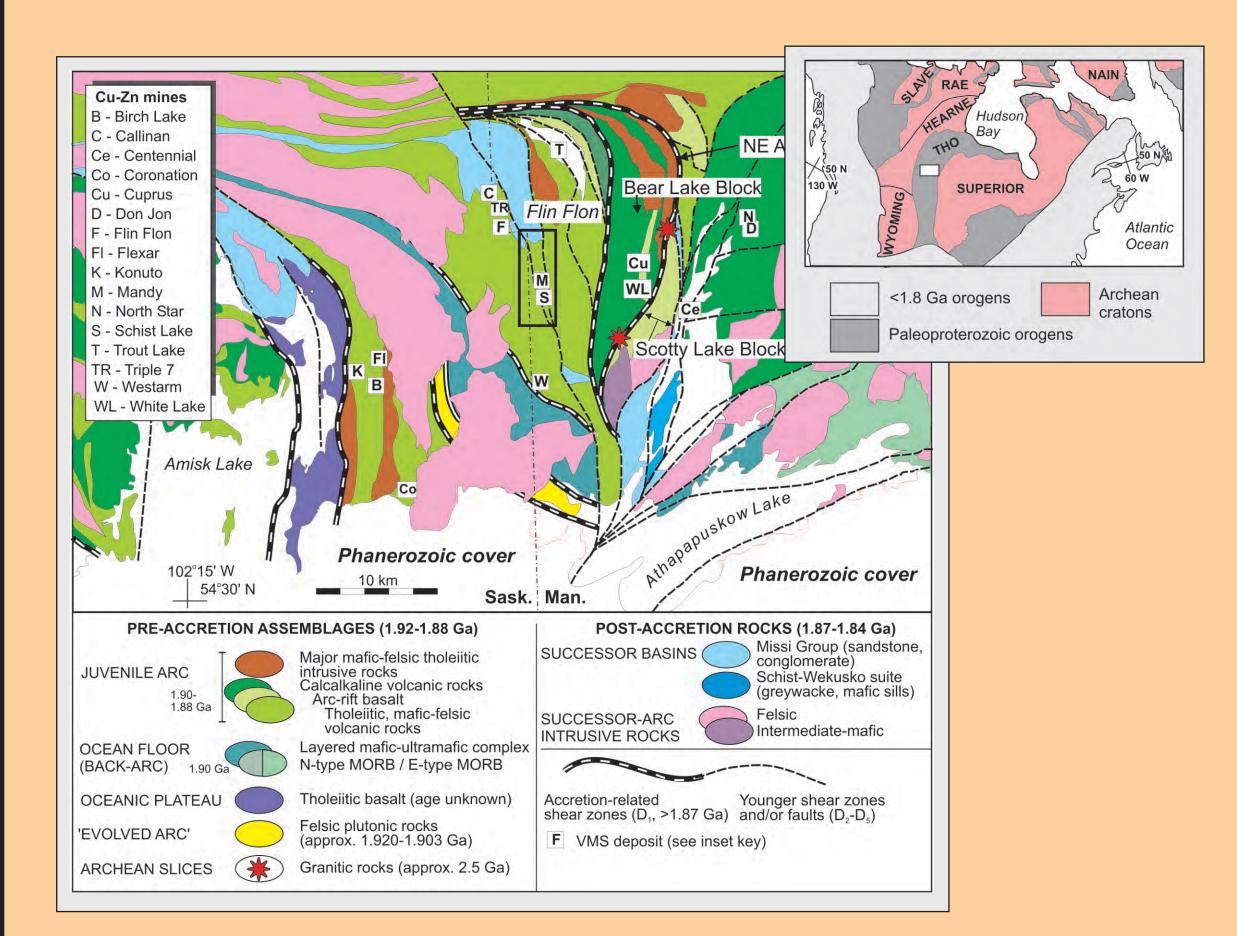
The New 1:10 000 Scale Bedrock Map for the Flin Flon Area, Manitoba and Saskatchewan

