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Palaeomagnetic, rock-magnetic and mineralogical investigations of the Lower Triassic Vardebukta Fm from the southern part of the West Spitsbergen Fold and Thrust Belt

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Supplementary Material

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Table S1. Chemical composition of carbonate cement

Sample No Mineral	Cup-96 55 / 1 . carbonate	Cup-96 58 / 1 . carbonate	Cup-96 62 / 1 . carbonate	Cup-96 64 / 1 . carbonate	Cup-96 65 / 1 . carbonate	Cup-96 66 / 1 . carbonate	Bau-3n 67 / 1 . carbonate	Bau-3n 70 / 1 . carbonate	Bau-3n 71 / 1 . carbonate	Bau-3n 72 / 1 . carbonate
Na	0	0.02	0.01	0	0.01	0.02	0.02	0.01	0.03	0.01
Mg	6.35	6.35	6.81	0.32	0.32	0.23	13.04	7.26	12.70	8.45
Al	0.00	0.02	0.01	0.00	0.01	0.02	0.11	0.00	0.74	0.01
Si	0.01	0.03	0.02	0.02	0.05	0.13	0.24	0.02	1.07	0.56
Mn	2.41	2.41	2.73	1.05	1.10	1.04	0.05	0.27	0	0.17
Fe	7.04	7.16	7.06	0.87	1.08	0.60	0.20	9.66	1.38	7.50
Ba	0.01	0	0.00	0	0.02	0.02	0	0.01	0	0
Sr	0	0.01	0.01	0.23	0.28	0.34	0	0.04	0.04	0.06
Ca	21.81	22.07	20.82	39.09	39.79	38.72	22.31	20.67	21.70	20.52
K	0	0.00	0	0.04	0.06	0.06	0	0.01	0.11	0
S	0.01	0	0.00	0.01	0	0	0.02	0.01	0.00	0.01
O	15.63	15.80	15.65	16.46	16.86	16.33	17.97	15.93	19.34	16.62
Total	53.27	53.87	53.11	58.08	59.56	57.51	53.95	53.88	57.09	53.91
$CaCO_3$	55.80	55.97	53.24	95.07	94.69	95.71	50.72	51.95	49.72	51.31
$MgCO_3$	26.78	26.53	28.70	1.30	1.25	0.95	48.87	30.07	47.98	34.85
$MnCO_3$	4.49	4.46	5.09	1.86	1.90	1.88	0.08	0.50	0.00	0.32
FeCO3	12.93	13.03	12.96	1.51	1.85	1.06	0.33	17.43	2.27	13.45
SrCO3	0.00	0.02	0.01	0.26	0.30	0.38	0.00	0.04	0.04	0.07
BaCO3	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00

The concentrations of Na, K, Al, Si, and S were excluded from the calculation of the endmembers.

Table S2. The chemical composition of inferred Ti- magnetite from magnetic separates. Emboldened analyses have been carried out on “free” grains whereas the remaining analyses were performed on grains included in volcanic lithoclasts. Calculation of ulvöspinel and magnetite end-members after Carmichael (1987)

