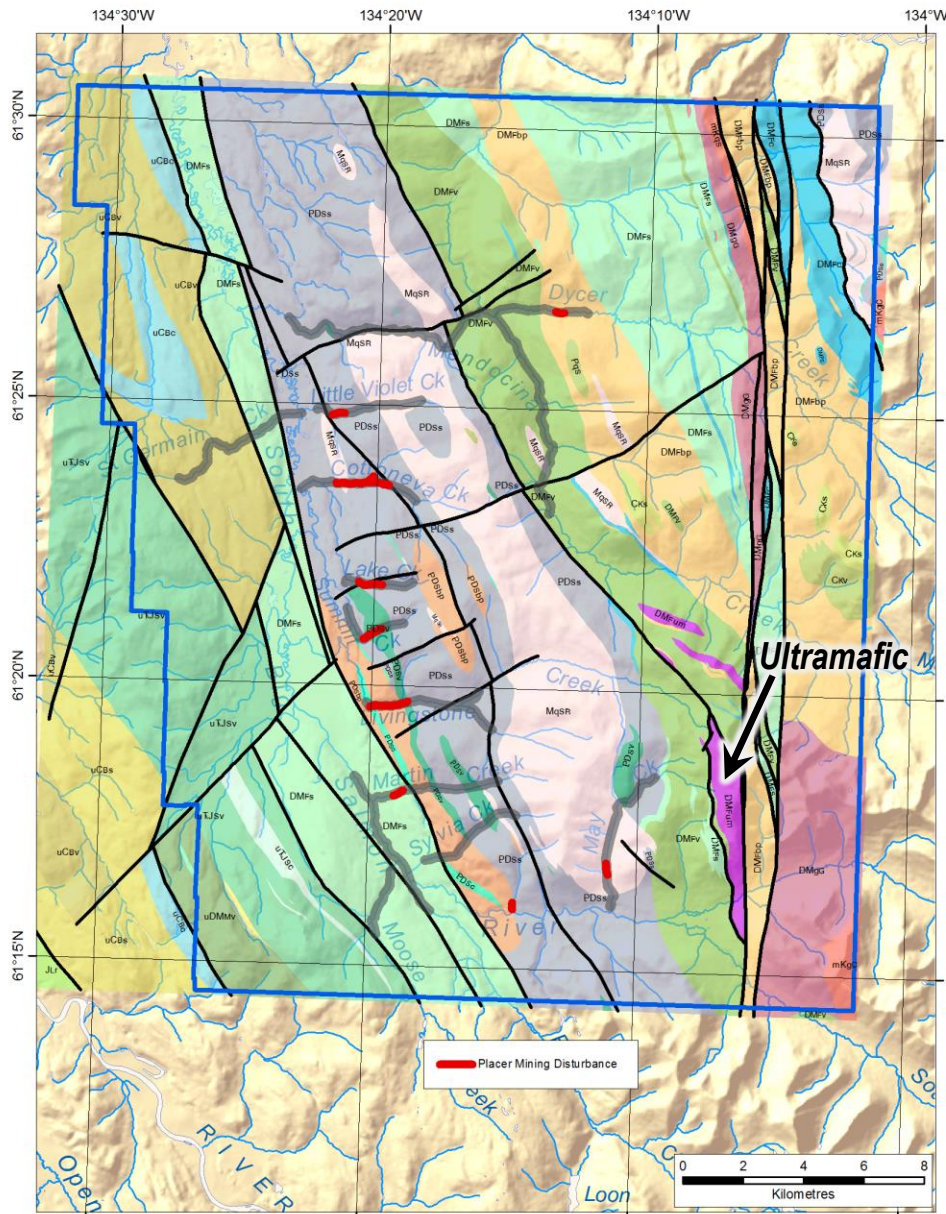
- ◆ Strong, steeply W-dipping conductor occurs along W margin of Mississippian pluton
- ◆ Contact aureole? Skarn?
- ◆ Gold commonly associated with magnetite