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Flin Flon Regional Geology

The Paleoproterozoic Flin Flon belt is part of the Reindeer Zone of the Trans-Hudson Orogen. The Flin Flon belt consists of a series of tectonostratigraphic assemblages (juvenile arc, juvenile ocean-floor back arc, ocean plateau, ocean-island basalt and evolved plutonic arc) that range in age from 1.92 to 1.87 Ga. All of the VMS deposits mined to date in the Flin Flon area are associated with the juvenile Flin Flon arc assemblage (Syme et al., 1999). The volcanic rocks of the Flin Flon area are part of the 1.9 Ga juvenile Flin Flon arc assemblage, which consists mainly of tholeiitic subaqueous pillowed basalt and basaltic andesite, with lesser amounts of heterolithic mafic breccia and mafic and felsic volcaniclastic rocks, and minor dacite to rhyolite flows (Bailes and Syme, 1989). The VMS deposits in the area occur in association with the felsic volcanic units in synvolcanic collapse structures and calderas, within the main mafic volcanic complex (Bailes and Syme, 1989; Syme and Bailes, 1993).

Recent detailed geological mapping and stratigraphic analysis of volcanic rocks of the Flin Flon mines area (Devine, 2003; Tardif, 2003; DeWolfe and Gibson, 2006; Gibson, unpublished data 2000-2006; MacLachlan and Devine 2007; MacLachlan 2006; Simard 2006; Simard and Creaser 2007), have allowed the establishment of an informal stratigraphic subdivision of rocks hosting and occurring within the footwall and hangingwall to the Flin Flon-Callinan-Triple 7 massive sulphide deposits (Devine, 2003; DeWolfe and Gibson, 2006).

Rocks of the Channing Block which host the Schist Lake and Mandy VMS deposits just south-east of Flin Flon share similarities with rocks from both the Flin Flon and Hook Lake blocks. Further work is underway to assess their affinity.

Rocks from the Hook Lake Block due east of Flin Flon across the Cliff Lake Fault have proven to be in part different from the rocks of the Flin Flon Block. The Eastern sequence of the Hook Lake Block is ~10 Ma younger than the footwall sequence of the Flin Flon deposits at 1882 +/- 1 Ma. Further work is underway to assess the affinity of the Western sequence of the Hook Lake Block with rocks from both the Flin Flon and Channing