No	3 / 1 .	4 / 1 .	6 / 1 .	7 / 1 .	8 / 1 .	9 / 1 .	10 / 1 .	11 / 1 .	**2 / 1 .1**	**4 / 1 . 1**	**8 / 1 . 1**	**9 / 1 .1**	**10 / 1 . 1**
MgO	4.26	4.22	4.4	3.11	1.44	3.98	2.92	3.31	**0**	**0**	**0**	**0.03**	**0**
CaO	0.13	0.1	0.13	0.35	0.32	0.24	0.31	0.25	**0**	**0**	**0**	**0**	**0**
MnO	0.67	0.71	0.84	0.73	0.92	0.74	0.8	0.78	**1.41**	**1.53**	**2.16**	**2.38**	**2.10**
FeO	64.73	65.03	65.49	65.1	70.99	69.35	68.61	70.05	**95.50**	**97.37**	**96.71**	**95.92**	**96.93**
ZnO	0.15	0.13	0.16	0.05	0	0.19	0.15	0.04	**0**	**0**	**0.033**	**0**	**0.05**
Al2O3	2.46	2.35	1.42	0.73	0.9	2.14	1.62	1.63	**0.03**	**0.01**	**0.01**	**0**	**0.01**
V2O3	0.33	0.23	0.32	0.23	0.26	0.35	0.32	0.37	**0**	**0**	**0.06**	**0.02**	**0**
Cr2O3	0.47	0.41	0.49	0.33	0.41	0.47	0.42	0.34	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**
SiO2	0.04	0.02	0.04	0.09	0.09	0.12	0.11	0.21	**0.03**	**0.04**	**0.04**	**0.08**	**0.06**
TiO2	23.06	22.81	22.65	23.63	23	23.22	24.31	23.78	**0**	**0**	**0**	**0**	**0.01**
ZrO2/NiO*	0.01	0.01	0.07	0.02	0	0.04	0.03	0	**0.04***	**0.04***	**0***	**0.02***	**0.01***
Nb2O5	0	0.05	0.04	0.2	0	0	0	0.01	**0**	**0**	**0**	**0**	**0**
Total	96.29	96.05	96.05	94.58	98.32	100.83	99.59	100.75	**97.01**	**99.00**	**99.03**	**98.45**	**99.17**

* for given analyses NiO was indicated instead of ZrO2

$Mg/(Mg+Fe^{2+})$	0.14	0.14	0.15	0.11	0.05	0.13	0.10	0.11
Xulvo	0.63	0.63	0.63	0.68	0.64	0.62	0.66	0.64
Xmag	0.37	0.37	0.37	0.32	0.36	0.38	0.34	0.36

