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SUPPLEMENTARY ONLINE MATERIAL FOR

Terreneuvian stratigraphy and faunas from the Anabar Uplift, Siberia

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Supplementary Online Material

SOM 1. Occurrence of taxa in samples

available at http://app.pan.pl/SOM/app62-Kouchinsky_etal_SOM/SOM_1.xlsx

SOM 2. Bioturbated lime mudstone from Member 3 (Kaufman et al. 1996) of the Nemakit-Daldyn Formation in section 2 herein, representing the earliest evidence of up to 20-cm deep bioturbation in the lower Fortunian deposits on the Siberian Platform, *Anabarites trisulcatus* Zone.

SOM 3. Results of the energy-dispersive X-ray analyses of *Blastulospongia* sp. (**a**) and *Platysolenites antiquissimus* (**b**) from sample 1/22.5, Medvezhya Formation, section 1.

SOM 4. Results of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ analyses from sections 1 and 3.

available at http://app.pan.pl/SOM/app62-Kouchinsky_etal_SOM/SOM_4.xlsx

SOM 5. Photographs of the sections discussed in the text.

References

SOM 2. Bioturbated lime mudstone from Member 3 (Kaufman et al. 1996) of the Nemakit-Daldyn Formation in section 2 herein, representing the earliest evidence of up to 20-cm deep bioturbation in the lower Fortunian deposits on the Siberian Platform, *Anabarites trisulcatus* Zone.

SOM 2 Figures 1–3. Vertical sections through the bioturbated mudstones.

SOM 2 Figure 1.



SOM 2 Figure 2.



SOM 2 Figure 3.

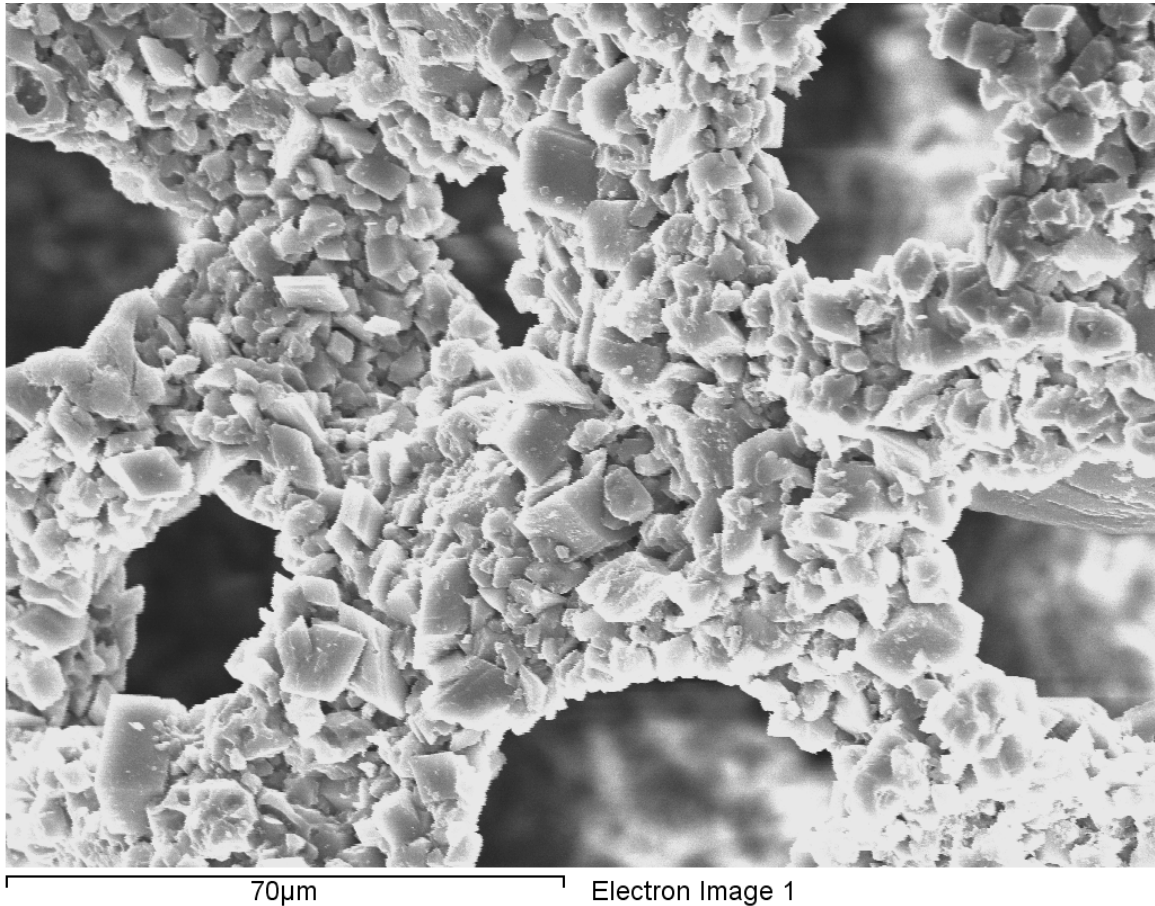


SOM 2 Figure 4. Upper bedding plane showing cross-sections of vertical canals.



