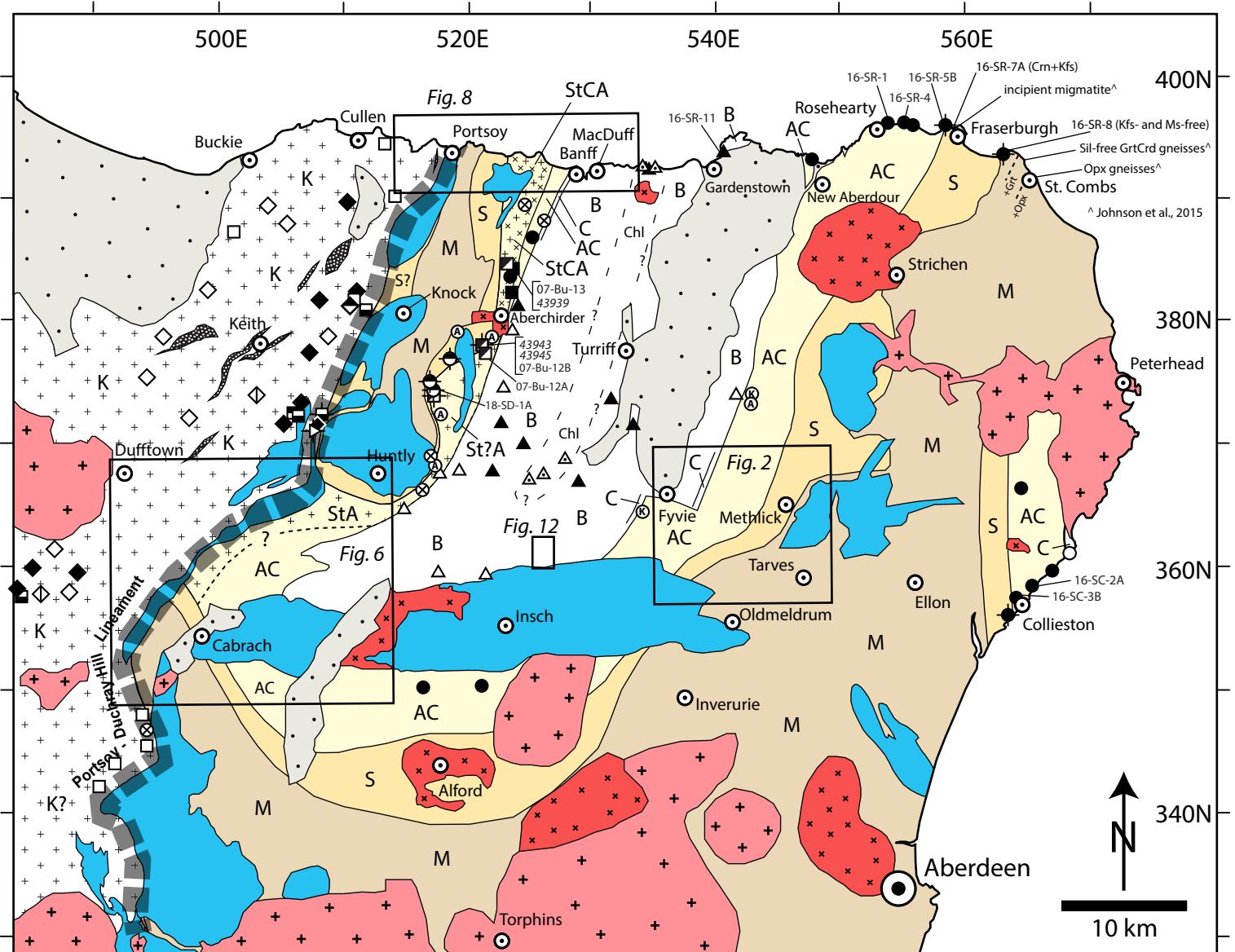


Fig. S1



Metamorphic zones in Buchan domain

<b>Chl</b>	Chlorite	<b>B</b>	Biotite	<b>C</b>	Cordierite	<b>AC</b>	Andalusite-cordierite
<b>StA</b>	Staurolite-andalusite	<b>StCA</b>	Staurolite-cordierite-andalusite	<b>S</b>	Sillimanite	<b>M</b>	Gneiss/migmatite

Non-metamorphic rock types

•	Devonian strata
+	Younger Granites
×	Granites
■	Mafic/ultramafic intrusions
▨	Older Granites

Barrovian domain: **K** Kyanite-staurolite domain

Mineral assemblages in Barrovian domain  
(all + Ms Pl Qtz)