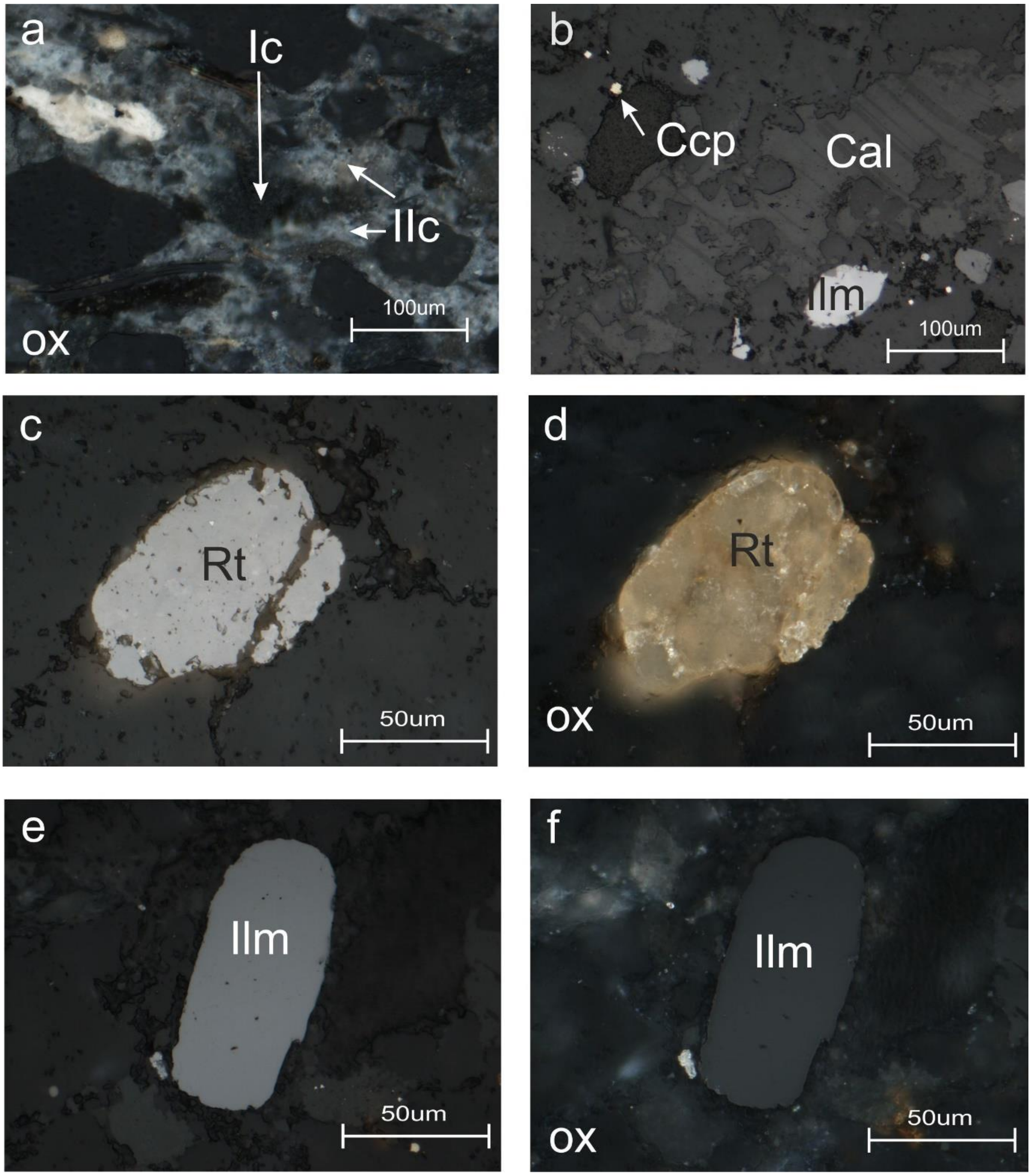

Figure S1. Mineralogy and textural relationships within studied rocks; (a) two generations of cement (Ic and IIc) the IIc calcite contains dispersed fine-grained Ti-oxide intergrowths (white internal reflections); (b) twinned calcite; (c - d) unaltered rutile grain; (e - f) unaltered ilmenite grains. Abbreviations: Cal – calcite, Ccp - chalcopyrite, Ilm - ilmenite, Rt - rutile, Ic - 1st generation of calcite cement, IIc - 2nd generation of calcite cement; all microphotographs were taken under reflected light; ox - crossed polarisation