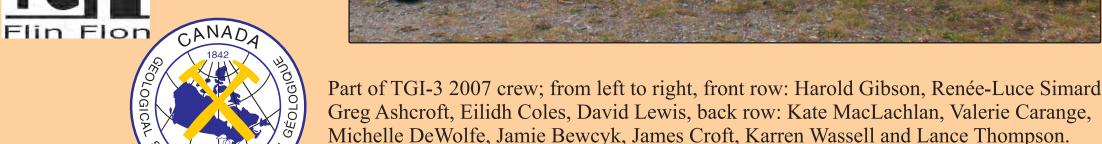
Map production and contribution

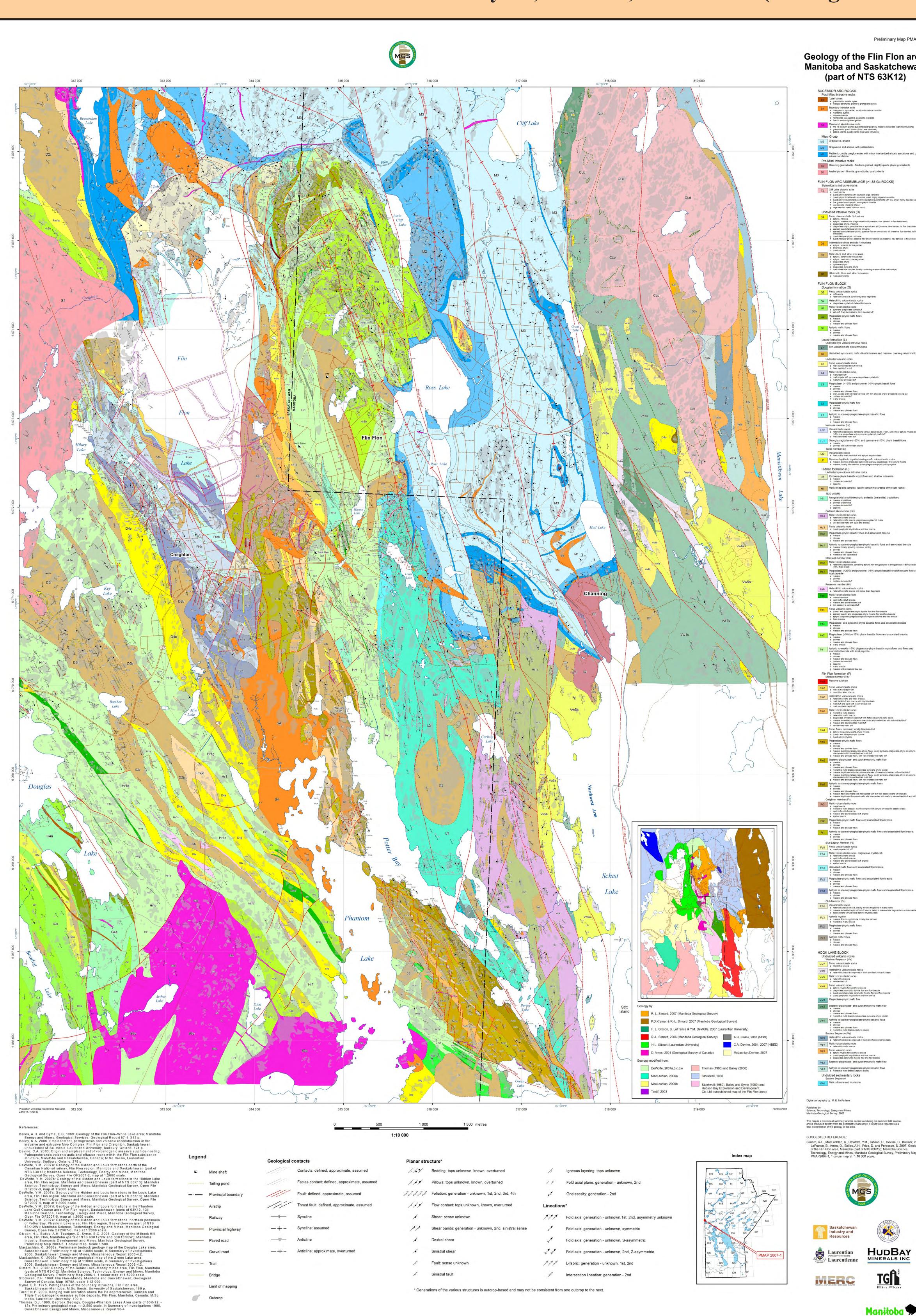
With the intent of stimulating private-sector resource exploration in areas of high basemetal potential in established mining communities, the Government of Canada launched a new five-year Targeted Geoscience Initiative (TGI-3) in 2005.

As part of this initiative, the production of a new 1:10 000 scale bedrock map of the Flin Flon area was undertaken by the Manitoba Geological Survey and Saskatchewan Geological Survey with partners from the Geological Survey of Canada, Laurentian University, and Hudson Bay Exploration and Development Co. Ltd..

When finalized, the new map will include ~70% of new mapping (2000-2007) by the different parties involved and ~30% of compiled material from previous work in the area (see references on the map). The final product, which should be released in early 2009, will present a seamless stratigraphic map with a revised structural model for the Flin Flon







Stratigraphy & Structure



HOOK LAKE **FLIN FLON BLOCK**

In the Flin Flon Block, the Flin Flon mine stratigraphy is composed of the Flin Flon formation (host of the deposits) conformably overlain by the Hidden and Louis formation. A similar stratigraphy can be found across the Beaver Road Anticline in the Douglas Lake area with the Hidden formation conformably overlain by the Douglas formation.