- ◆ Ky St Bt
- ◆ Ky St Bt Grt
- ◆ Ky St Bt Grt (And Sil)
- ◆ Ky St Bt Grt (And)
- ◆ Ky Bt (And)
- ◇ Ky\*
- St Bt
- St Bt Grt
- St\*
- Grt St Sil Bt
- ◇ Grt Sil Bt
- △ Slate/phyllite\*\*
- Ⓐ knotted slate/phyllite\*\*
- Ⓐ nodular And-bearing schist\*\*
- Chl
- ▲ Chl Bt
- Crd Bt
- Crd And Bt
- ⊗ And\*
- And Bt ±Grt
- ▢ St And Bt ±Grt
- St Crd And Bt ±Grt
- ▢ And+Sil\*
- Crd And Sil Bt
- And Sil Bt ±Grt
- Sil St And Bt ±Grt
- Sil St Crd And Bt ±Grt

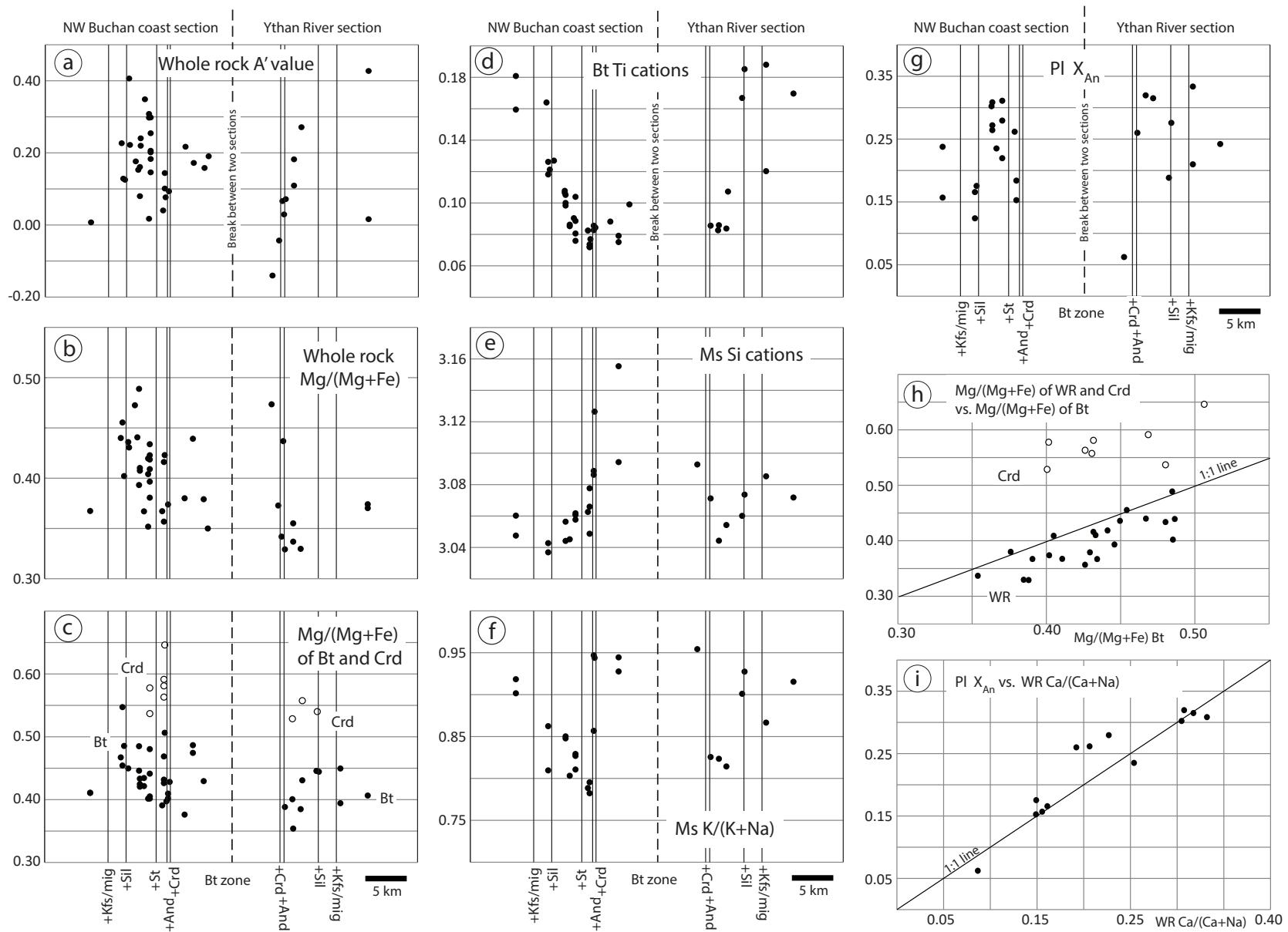
Mineral assemblages in Buchan domain (all + Ms Pl Qtz)

16-SR-4 sample numbers from this study  
43939 sample numbers in italics from Hudson (1975; 1980)

\* index mineral occurrences from the literature (full mineral assemblages not reported)