Blastulospongia

5/25/2016 12:24:08 PM



Spectrum processing : Peaks possibly omitted : 8.010, 8.070 keV

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

P GaP 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

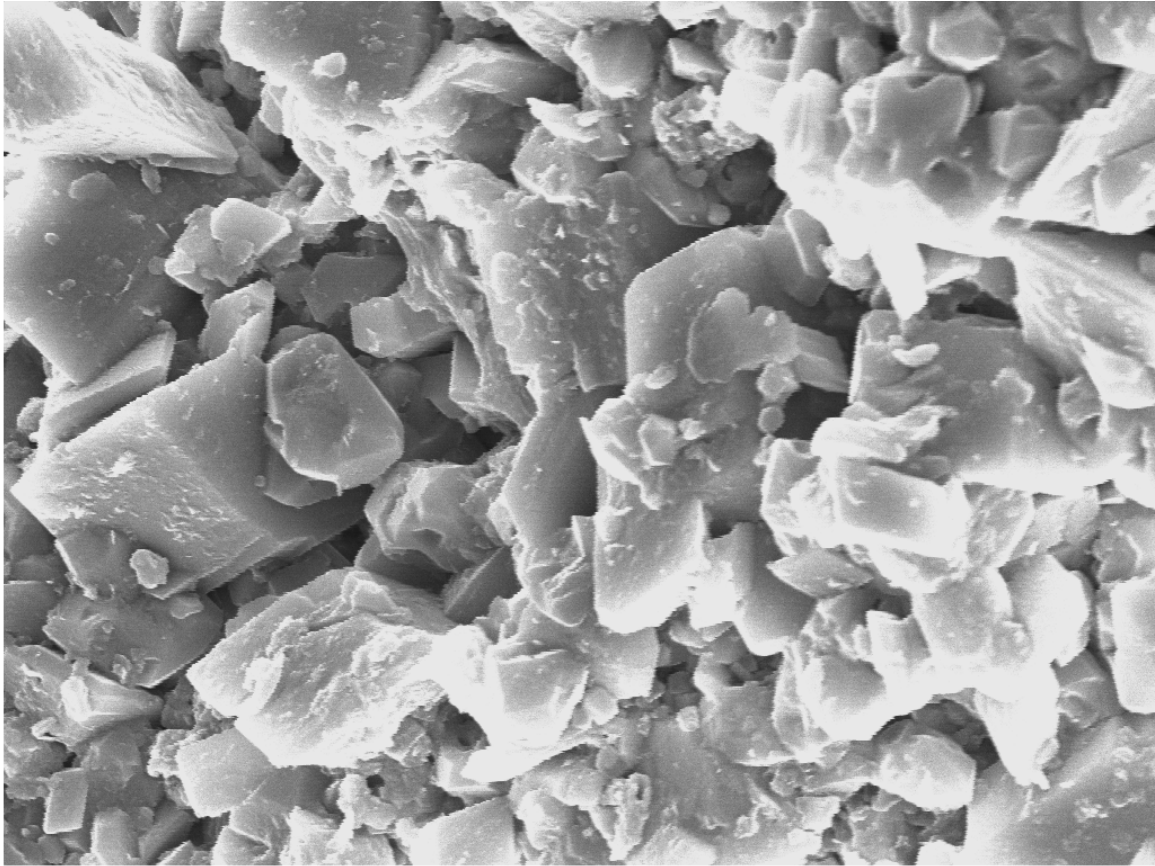
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 57.33 | 71.17 |
| Mg K | 0.19 | 0.15 |
| Al K | 4.98 | 3.67 |
| Si K | 30.26 | 21.40 |
| P K | 0.06 | 0.04 |
| K K | 6.48 | 3.29 |
| Ca K | 0.20 | 0.10 |
| Fe K | 0.49 | 0.18 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.33 | 0.40 |
| Al K | 9.64 | 10.63 |
| Si K | 69.33 | 73.47 |
| P K | 0.22 | 0.21 |
| K K | 18.60 | 14.16 |
| Ca K | 0.60 | 0.45 |
| Fe K | 1.28 | 0.68 |
| Totals | 100.00 | |



20µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

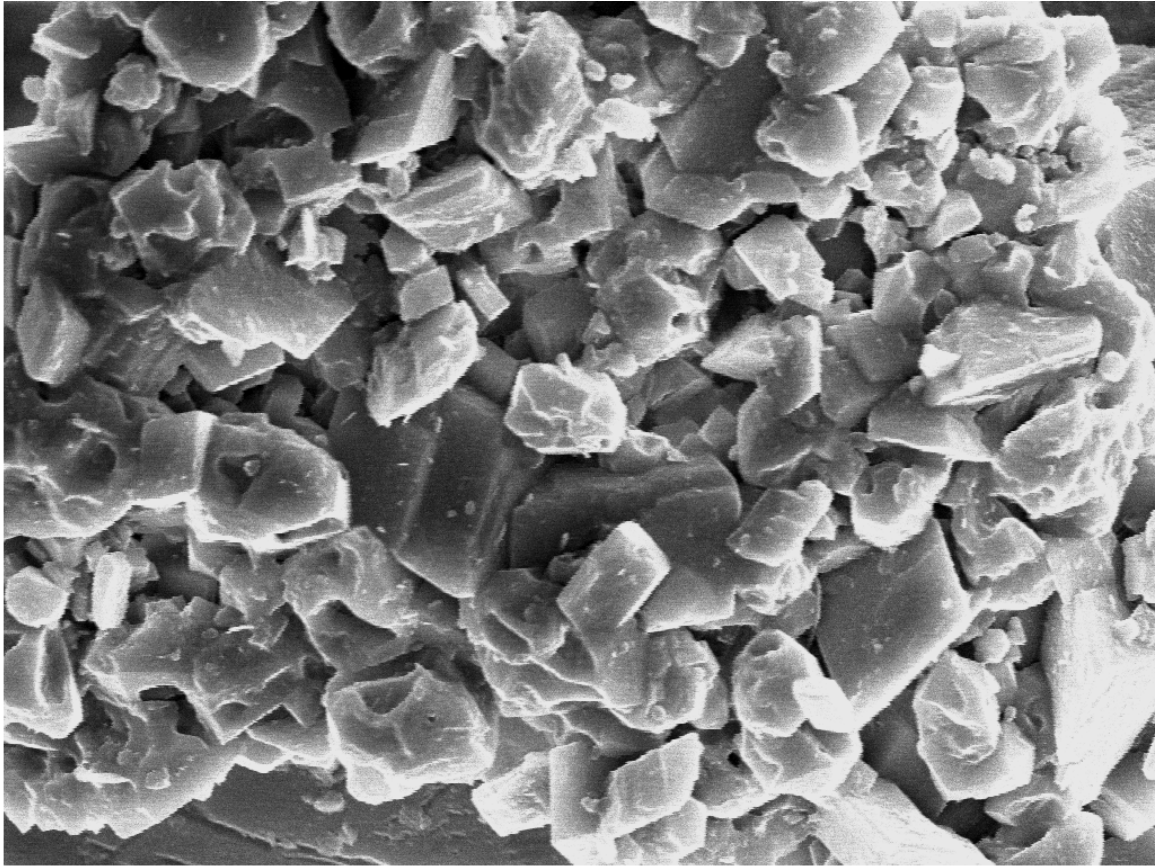
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 57.38 | 71.33 |
| Mg K | 0.10 | 0.08 |
| Al K | 5.31 | 3.92 |
| Si K | 29.32 | 20.76 |
| K K | 7.18 | 3.65 |
| Ca K | 0.00 | 0.00 |
| Fe K | 0.71 | 0.25 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.17 | 0.21 |
| Al K | 10.28 | 11.41 |
| Si K | 67.29 | 71.75 |
| K K | 20.41 | 15.63 |
| Ca K | 0.01 | 0.01 |
| Fe K | 1.83 | 0.98 |
| Totals | 100.00 | |



30µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

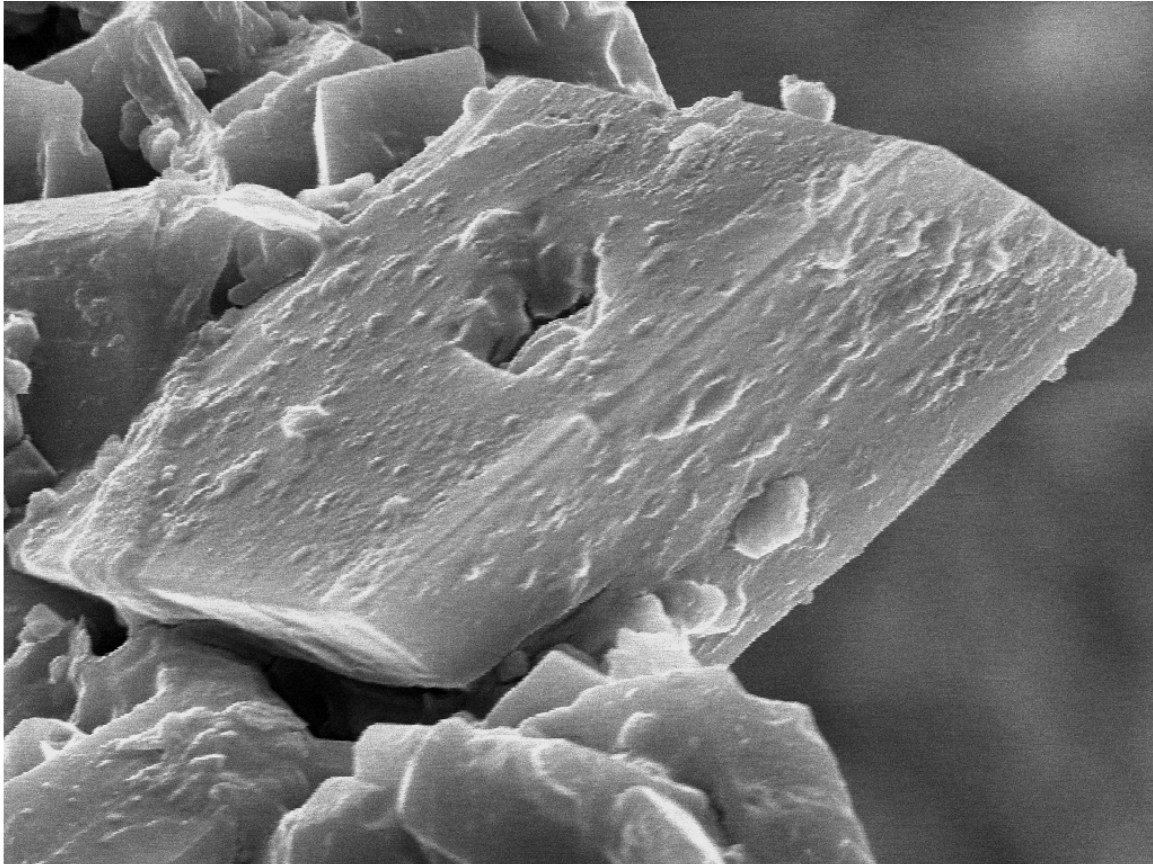
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 56.61 | 70.48 |
| Mg K | 0.31 | 0.26 |
| Al K | 3.96 | 2.92 |
| Si K | 32.49 | 23.04 |
| K K | 4.92 | 2.51 |
| Ca K | 1.31 | 0.65 |
| Fe K | 0.40 | 0.14 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.55 | 0.67 |
| Al K | 7.60 | 8.35 |
| Si K | 72.96 | 76.98 |
| K K | 14.06 | 10.65 |
| Ca K | 3.78 | 2.80 |
| Fe K | 1.05 | 0.56 |
| Totals | 100.00 | |



10µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

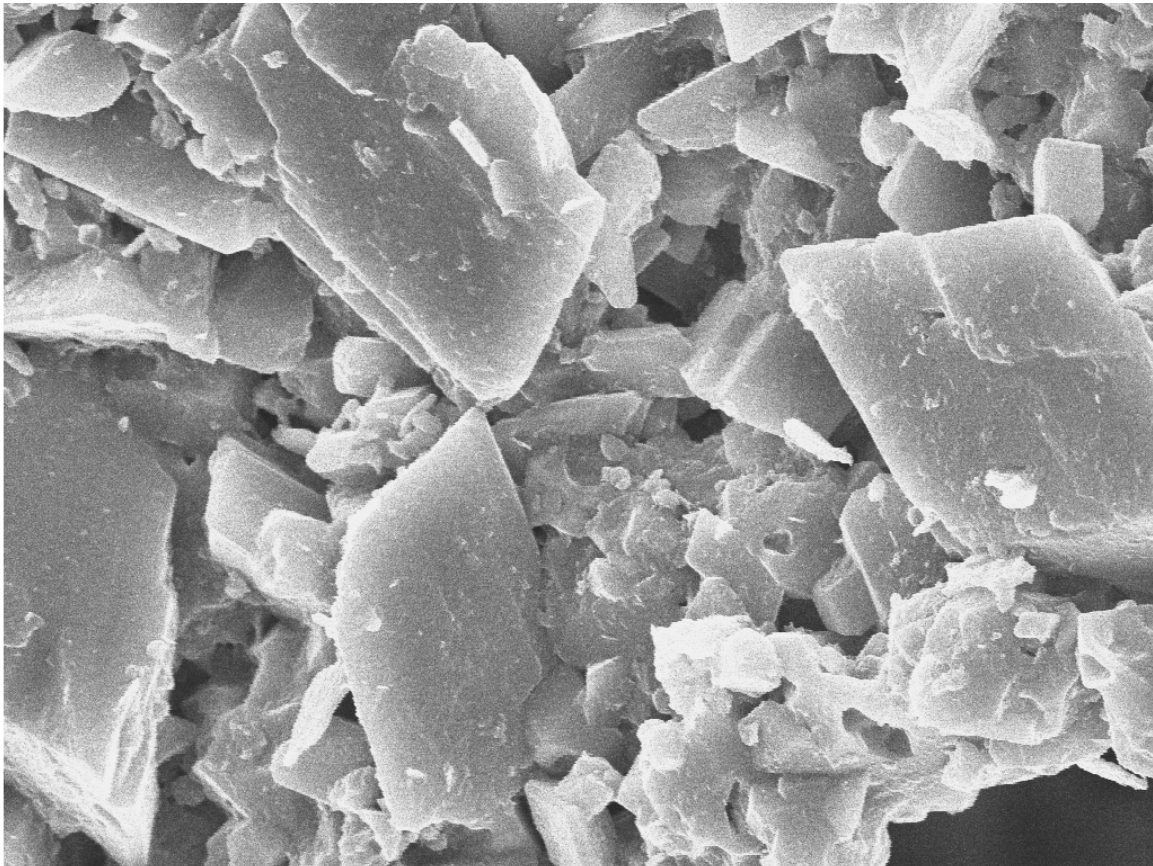
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 60.71 | 74.05 |
| Mg K | 0.36 | 0.29 |
| Al K | 5.30 | 3.84 |
| Si K | 26.26 | 18.25 |
| K K | 6.20 | 3.09 |
| Ca K | 0.62 | 0.30 |
| Fe K | 0.55 | 0.19 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.67 | 0.83 |
| Al K | 11.03 | 12.24 |
| Si K | 65.60 | 69.94 |
| K K | 19.19 | 14.69 |
| Ca K | 1.98 | 1.48 |
| Fe K | 1.54 | 0.83 |
| Totals | 100.00 | |



20µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 4

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

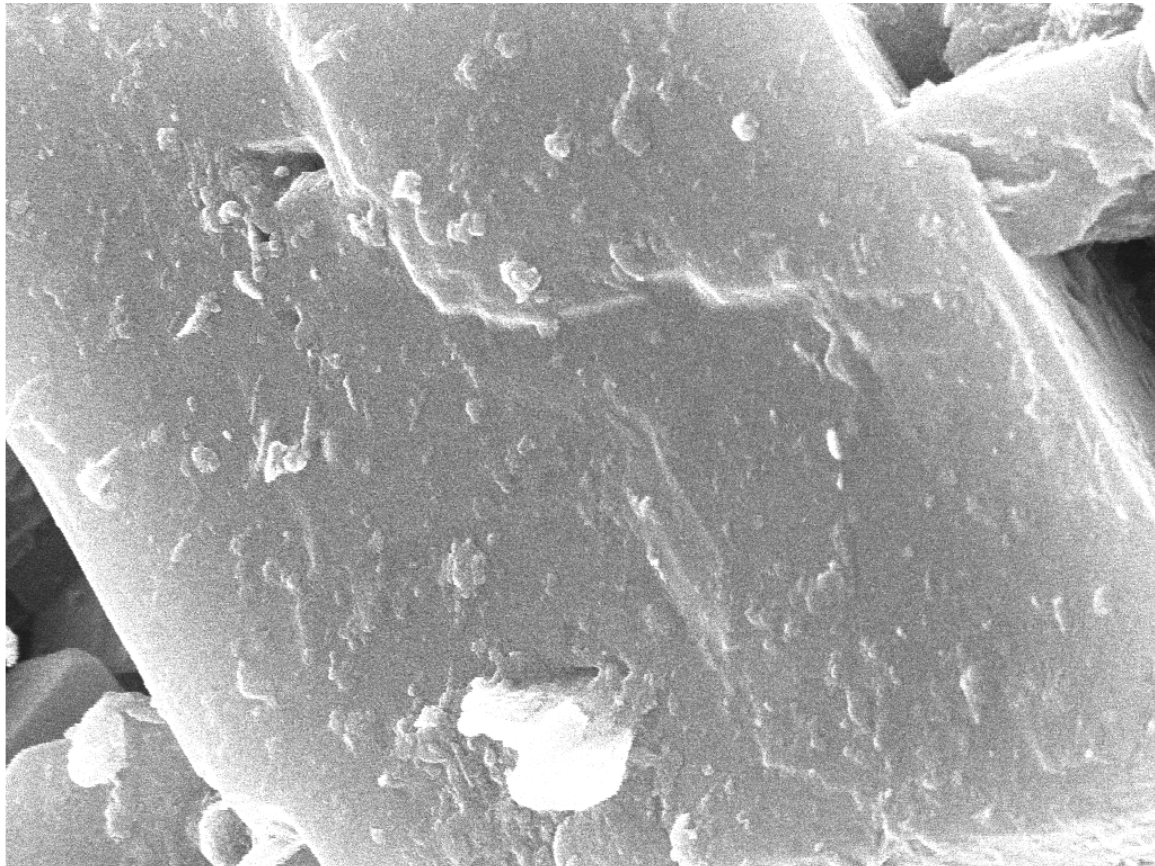
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 52.92 | 67.40 |
| Mg K | 0.12 | 0.10 |
| Al K | 6.30 | 4.76 |
| Si K | 31.86 | 23.11 |
| K K | 8.92 | 4.65 |
| Ca K | 0.18 | 0.09 |
| Fe K | -0.31 | -0.11 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.19 | 0.24 |
| Al K | 11.14 | 12.29 |
| Si K | 66.33 | 70.31 |
| K K | 22.57 | 17.19 |
| Ca K | 0.48 | 0.36 |
| Fe K | -0.71 | -0.38 |
| Totals | 100.00 | |