On the basis of field observations and preliminary geochemistry and geochronology, the host rocks of the Schist Lake-Mandy deposits and of the Hook Lake Block to the east are distinct from the Flin Flon mine stratigraphy

Geochronology (N. Rayner; GSC)

Flin Flon Block

Age constraints on volcanic rocks hosting the Flin Flon volcanic-hosted massive sulphide (VMS) deposit are limited. Extensive geochronological research in this area over the last 20 years has been hampered by poor zircon recovery. Previous U-Pb zircon geochronology constrained the crystallization age of the "Mine Rhyolite" to 1903 +3/-5 Ma (Stern et al. 1999, CJES) and inferred that this is also the age of the Flin Flon and Callinan VMS deposits and the associated tholeiitic arc volcanic rocks. The "South Main rhyolite domes" in the stratigraphic footwall of the Flin Flon deposit were originally dated 1893 +5/-4 Ma (David et al. 1993, Lithoprobe Report), but subsequently reinterpreted as 1903 +15/-12 Ma (Stern et al. 1999, CJES).

In order to improve concordance and errors on this age, chemical abrasion technique was employed on archived mineral separates from the "South Main rhyolite" (sample z1319 of Stern et al. 1999). Three concordant zircon fractions yield a preliminary new age of 1887 +/-2 Ma for this unit (determined by ID-TIMS, see diagram to the right). Two similar crystallization ages were obtained using the SHRIMP technique on two stratigraphically correlative samples across the Beaver Road anticline to the west, namely the "Hillary Lake lapilli tuff" sample at 1886 +/-4 Ma and the "Trancan Rhyolite Breccia" sample at 1889 +/-9 Ma (see diagrams to the right). These two units are interpreted as extrusive equivalents to the intrusive Myo felsic intrusions in this area, 107-07-1381 (Z9550) Eastern Sequence Of Hook Lake Block dated at 1890 +/-2 Ma (Bailey 2003, Laurentian University).

These results suggest that ca. 1890 Ma is the dominant age of volcanism and VMS mineralization in the Flin Flon assemblage and confirms major thrust imbrication in the camp. The significance of the 1903 Ma age for the Flin Flon sequence is now unclear. Further geochronology on rhyolite samples from the mine workings in the footwall and hangingwall to the 777 deposit is underway to resolve this issue.

