Chistyakova, S.Yu., and Latypov, R.M., 2022, Pothole-like depressions in the chamber floor of the Sudbury Igneous Complex, Canada: Geology, v. 50, https://doi.org/10.1130/G49928.1

Supplemental Material: Pothole-like depressions in the chamber floor of the Sudbury Igneous Complex, Canada

ADDITIONAL METHODOLOGY

The SIC is subdivided at surface into the North, South and East Ranges which have different thicknesses but similar magmatic stratigraphy (Fig. 1a). Our study area is located in the South Range, where we sampled one long cross-section intersecting both the lower and transitional layers (Section I) and two shorter ones mostly intersecting the transitional layer of the SIC (Sections II and III) (Fig. 1a & b). About 120 samples (each sample weighing ~1 kg) were collected for petrographic, whole-rock (XRF and ICP-MS) and mineral compositional analyses. Major and trace elements were analysed by Genalysis Intertek Laboratory Services in Australia. Major elements were determined by X-ray fluorescence analyses (XRF) using fusion discs (glass beads) fused with a lithium borate flux. XRF calibrations were performed using high purity reference materials to which the calibration and analytical data are traceable. Corrections were made for drift, background, emission line overlap and inter element enhancement-absorption effects. Analytical process control was achieved using certified reference materials which are grade- and matrix-matched as closely as possible. Calibrations used the international rock standards SARM8, SARM4, OREAS 24b, GBAP-12 as well as in-house controls. Agreement with recommended values was better than 0.6% for Cr_2O_3, Fe_2O_3, MgO, Al_2O_3 and better than for 1–6% for all other major elements. Trace elements were determined using 4 acid digests of the powdered sample material followed by inductively coupled plasma mass spectrometry (ICP-MS) and optical emission spectrometry (ICP-OES). Calibrations were made using certified reference material solutions. Each ICP-MS analysis was accompanied by control standards GTS-2a, AMIS0167, and AMIS0013 and selected samples were re-analysed to check anomalous results. Corrections for drift were made using internal standards. Corrections for interferences were accomplished using collision cell technology (for ICP-MS) and IEC models. Various certified reference materials are used in the analytical process control. Pulp replicates (checks) were selected during job registration to check the data repeatability. Selected samples were routinely re-analysed to confirm anomalous results. For all elements, the relative standard deviations were less than 10%. Approximately 200 microprobe major and minor element analyses of plagioclase was carried out on polished thin sections using a Jeol JXA 8230 Superprobe with 4 WD spectrometers at Rhodes University, South Africa. Analytical conditions employed were acceleration voltage 15 kV, probe current 20 nA, counting time 10 sec on peak and 5 sec on background, beam size spot <1 micron. Natural standards were used for measuring the characteristic X-rays. The ZAF matrix correction method was employed for quantification. A complete list of analyses which we used in this paper for Figs. 1b, 2 and 3, with the exception data from lower part of Section I on Fig. 2 is available online within the electronic Supplementary Table 1. The data from lower part of Section I in Fig. 2 are not included because they have already been published as Supplementary Materials in Latypov et al. (2019).

REFERENCES METHODOLOGY

Latypov, R., Chistyakova, S., Grieve, R., and Huhma, H., 2019, Evidence for igneous differentiation in Sudbury Igneous Complex and impact-driven evolution of terrestrial planet proto-crusts: Nature Communications, v. 10, p. 508, doi:10.1038/s41467-019-08467-9.

FIGURE 1. PHOTOMICROGRAPHS OF MAJOR ROCK UNITS OF THE SUDBURY IGNEOUS COMPLEX, CANADA

(A-B) Photomicrographs of felsic norite (sample S2-525, Elm area) in parallel-polarized light and cross-polarized light. Felsic norite shows a medium grained hypidiomorphic texture. The major minerals and average modal percentages are as follows: plagioclase (55-60%), orthopyroxene (25-35%), clinopyroxene (5-10%). Cumulus minerals are plagioclase and orthopyroxene, intercumulus mineral is clinopyroxene. Minor magnetite, biotite, chlorite and quartz are present interstitially. The characteristic feature of felsic norite is a low degree of alteration and elongated crystals of orthopyroxene with small alteration rims of biotite.