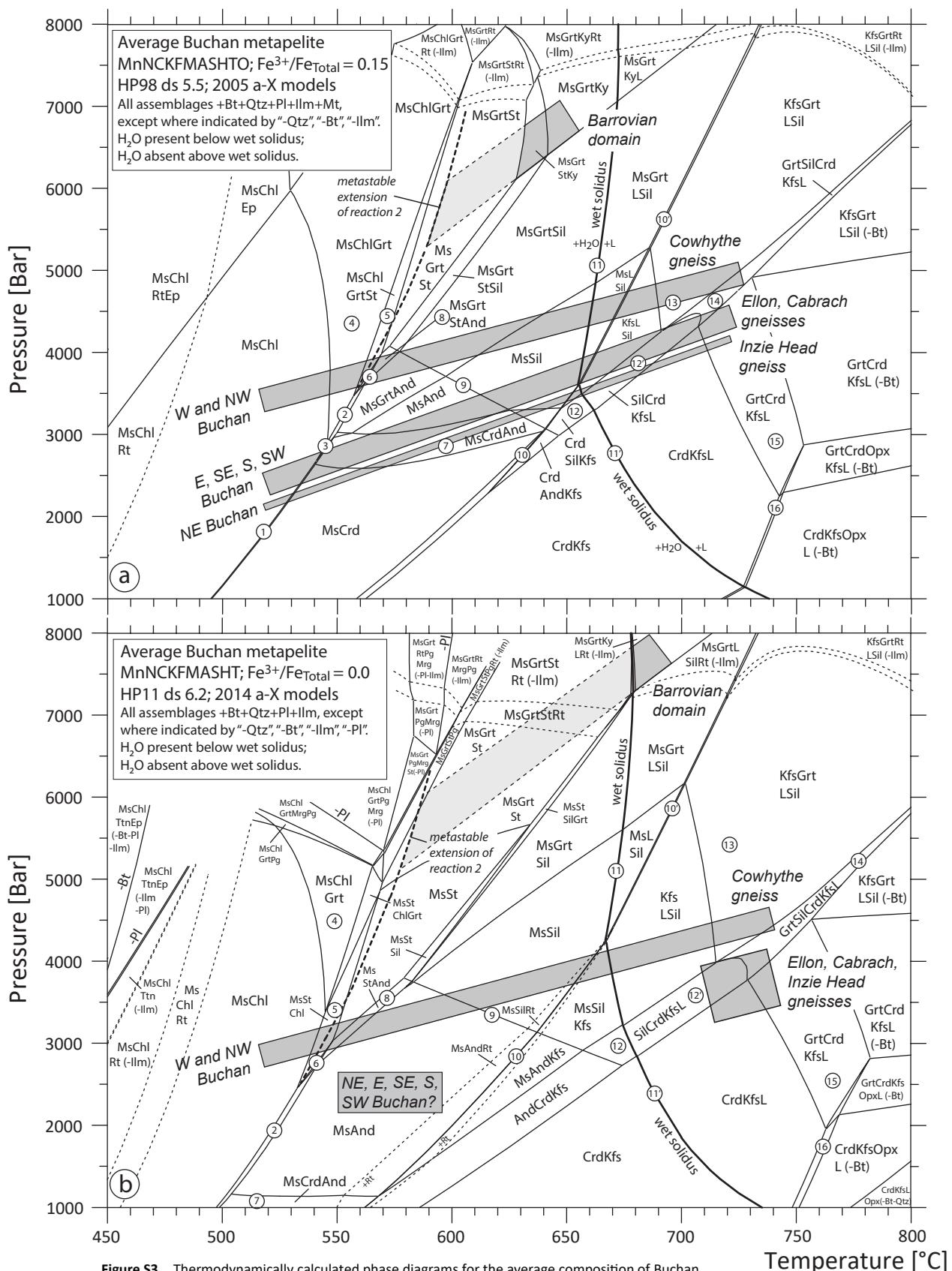
\*\* field-based rock descriptions from Read (1923), Fettes et al. (1991) and Gunn et al. (2015)