Gold (and magnetite) from Little Violet Creek

Placers

- ◆ Ultramafic rocks as alternate source of magnetite
- ◆ Main producing creeks underlain by Snowcap west of Mississippian pluton
- ◆ >50,000 ounces Au recovered since Gold Rush



Large gold nugget, Cottoneva Creek

Geophysics applied to placer exploration

61°20'N

134°10'W

Creek

ek

Creek

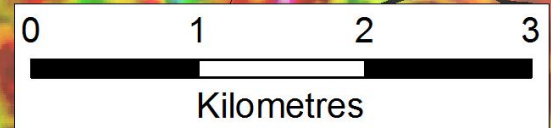
Livingstone

ultramafic

Tilt derivative
aeromagnetic image
(reduced to pole)

Martin

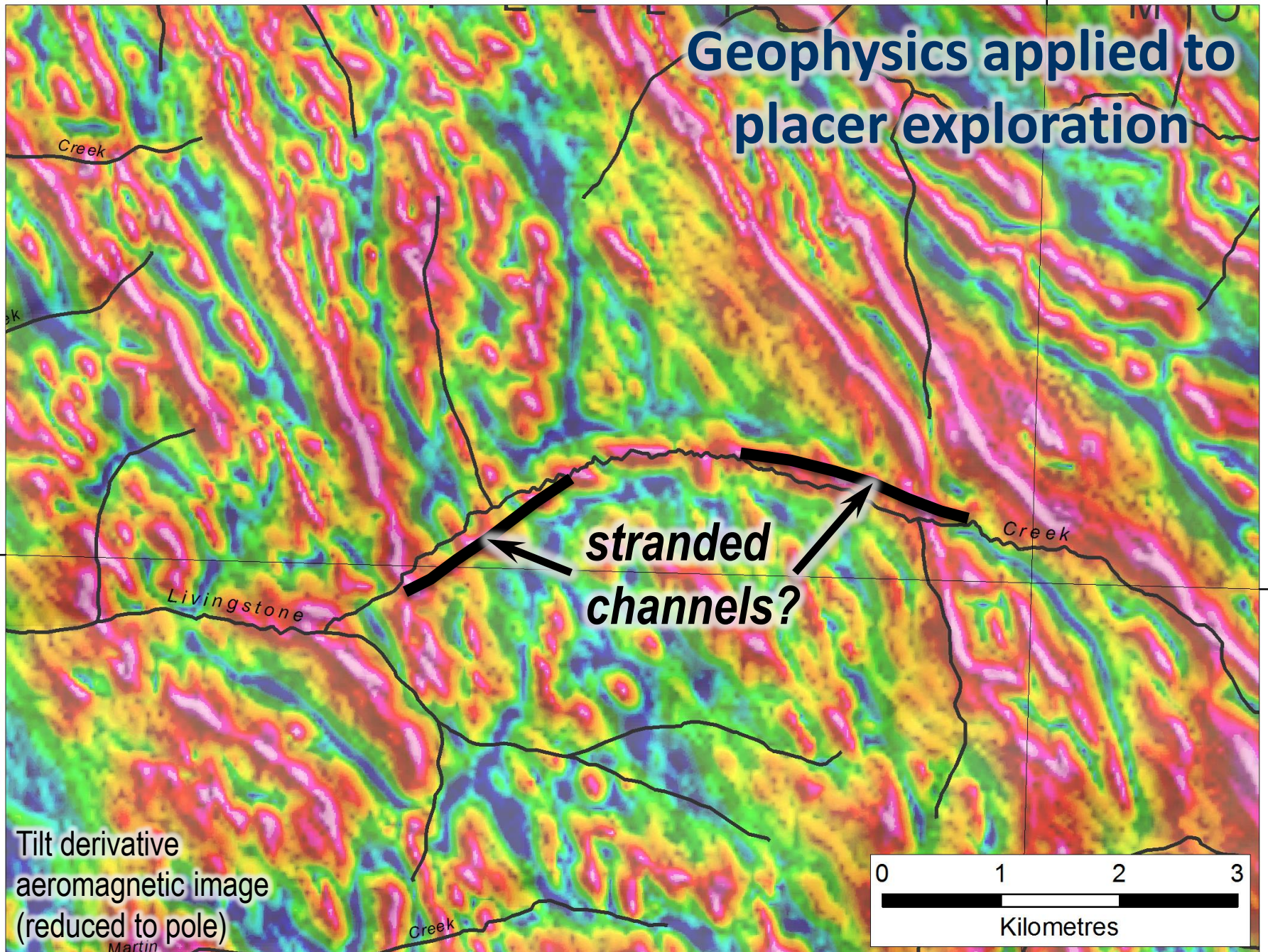
Creek



134°10'W