6 μ m

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 4

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 46.06 | 61.42 |
| Mg K | 0.04 | 0.04 |
| Al K | 8.81 | 6.96 |
| Si K | 32.56 | 24.73 |
| K K | 12.75 | 6.95 |
| Ca K | -0.13 | -0.07 |
| Fe K | -0.09 | -0.03 |
| Totals | 100.00 | |

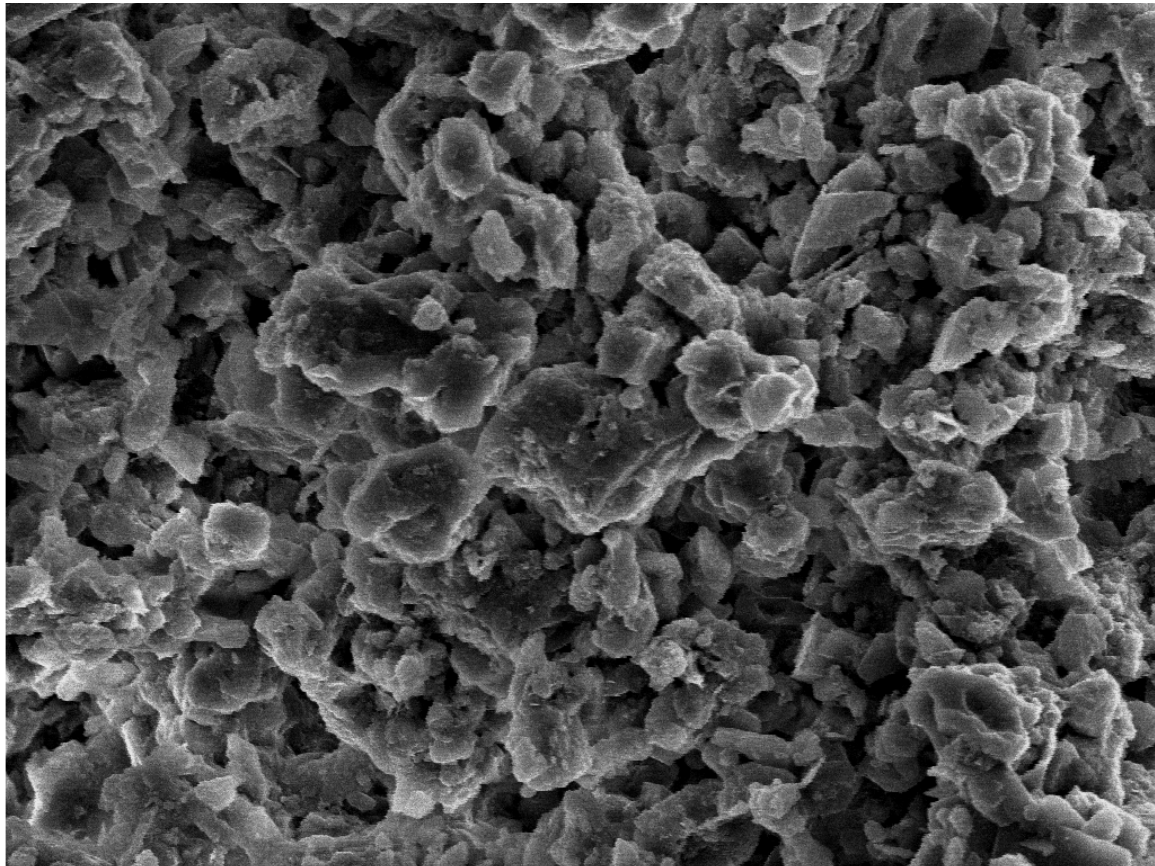
O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.06 | 0.08 |
| Al K | 13.86 | 15.49 |
| Si K | 59.59 | 63.97 |
| K K | 26.95 | 20.78 |
| Ca K | -0.29 | -0.22 |
| Fe K | -0.18 | -0.10 |
| Totals | 100.00 | |

SOM 3b. Results of the energy-dispersive X-ray analyses of *Platysolenites antiquissimus* from sample 1/22.5, Medvezhya Formation, section 1.