Fig. S2



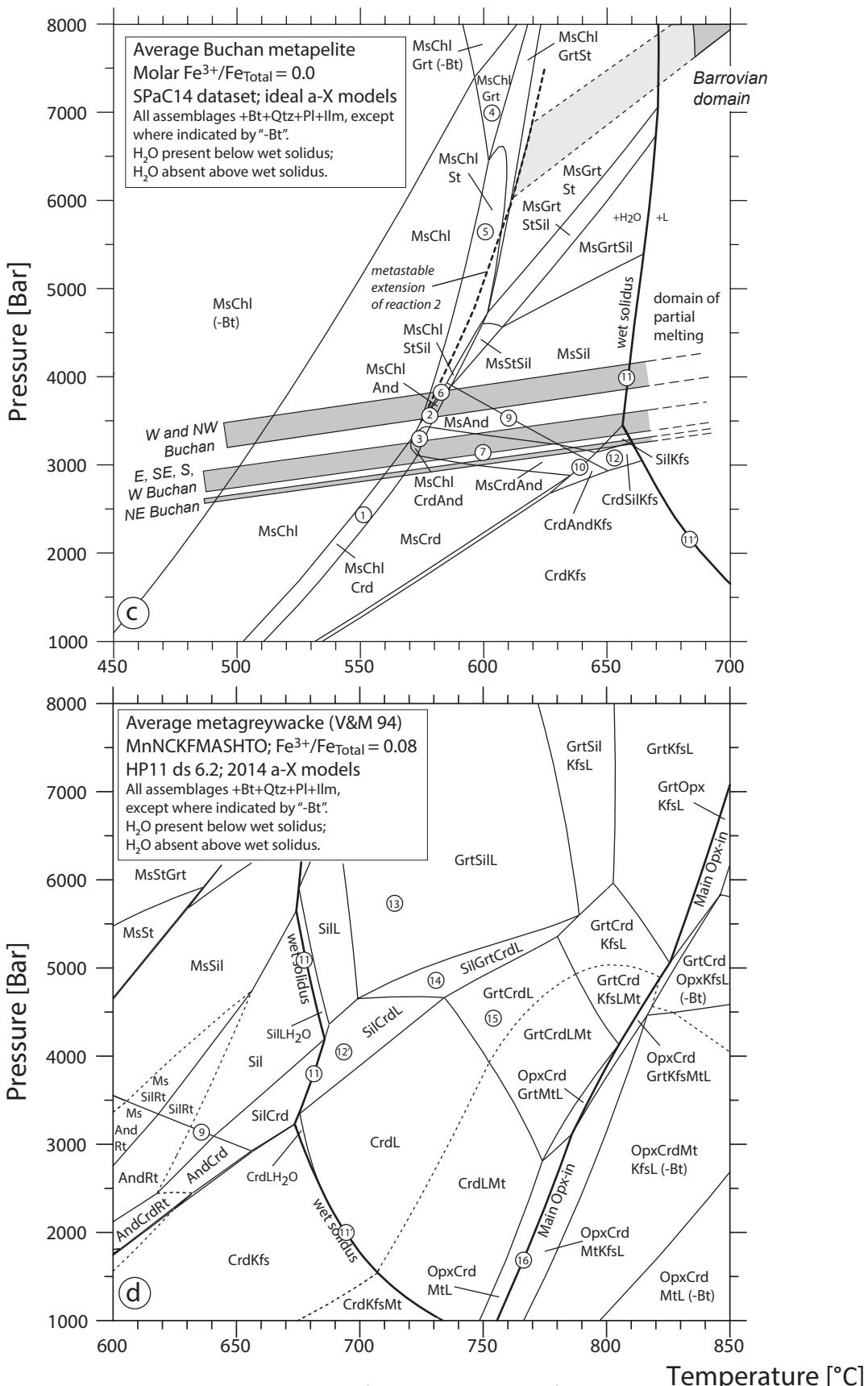
**Fig. S2.** Plots of whole rock and mineral chemical parameters as a function of distance/grade across the Buchan block. The graphs portray data from the two most intensively-sampled transects: the Ythan River transect (Fyvie-Methlick-Tarves area) of the central SE Buchan sequence (Figs. 1b and 2); and the NW Buchan coastal sequence (Figs. 1b and Fig. 8). The two transects increase in grade outwards in opposite directions (east and west) from the central low-grade Bt±Chl domain (see Fig. 1b). Raw data in Supplementary Tables S2 to S11.