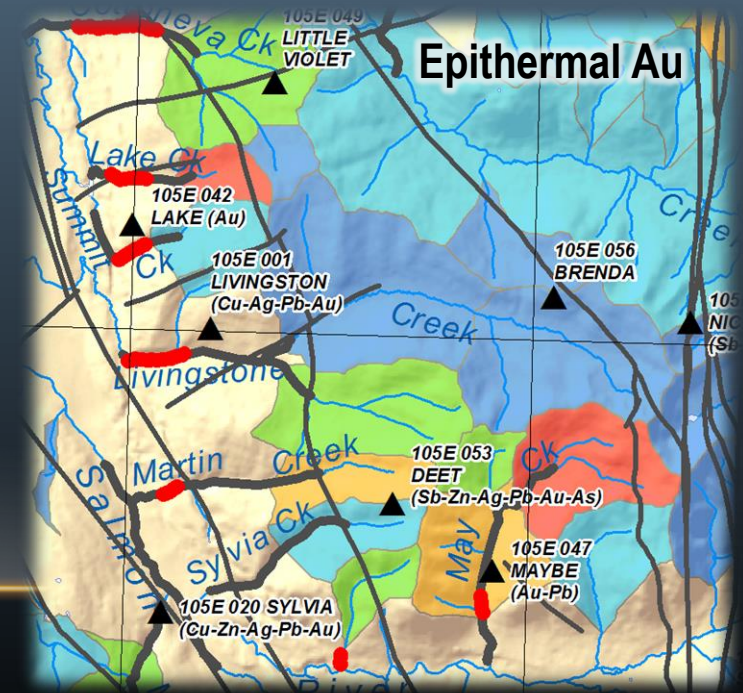
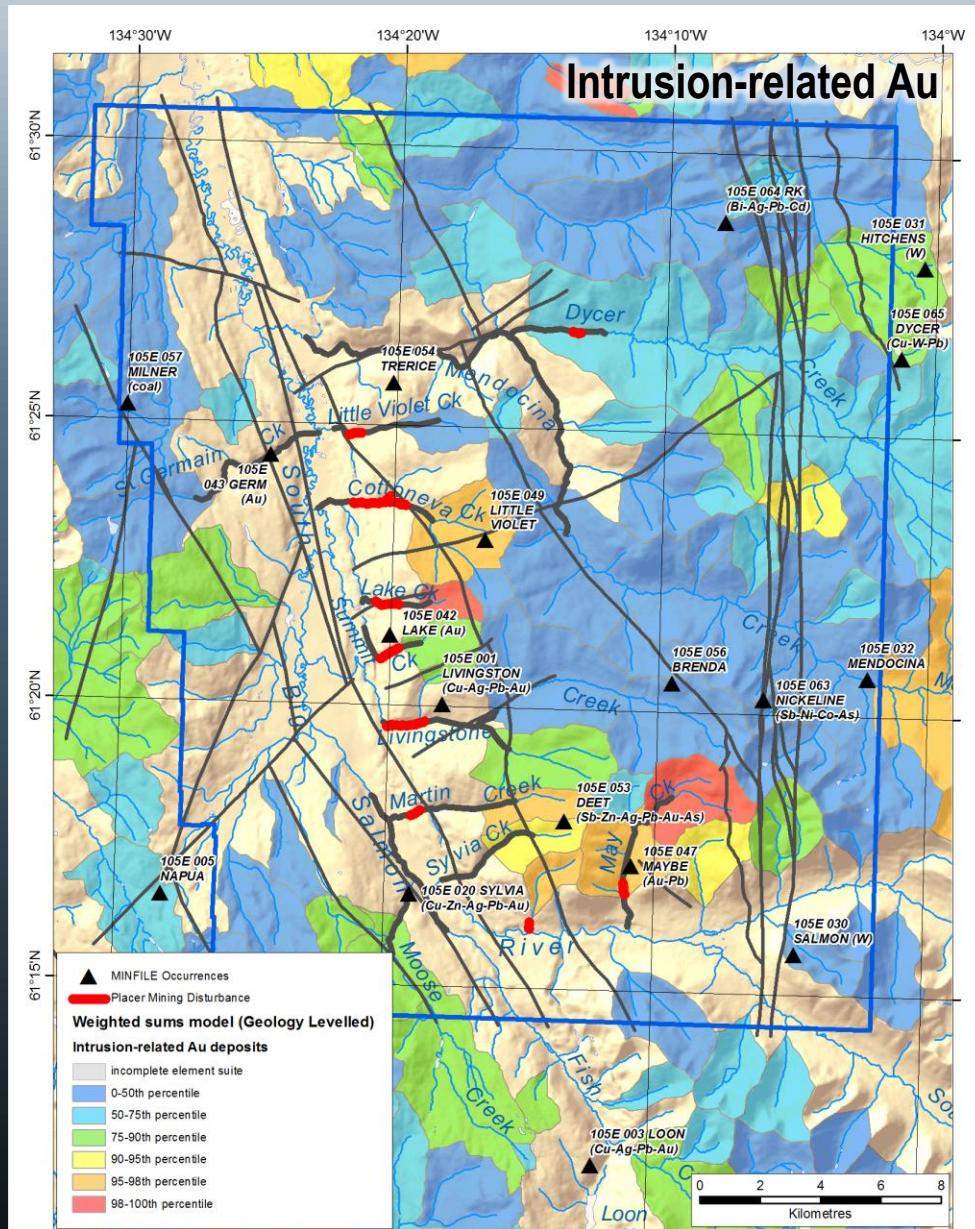
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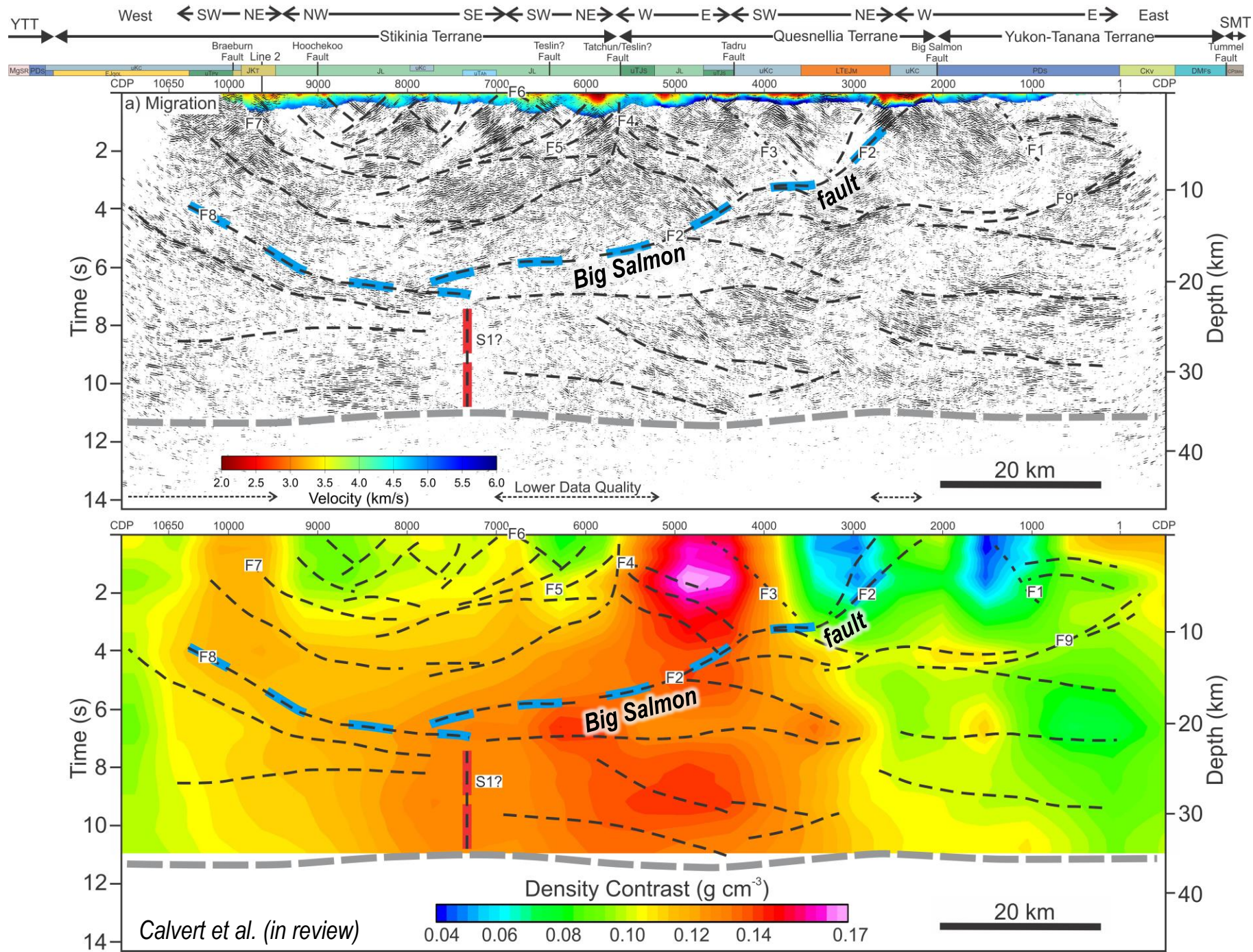
61°20'N