(C-D) Photomicrographs of magnetite gabbro (sample 885, Elm area) in parallel-polarized light and cross-polarized light. Magnetite gabbro shows a fine to medium grained allotriomorphic texture. The major minerals and average modal percentages are as follows: plagioclase (50-55%), clinopyroxene (20-25%), magnetite and ilmenite (5-10%), hornblende (5-10%). In addition, secondary minerals constitute up to 10-15%. Cumulus minerals are plagioclase, clinopyroxene, magnetite and hornblende. Secondary phases are biotite, chlorite, quartz and actinolite which replace plagioclase and clinopyroxene and occur interstitially between cumulus minerals. The characteristic features of magnetite gabbro are a high degree of sericitization of cumulus plagioclase, the disappearance of cumulus orthopyroxene as well as the appearance of cumulus clinopyroxene, hornblende and magnetite as new cumulus phases.

(E-F) Photomicrographs of apatite-magnetite gabbro (sample 779, Elm area) in parallel polarized-light and cross-polarized light. Apatite-magnetite gabbro shows a fine- to medium-grained allotriomorphic texture. The major minerals and average modal percentages are as follows: plagioclase (50-55%), clinopyroxene (20-25%), magnetite and ilmenite (5-10%), hornblende (5-10%), apatite (2-5%). In addition, secondary minerals constitute up to 10-15%. Secondary phases are biotite, chlorite, quartz and actinolite which replace cumulus plagioclase and clinopyroxene and occur interstitially between them. The characteristic features of apatite-magnetite gabbro are a high degree of alteration of plagioclase and clinopyroxene, and the appearance of apatite as a new cumulus phase.

(G-H) Photomicrographs of ilmenite-apatite-magnetite gabbro (sample 749, Elm area) in parallel polarized-light and cross-polarized light. Ilmenite-apatite-magnetite gabbro shows a fine- to medium-grained allotriomorphic texture. The major minerals and average modal percentages are as follows: plagioclase (45-50%), clinopyroxene (15-20%), hornblende (5-10%), apatite (2-5%), magnetite and ilmenite (10-15%). In addition, secondary minerals constitute up to 10-15%. Secondary phases are biotite, chlorite, quartz and actinolite which replace cumulus plagioclase and clinopyroxene and occur interstitially between them. The characteristic features of ilmenite-apatite-magnetite gabbro are a high degree of alteration of plagioclase and clinopyroxene, and the appearance of ilmenite as a new cumulus phase.

Abbreviations here and in the text: Pl – plagioclase; Cpx – clinopyroxene; Opx – orthopyroxene; Qtz – quartz, Bt-biotite, Chl – chlorite, Mgt – magnetite, Ilm – ilmenite, Hbl –hornblende, Ap – apatite.