Fig. S3a and S3b



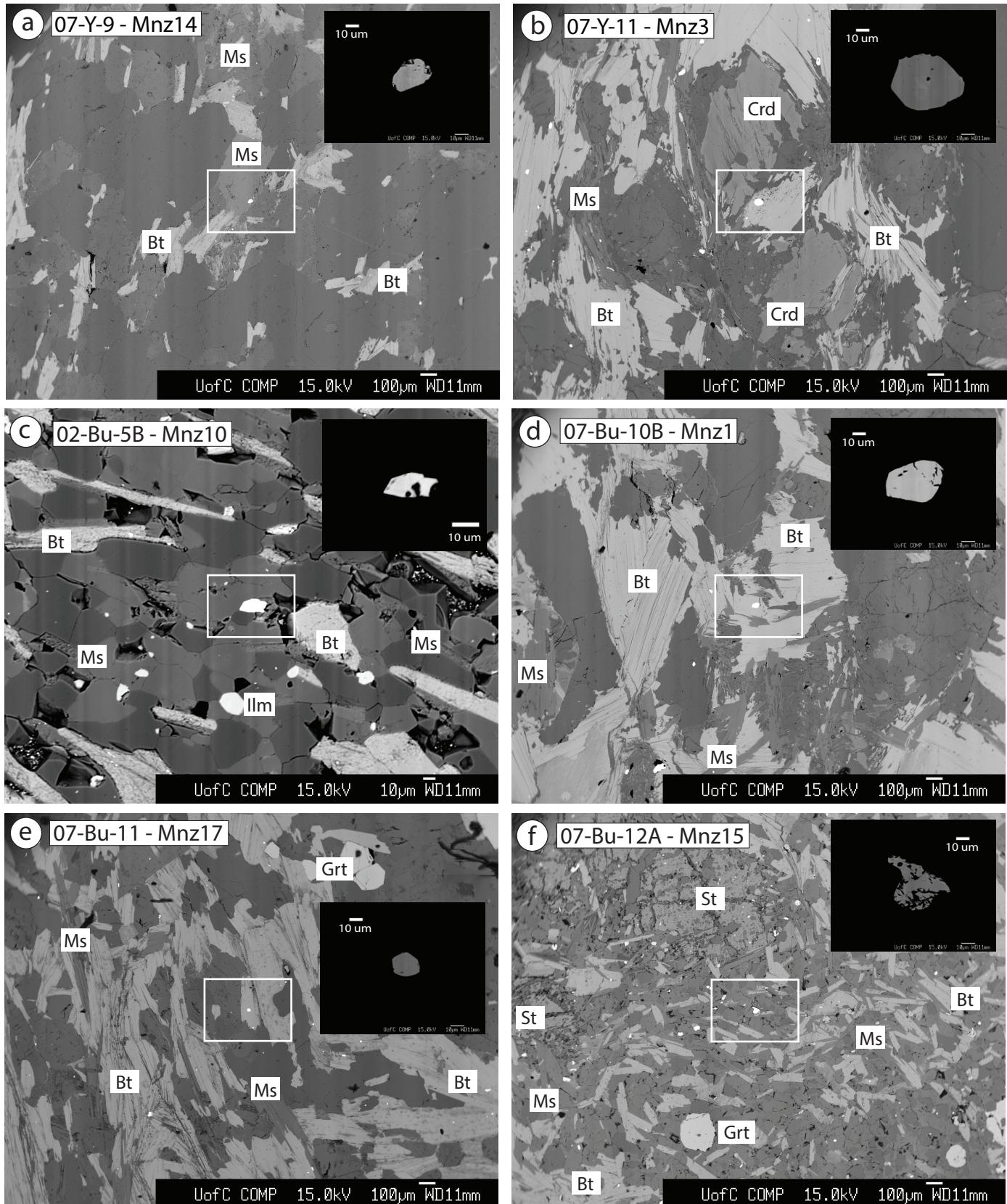
**Figure S3.** Thermodynamically calculated phase diagrams for the average composition of Buchan pelites of this study, except for (d) which is for an average metagreywacke composition. The compositions are listed in Table S4. The method of calculation of the phase diagrams is provided in Supplementary Document S2. Numbered reactions are listed in the text. Mineral abbreviations from Kretz (1983). Metamorphic field gradients are drawn on the diagrams to satisfy the order of inferred reactions in the text. See text for explanation of the pale-coloured P-T box for the Barrovian domain. **(a)** Phase diagram calculated using thermodynamic dataset and a-X models "HP5.5", using the measured whole rock value of  $X_{\text{Fe}^{3+}} = 0.15$  (see text for explanation and discussion). The complementary phase diagram calculated assuming all Fe as  $\text{Fe}^{2+}$  is provided in Fig 16a. **(b)** Phase diagram calculated using thermodynamic dataset and a-X models "HP6.2", assuming all Fe as  $\text{Fe}^{2+}$  (see text for explanation and discussion). The complementary phase diagram calculated for the measured whole rock value of  $X_{\text{Fe}^{3+}} = 0.15$  is provided in Fig. 16b.

