STRATIGRAPHIC AND STRUCTURAL FRAMEWORK FOR THE EOCENE VOLCANIC ROCKS IN CENTRAL BRITISH COLUMBIA

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INTRODUCTION

Eocene volcanic rocks cover a surface of 65000km^2 in the Nechako and Chilcotin Plateaus of central British Columbia (BC) (**FIGURE 1**). These rocks extruded between 55 and 45 Ma (Bordet and Mihalynuk, *unpub. data*; Beitsprecher and Mortensen, 2004), and overlay the accreted Paleozoic to Mesozoic terranes of Stikinia (island arc affinity), Cache Creek (subduction-related accretionary-complex) and Quesnellia (island arc affinity) (**FIGURE 1**).

Eocene volcanism occurred under regional east-west-directed extensional tectonics which resulted in the exhumation of metamorphic core complexes (e.g. Tatla Lake and Vanderhoof complexes; Struik, 1993). Early Cenozoic dextral strike-slip structures, such as the Yalakom (57-34 Ma) and Fraser (43-36 Ma) faults (**FIGURE 1**), accommodated the northward translation of the western North American margin (Struik, 1993).

The Eocene volcanic stratigraphy of central BC results from spatially heterogeneous volcanic processes overprinted by syn- and post-Eocene deformations and geological events. Overlapping ages between Eocene volcanic groups (Grainger et al., 2001) suggest that the temporal variability within the stratigraphic pile does not allow the recognition of individual volcanic centers.

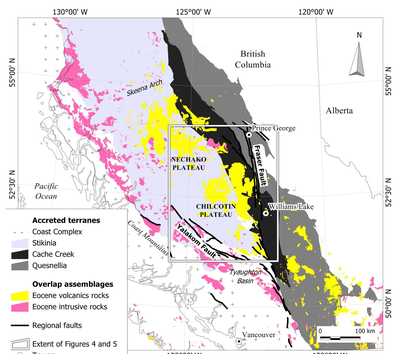

Figure 1. Distribution of Eocene volcanic rocks in the Nechako and Chilcotin Plateaus of central British Columbia with respect to the accreted terranes and regional structures (modified from Massey et al., 2005). The extent of Eocene volcanism is bound to the east by the Fraser fault, to the west by the Yalakom fault, and by the Skeena Arch to the north and the Tyaughton Basin to the south.

RESEARCH QUESTIONS & OBJECTIVES

1

QUESTIONS	Age and duration of Eocene volcanism? Recognition of one or various volcanic centers?
OBJECTIVE	**Establish a new chronostratigraphic framework for the extrusion of Eocene volcanic rocks in central BC based on field mapping and U-Pb and $^{39}Ar/^{40}Ar$ geochronology**

2

QUESTIONS	Relationship between primary volcanic processes, structures, and the deposition and preservation of Eocene volcanic rocks? Implications for the metallogenesis of central BC?
OBJECTIVE	**Propose a preliminary structural framework for central BC based on aeromagnetic survey interpretation**

STRATIGRAPHIC FRAMEWORK

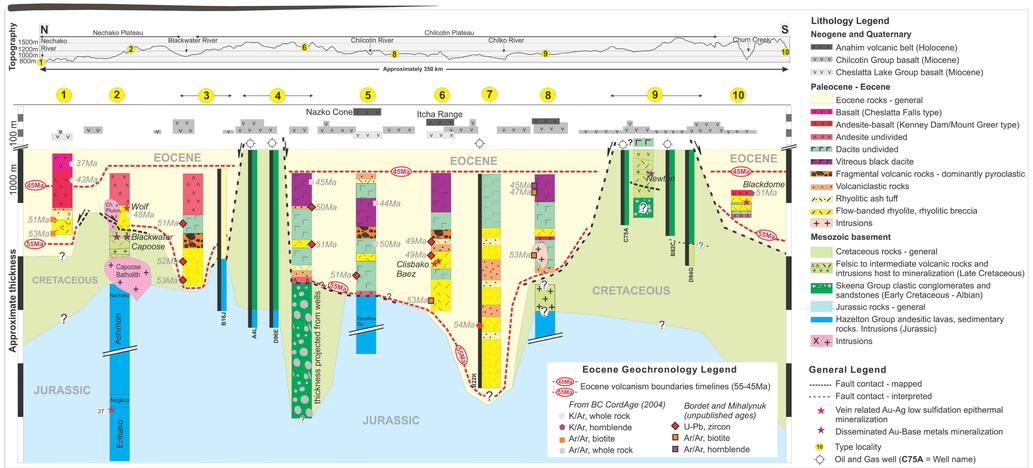

Figure 2. Isopach stratigraphic correlation diagram for type localities across the Nechako and Chilcotin Plateaus. Thicknesses are estimated from field work, literature, or well data. Type localities are 1) Vanderhoof-Fort Fraser areas; 2) Nechako and Fawnie Ranges; 3) Tibbles Road, Quesnel map area; 4) Nazko River valley, Quesnel map area; 5) Baezaeko road, Quesnel map area; 6) Clisbako area, Quesnel map area; 7) B22K well, Anahim Lake map area; 8) Chilanko Forks and Chezacut areas, Anahim Lake map area; 9) Chilcotin Plateau, by the Newton deposit; 10) Blackdome Mine.