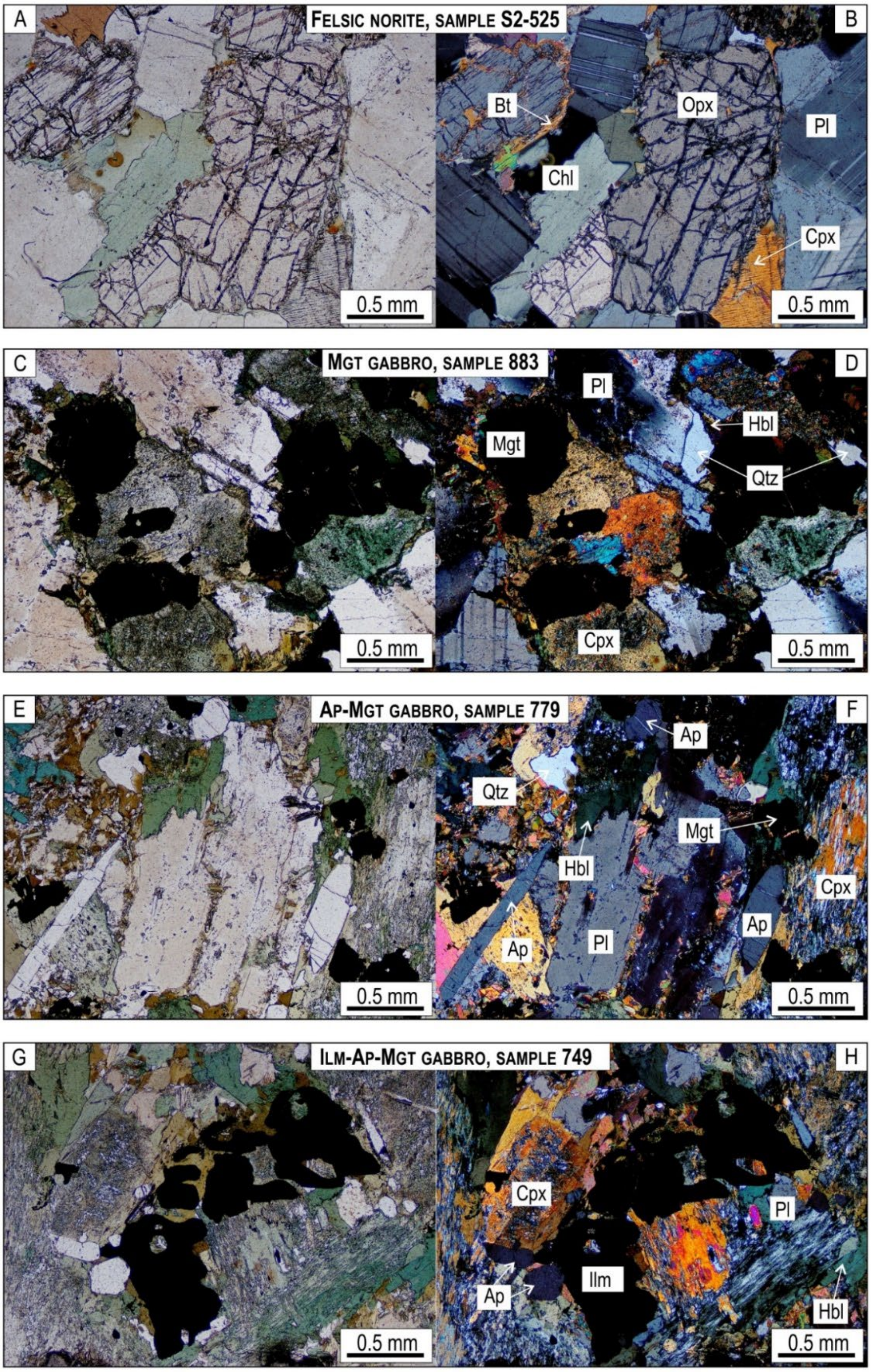

TABLE 1. Major element data and CIPW norms for rocks and An-content in plagioclase from the Elm Street area, South Range (Sudbury Igneous Complex, Canada). *Provided as a separate Excel file*.