Fig. S3c and S3d



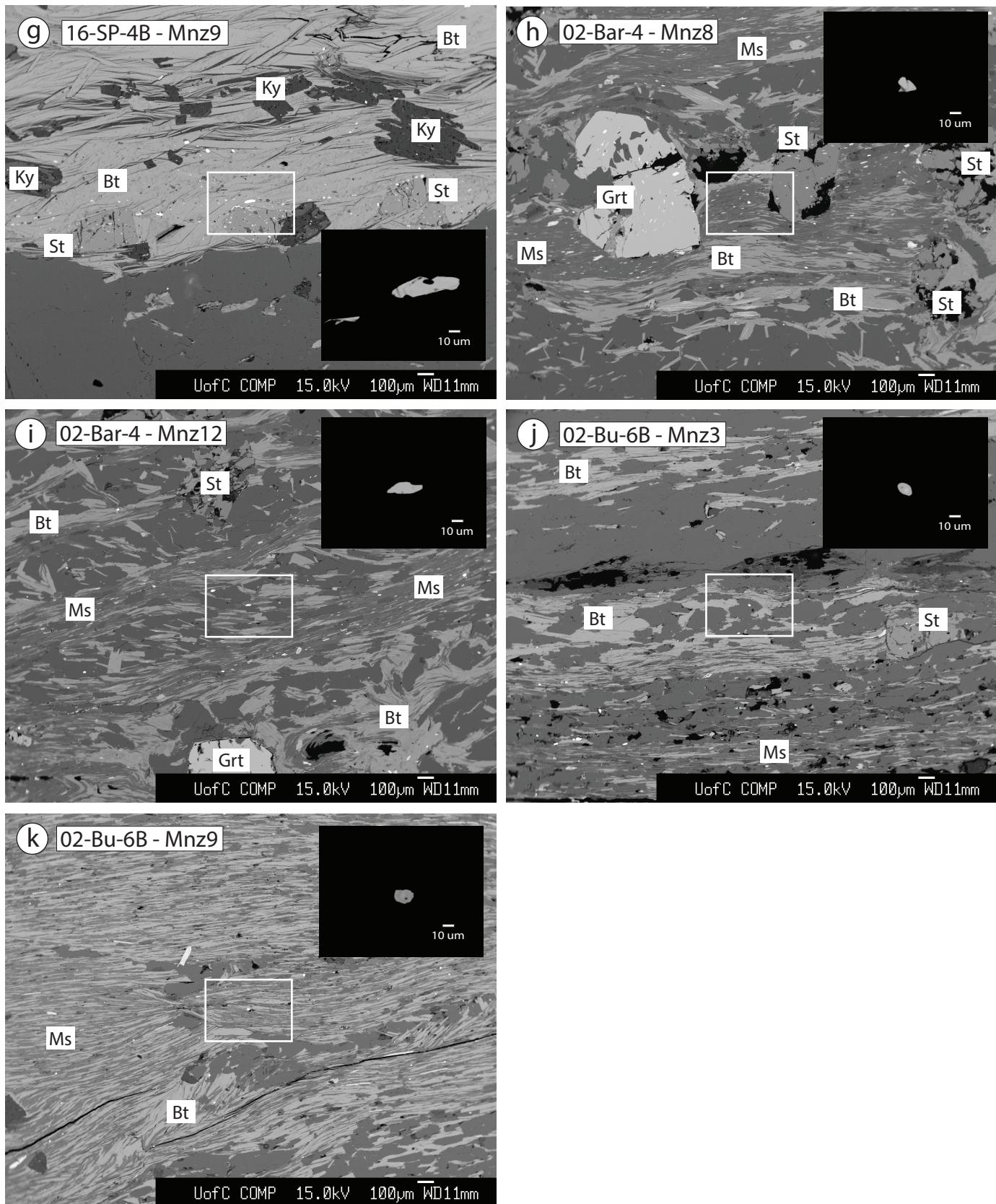
**Figure S3.** Thermodynamically calculated phase diagrams for the average composition of Buchan pelites of this study, except for (d) which is for an average metagreywacke composition. The compositions are listed in Table S4. The method of calculation of the phase diagrams is provided in Supplementary Document S2. Numbered reactions are listed in the text. Mineral abbreviations from Kretz (1983). Metamorphic field gradients are drawn on the diagrams to satisfy the order of inferred reactions in the text. See text for explanation of the pale-coloured P-T box for the Barrovian domain. (c) Subsolidus phase diagram calculated using thermodynamic dataset and a-X models "SPA14", assuming all Fe as  $\text{Fe}^{2+}$  (see text for explanation and discussion). (d) Phase diagram for the average metagreywacke composition of Vielzeuf & Montel (1994), calculated using thermodynamic dataset and a-X models "HP6.2" and the measured whole rock value of  $X_{\text{Fe}^{3+}} = 0.08$ .

Fig. S4a to f. Representative back-scattered electron images of textural setting of monazite in rocks from the Buchan domain