Enhanced RGS

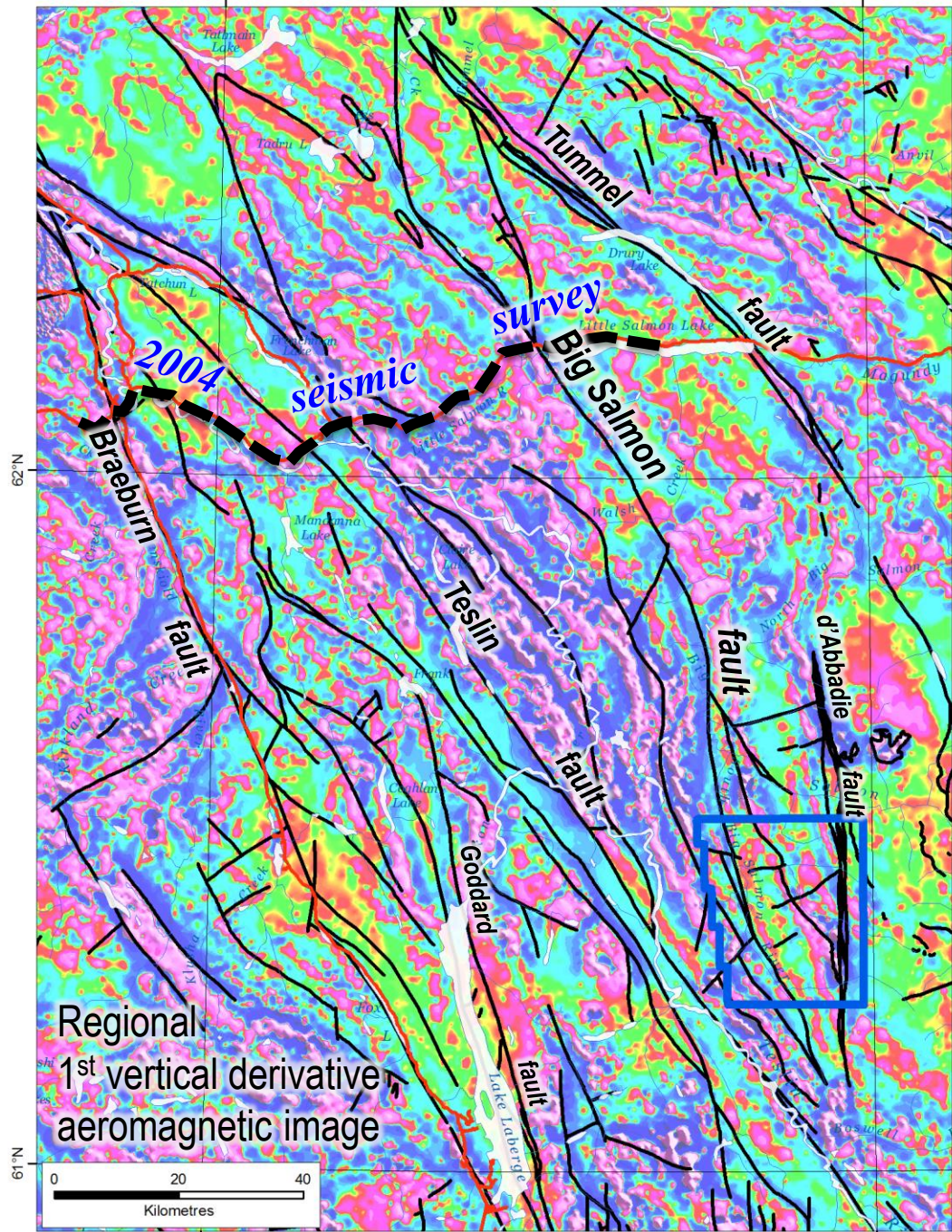
- ◆ Enhanced interpretation of stream sediment geochemical data (CSA Global)
- ◆ YGS Open File 2016-9
- ◆ SINED-YGS funded
- ◆ Catchments anomalous for most Au deposit models





136°W

134°W



Big Salmon fault

- ◆ Big Salmon fault is major regional structure
- ◆ Extends north over 120 km
- ◆ Truncated by Tintina fault
- ◆ Imaged in 2004 seismic survey along Robert Campbell highway