Eocene type localities include:

- Vanderhoof **1**: a contact is exposed between rhyolitic flows (**FIGURE 3f**), tuffs and tuffaceous sandstones with overlying thick flows of andesitic to basaltic andesite (**FIGURE 3d,e,g,h,i**; Grainger et al., 2001).
- Quesnel-Anahim Lake **3** to **8**: rhyolitic flows and breccia are overlain by several packages of dacitic lavas (**FIGURE 3j,k,l,m,n**) and volcaniclastic rocks (**FIGURE 3o,p,q**) (Mihalynuk et al., 2008, 2009; this study).
- Clisbako-Baez **6**: low-sulfidation epithermal gold prospects are hosted in the lower package of flow-banded rhyolite (**FIGURE 3f**).
- Blackdome mine **10**: a dominantly rhyolitic to dacitic volcanic pile is overlain by Eocene andesitic flows and capped by Miocene basalts of the Chilcotin Group.

Eocene volcanic rocks are unconformably overlain by:

- Neogene Chilcotin Group olivine-basalts (**FIGURE 3a**)
- Cheslatta Lake suite xenocrystic basalts (**FIGURE 3b**)
- Subaerial basalt flows and breccias of the Miocene to Holocene Anahim Volcanic Belt (**FIGURE 3c**).

Jurassic and Cretaceous basement rocks include:

- Mid Cretaceous chert-pebble conglomerate and sandstone (**FIGURE 3s**; Riddell, 2011) **4**
- Mid- to Late Cretaceous continental volcanic arc rocks (**FIGURE 3t,u**; Diakow, 2006) **2**
- Lower to Middle Jurassic volcanic arc successions of the Hazelton Group (**FIGURE 3w**; Diakow, 2006), intruded by Late Jurassic and Late Cretaceous plutons (**FIGURE 3v**; Friedman et al., 2001). **2**

Figure 3. Mezosoic, Eocene, Neogene and Quaternary lithologies and textures in the Nechako and Chilcotin Plateaus of central British Columbia.

STRUCTURAL FRAMEWORK

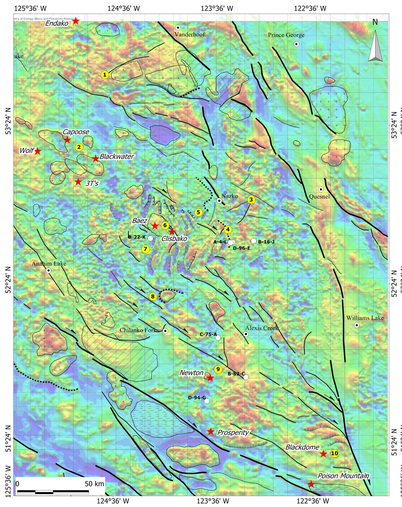

Figure 4. Reduced to the pole (RTP) aeromagnetic anomaly survey for central BC (Colin Barnett, personal communication) and interpreted magnetic lineaments. Magnetic signature of relevant geological features and intrusive bodies is outlined. Mineral deposits and prospects from MINFILE (2010). Type localities refer to Figure 2.

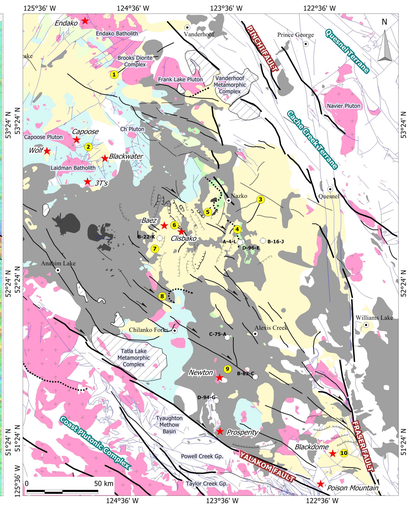

Figure 5. Geological and structural interpretation of central British Columbia. Fault (blue) from Massey et al. (2005) and interpreted magnetic lineaments (black; see legend of Figure 4). Geology polygons from Massey et al. (2005). Mineral deposits and prospects from MINFILE (2010). Type localities refer to Figure 2.

CONCLUSIONS

1 We propose **a new chronostratigraphic framework** for the Eocene volcanic rocks based on field mapping and geochronology (**FIGURES 2 & 3**). Results suggests that **lithological subdivisions** of the Eocene sequence reflect local spatial variations in volcanic and/or depositional process.

The span of Eocene volcanism is well constrained to **55-45 Ma** by $^{39}Ar/^{40}Ar$ and U-Pb geochronology. Although the magmagenesis of Eocene volcanic rocks is still under debate, these rocks may be considered as the result of a single sustained volcanic event resulting from the action of coeval tectonic and magmatic processes.

2 Preliminary structural interpretations suggest an **extensional to transtensional tectonic control on the deposition and preservation of Eocene volcanic rocks by northwest-trending fault systems** (**FIGURE 4 & 5**).

- Three major basins hosting Eocene stratigraphy with thicknesses in excess of 3km have been identified (e.g. well B22K; **FIGURES 2 & 4-5**).
- Zones of transtension along the north-west trending Fraser and Yalakom dextral strike-slip fault systems govern localized subsidence and Eocene volcanism (**FIGURES 4 & 5**).

Eocene stratigraphy and interpreted structures provide a framework for the distribution and style of known mineral prospects in the Nechako and Chilcotin Plateaus.

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