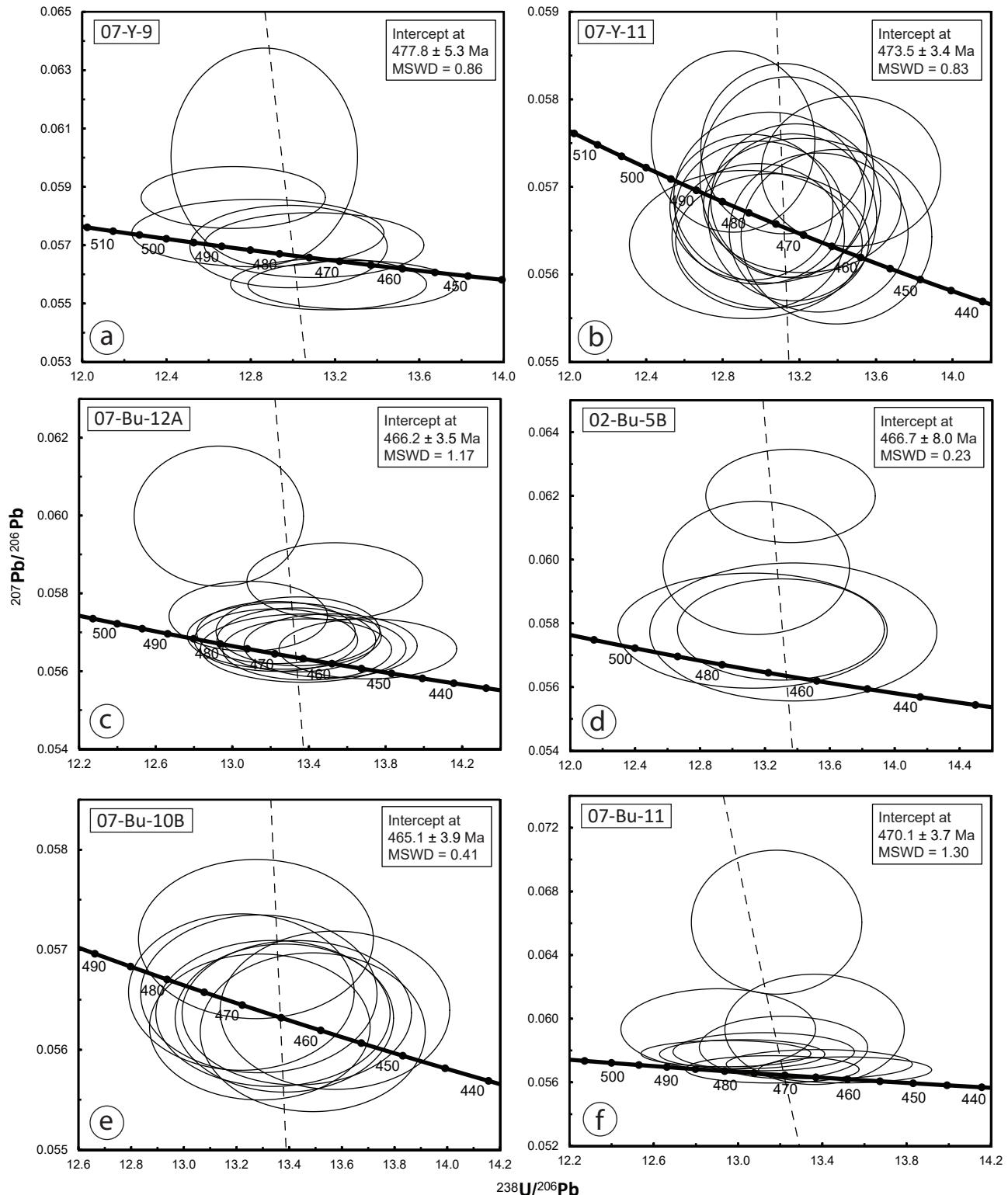
**Figure S4.** Back-scattered electron (BSE) images of the textural setting of monazite grains from the nine samples chosen for monazite U-Pb geochronology (isotopic results and interpreted ages provided in Table S13). “Mnz14” etc. refers to the grain number in Table S13. In addition to the minerals labelled, all rocks contain quartz and plagioclase (darker grey colours in the BSE images). Mineral abbreviations from Kretz (1983). Images S4a to f are for the six samples from the Buchan domain; images S4g to k are for the three coastal samples from the Barrovian domain west of Portsoy.

Fig. S4g to k. Representative back-scattered electron images of textural setting of monazite in Barrovian rocks of the northwest Buchan coastal section