Physiographic expression of Big Salmon fault on Landsat 7

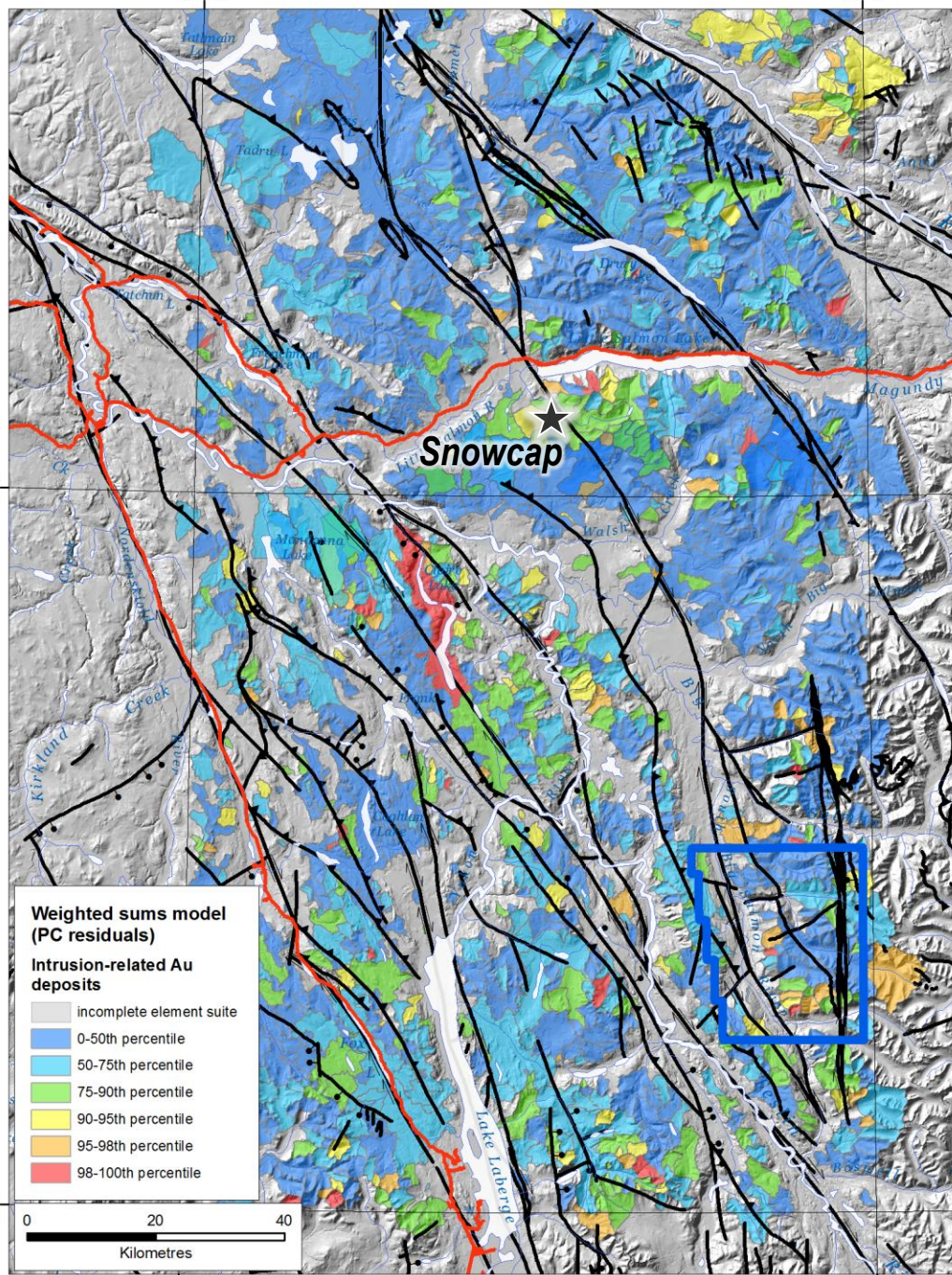


136°W

134°W

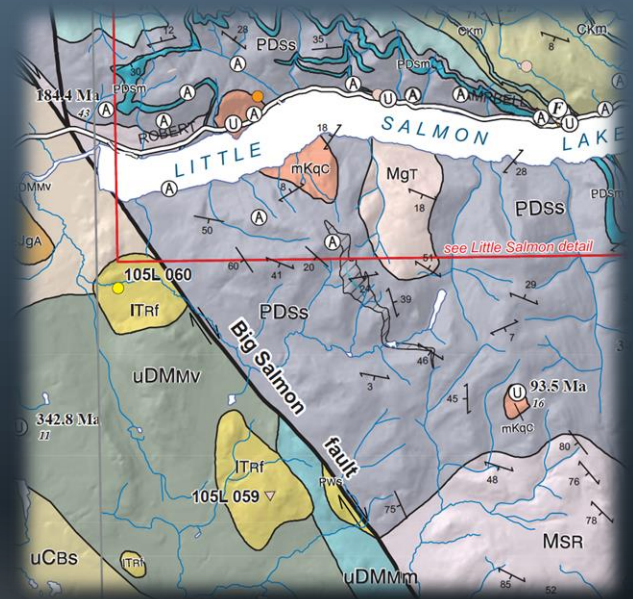
62°N

61°N



Big Salmon fault

- ◆ Big Salmon fault is major regional structure
- ◆ Epithermal mineralization along structure near Little Salmon



YGS Geoscience Map 2011-1