Platysolenites

5/25/2016 1:15:45 PM



50µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

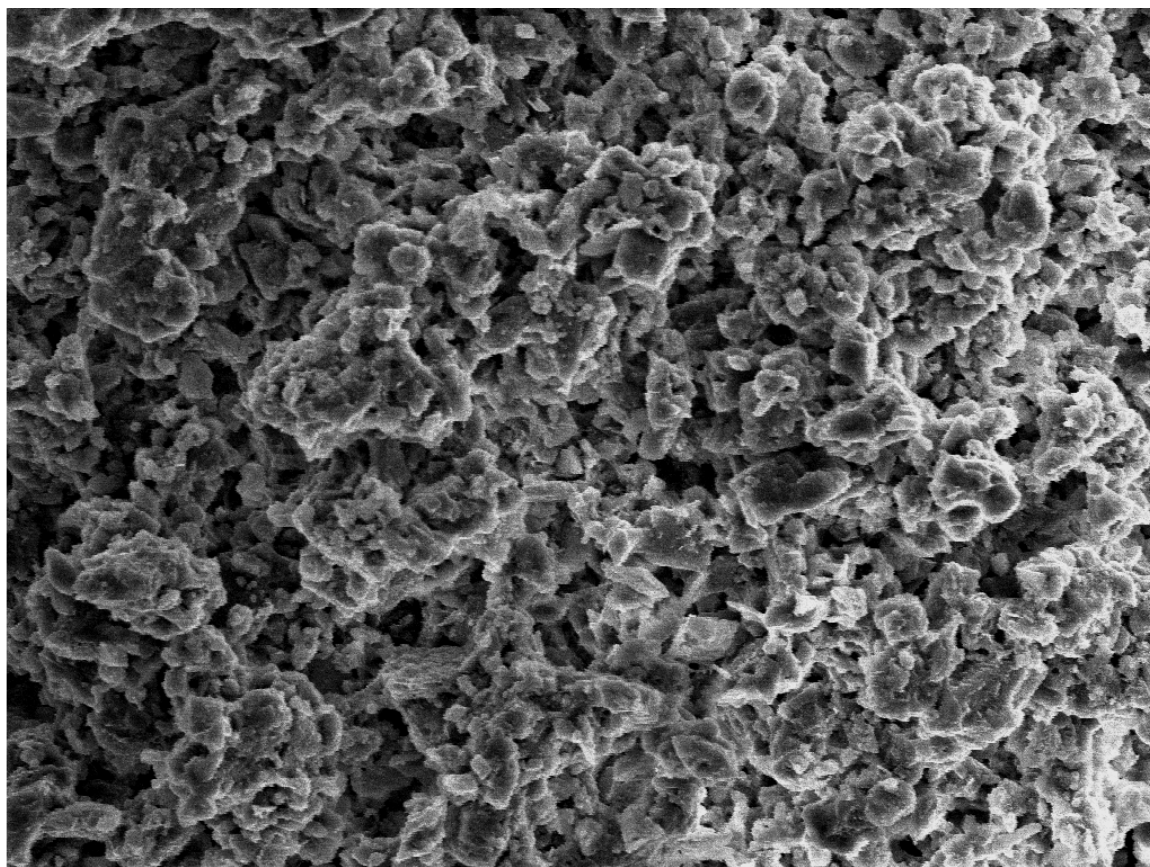
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 57.64 | 72.33 |
| Mg K | 1.21 | 1.00 |
| Al K | 3.15 | 2.34 |
| Si K | 27.11 | 19.37 |
| K K | 3.66 | 1.88 |
| Ca K | 3.39 | 1.70 |
| Fe K | 3.85 | 1.38 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 2.32 | 2.96 |
| Al K | 6.50 | 7.50 |
| Si K | 62.38 | 69.09 |
| K K | 9.97 | 7.93 |
| Ca K | 9.27 | 7.19 |
| Fe K | 9.56 | 5.33 |
| Totals | 100.00 | |



100µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 4

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

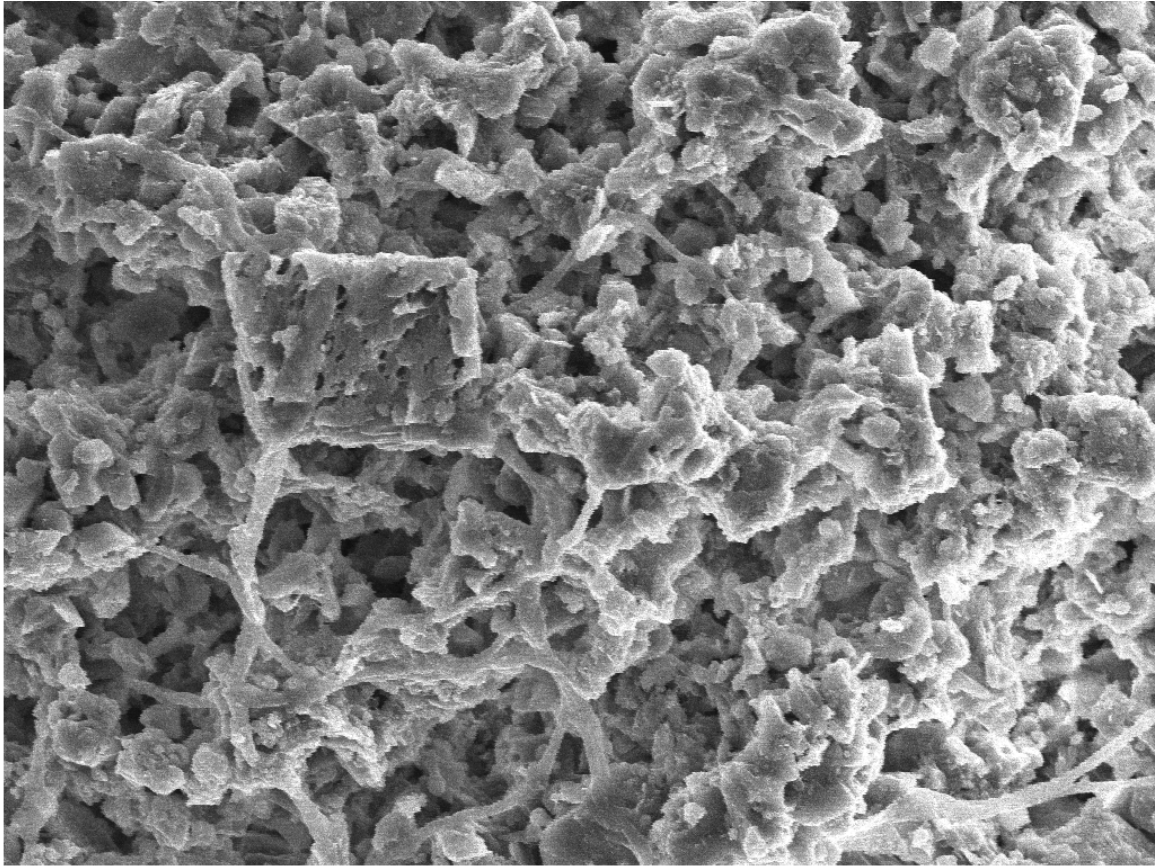
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 58.81 | 73.04 |
| Mg K | 0.44 | 0.36 |
| Al K | 3.11 | 2.29 |
| Si K | 28.45 | 20.12 |
| K K | 4.14 | 2.10 |
| Ca K | 2.07 | 1.03 |
| Fe K | 2.98 | 1.06 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 0.86 | 1.08 |
| Al K | 6.46 | 7.36 |
| Si K | 66.97 | 73.29 |
| K K | 11.93 | 9.37 |
| Ca K | 6.03 | 4.63 |
| Fe K | 7.76 | 4.27 |
| Totals | 100.00 | |



70µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 5

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

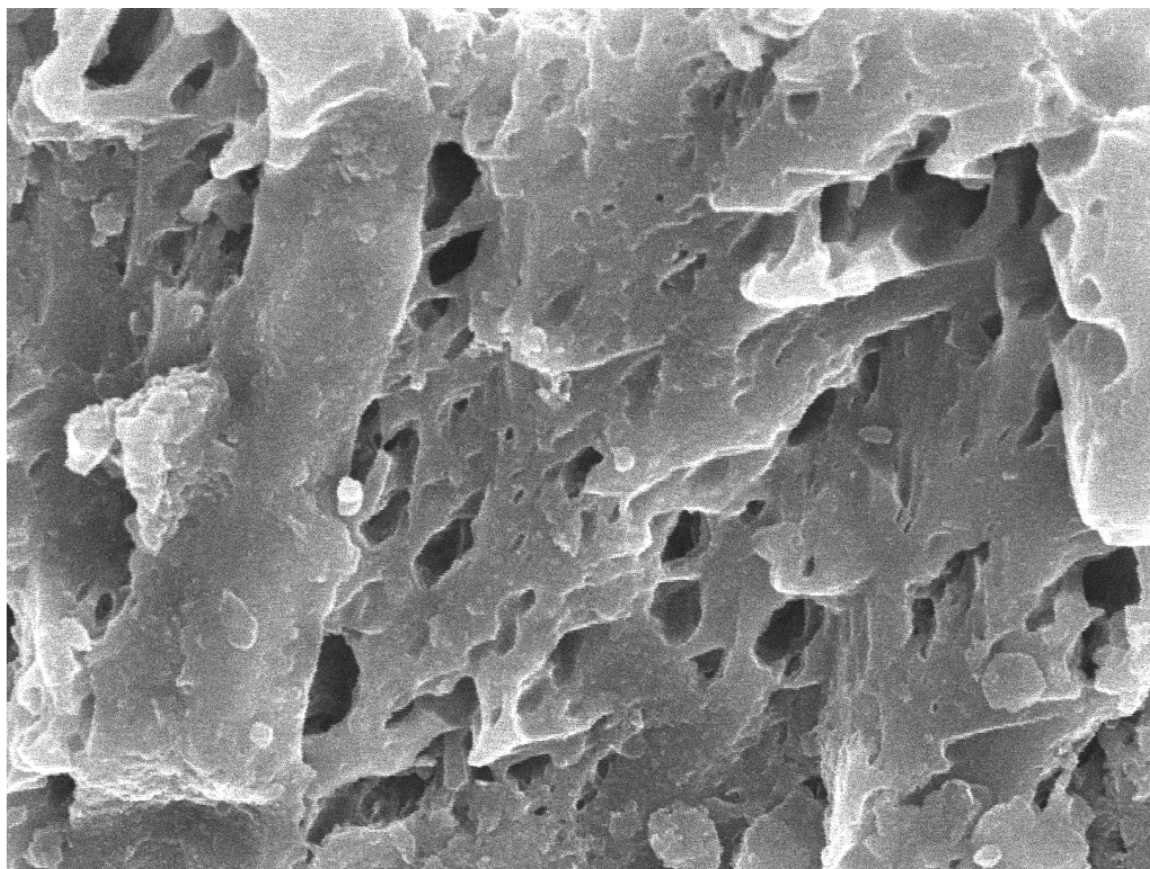
Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 61.19 | 74.69 |
| Mg K | 0.95 | 0.76 |
| Al K | 3.82 | 2.76 |
| Si K | 25.97 | 18.06 |
| K K | 4.15 | 2.07 |
| Ca K | 2.06 | 1.01 |
| Fe K | 1.86 | 0.65 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 1.88 | 2.35 |
| Al K | 8.30 | 9.34 |
| Si K | 65.39 | 70.67 |
| K K | 12.80 | 9.93 |
| Ca K | 6.45 | 4.89 |
| Fe K | 5.18 | 2.82 |
| Totals | 100.00 | |