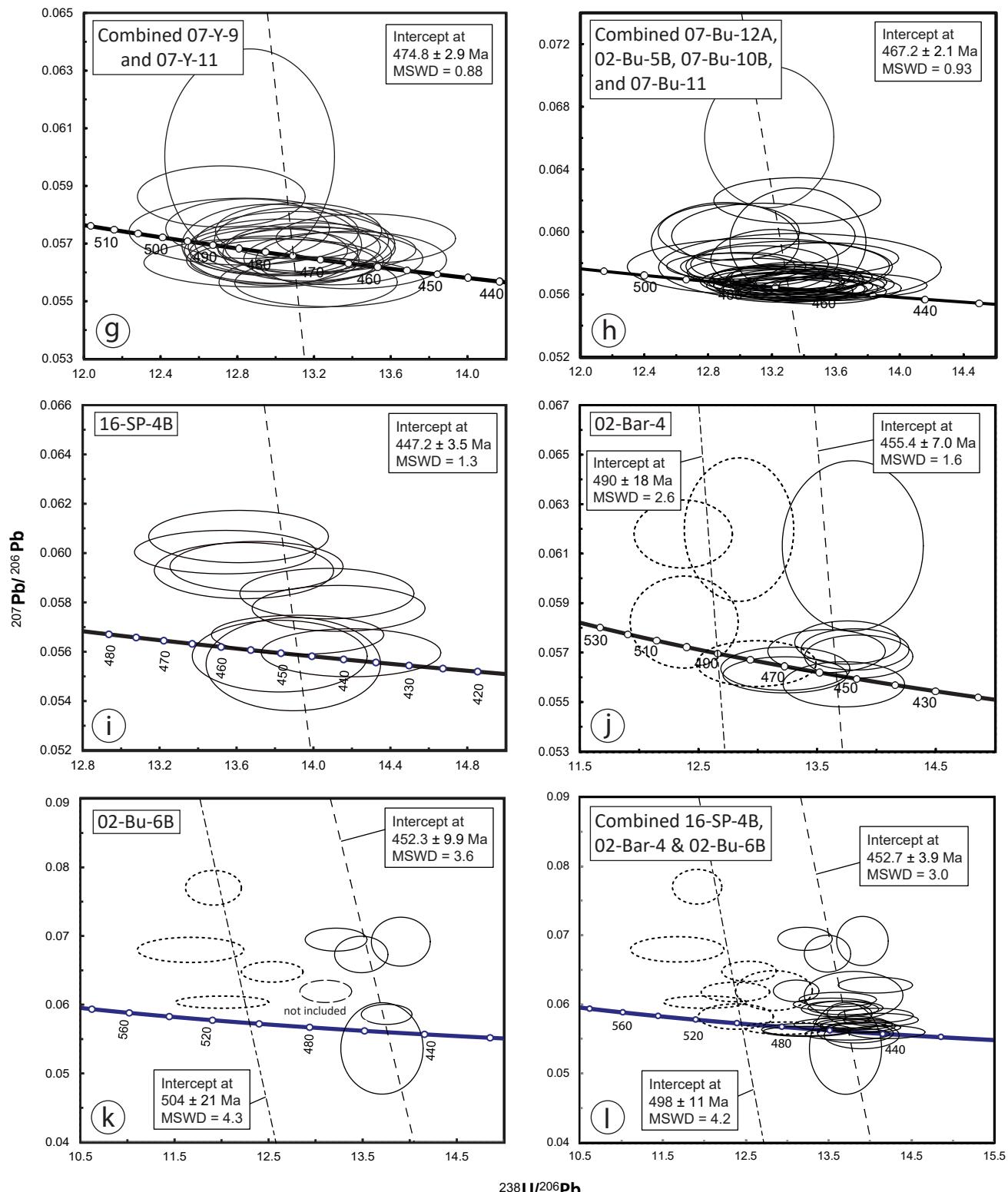
**Figure S4.** Back-scattered electron (BSE) images of the textural setting of monazite grains from the nine samples chosen for monazite U-Pb geochronology (isotopic results and interpreted ages provided in Table S13). “Mnz14” etc. refers to the grain number in Table S13. In addition to the minerals labelled, all rocks contain quartz and plagioclase (darker grey colours in the BSE images). Mineral abbreviations from Kretz (1983). Images S4a to f are for the six samples from the Buchan domain; images S4g to k are for the three coastal samples from the Barrovian domain west of Portsoy.

Fig. S5a to f. Monazite U-Pb results for samples from the Buchan domain plotted on Tera-Wasserberg concordia diagrams



**Figure S5.** Results of monazite U-Pb geochronology plotted on Tera-Wasserburg U-Pb concordia diagrams (Tera & Wasserburg, 1972; Ludwig, 2003). Raw data for these plots are presented in Table S13, and analytical methods are provided in Supplementary Document S1. The samples are located in Figs. 1b, 2 and 4. Concordia intercept ages are anchored to an assumed common Pb value of  $0.835 \pm 0.06$ . Uncertainty ellipses are 2-sigma. MSWD – Mean Square of Weighted Deviates. Figures S5a to f are for the six samples analysed from the Buchan domain.

Fig. S5g to l. Monazite U-Pb results for combined samples from the Buchan domain, and for coastal samples from the Barrovian domain west of Portsoy, plotted on Tera-Wasserberg concordia diagrams



**Figure S5.** Results of monazite U-Pb geochronology plotted on Tera-Wasserburg U-Pb concordia diagrams (Tera & Wasserburg, 1972; Ludwig, 2003). Raw data for these plots are presented in Table S13, and analytical methods are provided in Supplementary Document S1. The samples are located in Figs. 1b, 2 and 4. Concordia intercept ages are anchored to an assumed common Pb value of  $0.835 \pm 0.06$ . Uncertainty ellipses are 2-sigma. MSWD – Mean Square of Weighted Deviates. Figure S5g combines the results for the two samples of the Ellon gneiss from the SE Buchan domain (07-Y-9 and 07-Y-11); Figure S5h combines the results from the four samples from the northwest Buchan coastal sequence (02-Bu-5B, 07-Bu-10B, 07-Bu-11 and 07-Bu-12A); Figures S5i to k are for the three samples analysed from the Barrovian domain west of Portsoy; and Figure S5l combines the results from the three samples from the Barrovian domain west of Portsoy.