Sun & McDonough, 1989

W-Hook rhyolite

W-Hook basalt

Sun & McDonough, 1989

Flin Flon hangingwall

 \triangle Cliff Tonalite

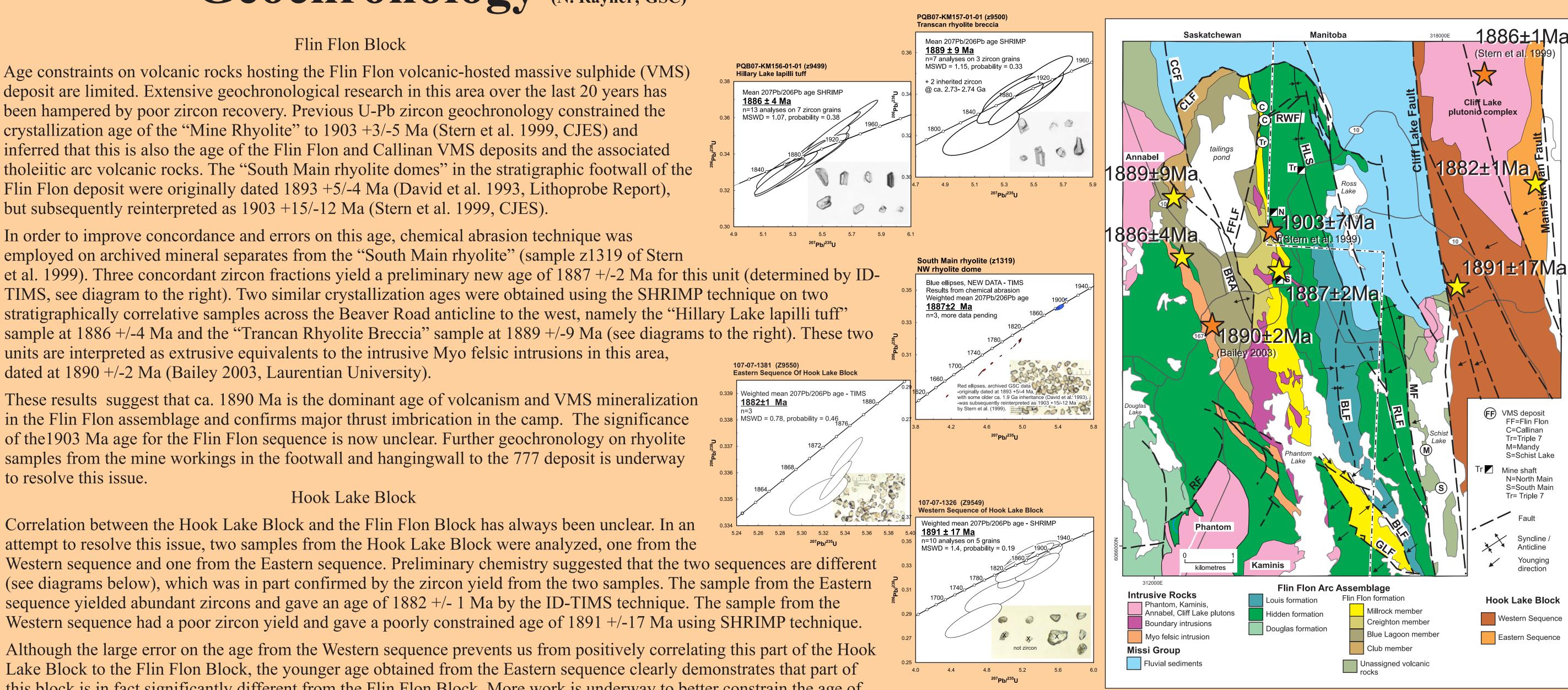
E-Hook rhyolite

Hook Lake Block Correlation between the Hook Lake Block and the Flin Flon Block has always been unclear. In an attempt to resolve this issue, two samples from the Hook Lake Block were analyzed, one from the Western sequence and one from the Eastern sequence. Preliminary chemistry suggested that the two sequences are different (see diagrams below), which was in part confirmed by the zircon yield from the two samples. The sample from the Eastern sequence yielded abundant zircons and gave an age of 1882 +/- 1 Ma by the ID-TIMS technique. The sample from the

TiO₂/Y Sun & McDonough, 1989

E-Hook Block

Although the large error on the age from the Western sequence prevents us from positively correlating this part of the Hook Lake Block to the Flin Flon Block, the younger age obtained from the Eastern sequence clearly demonstrates that part of this block is in fact significantly different from the Flin Flon Block. More work is underway to better constrain the age of the Western sequence.



Geochemistry

Flin Flon Block

Rocks of the Flin Flon-Callinan-777 mine stratigraphy display very similar whole rock and isotopic geochemical signatures with only subtle variations, if any, between the footwall (Flin Flon formation) and hangingwall (Hidden and Louis formations) packages (see diagrams to the left; DeWolfe, pers. comm., 2007; Gibson, unpublished data, 2000-2007). The Flin Flon-Callinan-777 footwall and hangingwall volcanic rocks are both the result of tholeiitic arc volcanism (Syme et al. 1999, CJES) with relatively juvenile isotopic signatures (i.e., positive Nd values of +2 to +5; Stern et al.

Channing and Hook Lake blocks

Preliminary geochemical results from the Hook Lake Block clearly demonstrate that the Western and Eastern sequence are distinct (see diagrams to the left). Furthermore, felsic rocks from the Eastern sequence which have a higher Zr and LREE content are clearly different from the felsic rocks from the Flin Flon Block rocks (see diagrams to the left). Further work is underway to more definitely assess the Western sequence affinity with the rocks from the Flin Flon Block.

The scarcity of analyses for rocks of the Channing Block which host the Schist Lake and Mandy VMS deposits prevents any conclusive comparison to the Flin Flon-Callinan-777 mine package or Hook Lake Block based on geochemistry. More detailed characterization of the Channing Block is the focus of an ongoing Master's thesis by E. Cole at Laurentian University.

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