10µm

Electron Image 1

Spectrum processing : No peaks omitted

Processing option : All elements analyzed (Normalised)

Number of iterations = 6

Standard :

O SiO₂ 1-Jun-1999 12:00 AM

Mg MgO 1-Jun-1999 12:00 AM

Al Al₂O₃ 1-Jun-1999 12:00 AM

Si SiO₂ 1-Jun-1999 12:00 AM

K MAD-10 Feldspar 1-Jun-1999 12:00 AM

Ca Wollastonite 1-Jun-1999 12:00 AM

Fe Fe 1-Jun-1999 12:00 AM

| Element | Weight% | Atomic% |
|---------|---------|---------|
| O K | 62.13 | 77.80 |
| Mg K | 8.22 | 6.77 |
| Al K | 0.87 | 0.65 |
| Si K | 3.02 | 2.16 |
| K K | 1.17 | 0.60 |
| Ca K | 22.75 | 11.37 |
| Fe K | 1.85 | 0.66 |
| Totals | 100.00 | |

O excluded

| Element | Weight% | Atomic% |
|---------|---------|---------|
| Mg K | 19.29 | 27.41 |
| Al K | 2.48 | 3.17 |
| Si K | 8.62 | 10.60 |
| K K | 3.05 | 2.69 |
| Ca K | 61.51 | 53.01 |
| Fe K | 5.06 | 3.13 |
| Totals | 100.00 | |

SOM 5. Photographs of the sections discussed in the text.

SOM 5 Figures 1 and 2. Section 1, on the left bank of the Kotuj River, right side of the mouth of Ary-Mas-Yuryakh Creek. Boundary between the Nemakit-Daldyn and Medvezhya formations is arrowed.

SOM 5 Figure 1



SOM 5 Figure 2



SOM 5 Fig. 3. Section 2, on the right bank of the Kotujkan River, ca. 2.5 km upstream its mouth. Boundaries between the Nemakit-Daldyn and Staraya Rechka formations and the Nemakit-Daldyn and Medvezhya formations are indicated with the lower and upper arrows, respectively. Artem Kouchinsky during fieldworks in 2007 - in the middle. The section was sampled for carbon isotopes by A. Knoll and J. Grotzinger in 1992 (see Kaufman et al. 1996).



SOM 5 Fig. 4. Section 3, on the right bank of the Kotuj River, ca. 3 km downstream from the mouth of Kotujkan River, at the mouth of the Kugda-Yuryakh Creek. Boundary between the Nemakit-Daldyn and Medvezhya formations is arrowed.



SOM 5 Fig. 5. Section 3, part of the section downstream of the mouth of Kugda-Yuryakh. Boundary between the Medvezhya and Kugda-Yuryakh formations is arrowed.



SOM 5 Fig. 6. Section 96-4, on the left bank of the Bol'shaya Kuonamka River, 1 km upstream of the mouth of the Ulakhan-Tyulen Creek (on the opposite river bank). "Marker bed with angustiochreids" within the Manykay Formation is arrowed (see also Kouchinsky et al. 1999 and Kouchinsky et al. 2001).



SOM 5 Fig. 7. Section 96-5, on the left bank of the Ulakhan-Tyulen Creek (right tributary of the Bol'shaya Kuonamka River), ca. 1 km upstream from the mouth. Boundary between the Manykay and Emyaksin formations arrowed (see Kouchinsky et al. 2001).



SOM 5 Fig. 8. Section 96-5, upper part.



SOM 5 Fig. 9. View from the collecting site in section 96-6 (see SOM 5 Fig. 10) to section 96-5a on the right side of the mouth of the Ulakhan-Tyulen Creek. Position of the mouth is arrowed. Section 96-5a passes into cliffs situated on the right bank 1–2.5 km downstream along the Bol'shaya Kuonamka River (see Kouchinsky et al. 2001, 2015).



SOM 5 Fig. 10. Section 96-6, collecting site ca. 2 km downstream from the mouth of Ulakhan-Tyulen Creek. The image is a composite of two images of the lower and upper parts of the outcrop.



SOM 5 Fig. 11. View from the top of section 96-5a towards section 96-6 on the right bank and section 96-7 on the left bank of the Bol'shaya Kuonamka River (see Kouchinsky et al. 2015).



SOM 5 Fig. 12. Section 96-7, on the left bank of the Bol'shaya Kuonamka River, ca 3.5–4 km downstream from the mouth of the Ulakhan-Tyulen Creek (see Kouchinsky et al. 2015).



SOM 5 Fig. 13. Section 96-8, on the left bank of the Bol'shaya Kuonamka River, ca. 7 km downstream from the mouth of the Ulakhan-Tjulen Creek (see Gubanov et al. 2004 and Kouchinsky et al. 2011), view towards the cliffs downstream from the collecting site (see SOM 5 Fig. 14). Boundary between the Kuonamka and overlying Olenyok formations is arrowed.



SOM 5 Fig. 14. Section 96-8, collecting site in the upstream part of the section (see Gubanov et al. 2004 and Kouchinsky et al. 2011).



SOM 5 Fig. 15. Section 96-1, Kuonamka Formation on the left bank of the Malaya Kuonamka River, near and downstream the Dzhilinda village (see Gubanov et al. 2004 and Kouchinsky et al. 2011).



SOM 5 Fig. 16. Section 96-2, on the right bank of the Malaya Kuonamka River, ca 2 km downstream the Dzhilinda village. Boundary between the Kuonamka and the overlying Olenyok Formation is arrowed.



SOM 5 Fig. 17. Section 96-3, Emyaksin Formation on the left bank of the Malaya Kuonamka River, 1.5–2 km downstream of the mouth of the Maspaky Creek (see Kouchinsky et al. 2001, 2015).



References

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