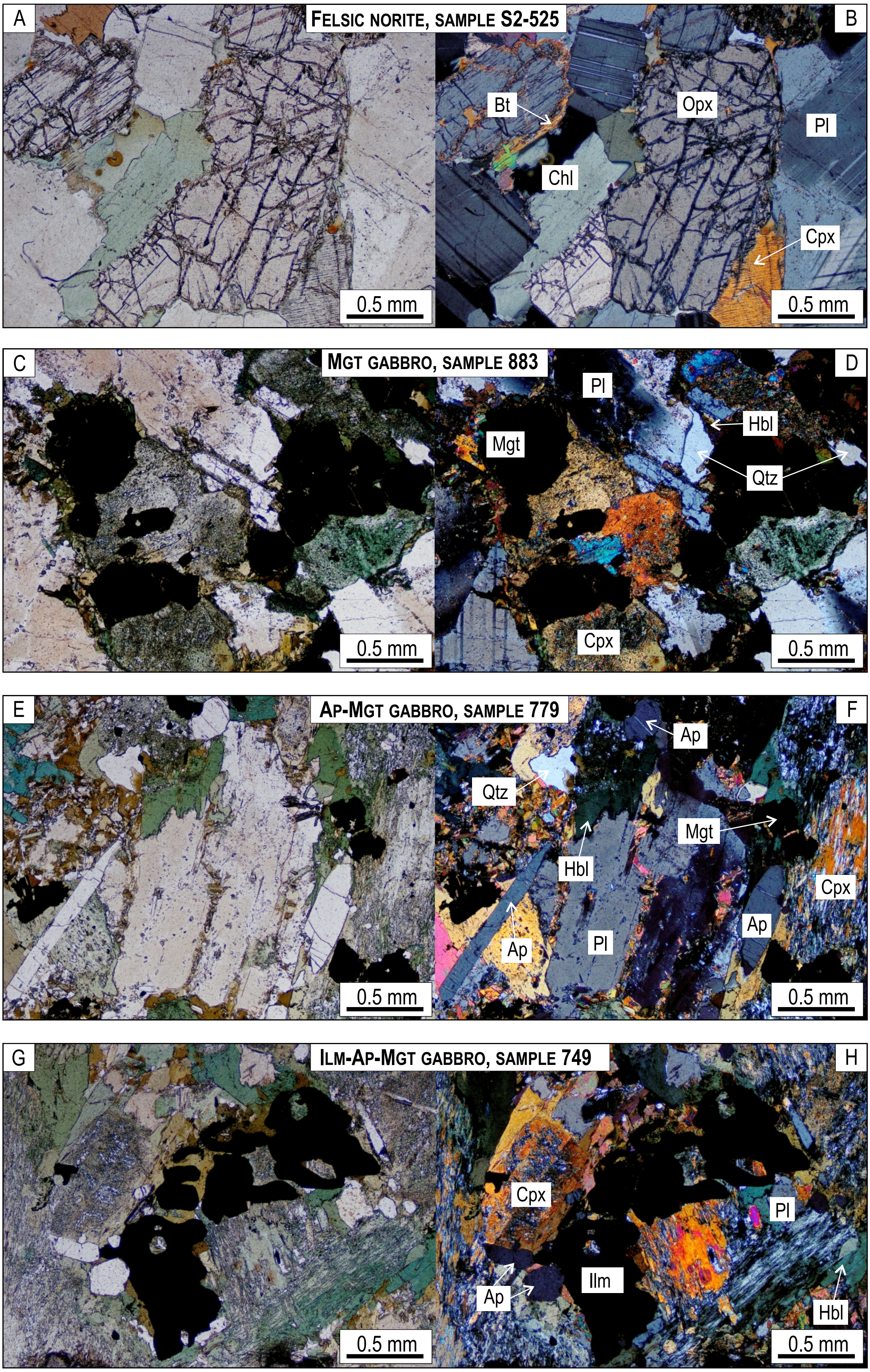
A
Felsic norite, sample S2-525
B
Bt
Opx
Pl
Chl
Cpx
0.5 mm
0.5 mm
C
Mgt gabbro, sample 883
D
Pl
Hbl
Mgt
Qtz
Cpx
0.5 mm
0.5 mm
E
Ap-Mgt gabbro, sample 779
F
Ap
Qtz
Mgt
Hbl
Cpx
Ap
Pl
Ap
0.5 mm
0.5 mm
G
Ilm-Ap-Mgt gabbro, sample 749
H
Cpx
Pl
Ap
Ilm
Hbl
0.5 mm
0.5 mm

Fig. S1