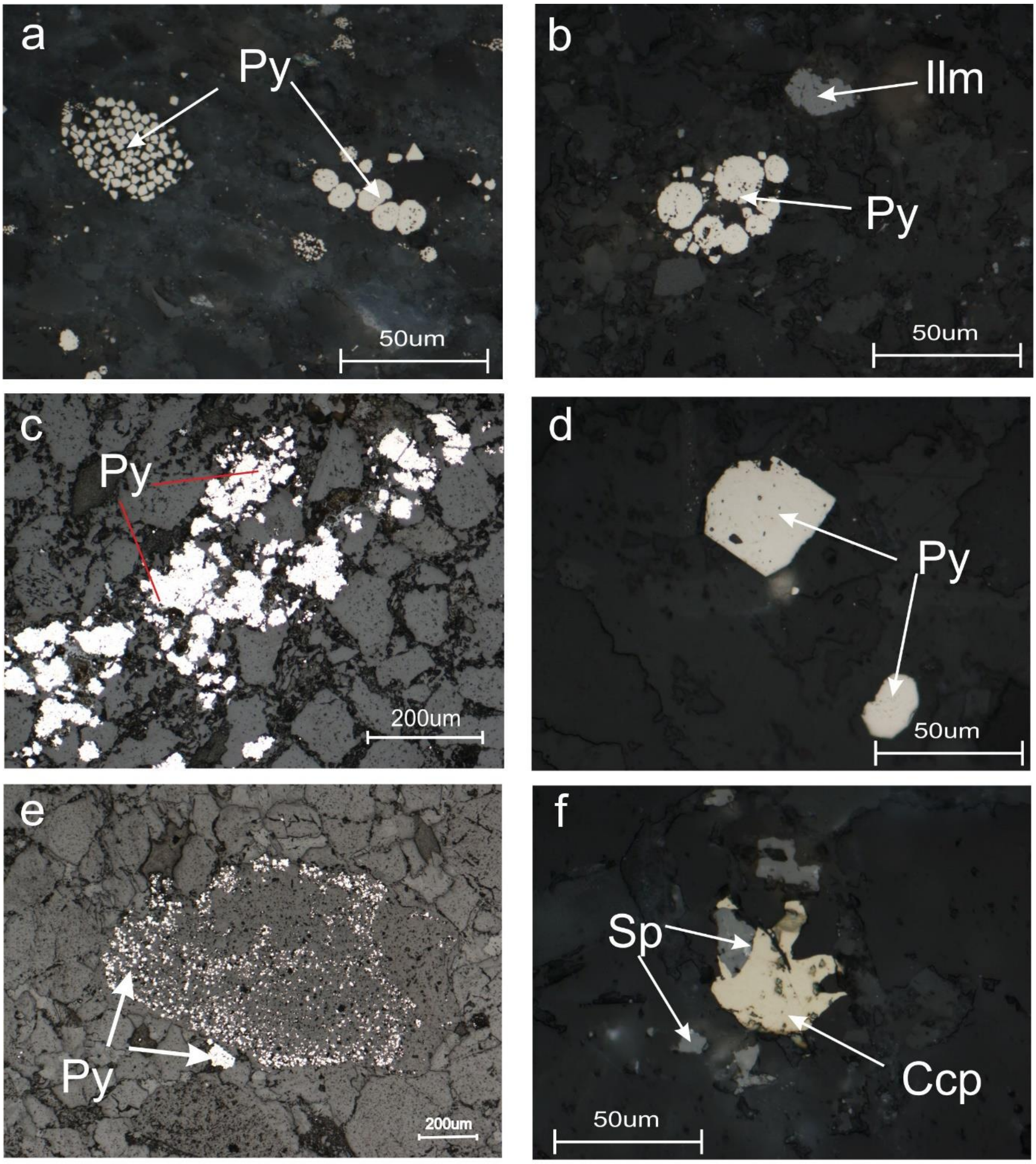

Figure S2. Pyrite forms occurring within investigated rocks; (a - b) framboidal pyrite aggregates; (c) epigenetic pyrite aggregates with random texture; (d) euhedral pyrite crystals; (e) pyrite in dispersed form replacing calcite; (f) sphalerite and chalcopyrite replacing euhedral pyrite. Abbreviation: Ilm - ilmenite, Ccp- chalcopyrite, Py – pyrite, Sp - sphalerite; all microphotographs were taken under reflected light

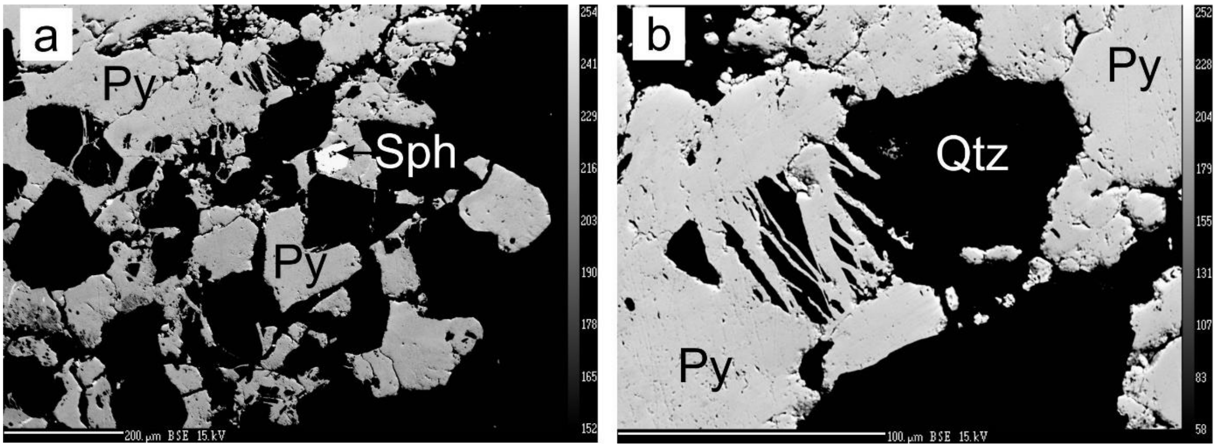

Figure S3. (a-b) Pyrite cement surrounding and filling brittle cracks in detrital grains. Abbreviation: Qtz - quartz, Py – pyrite, Sp - sphalerite; all microphotographs were derived from polished specimens on EMPA

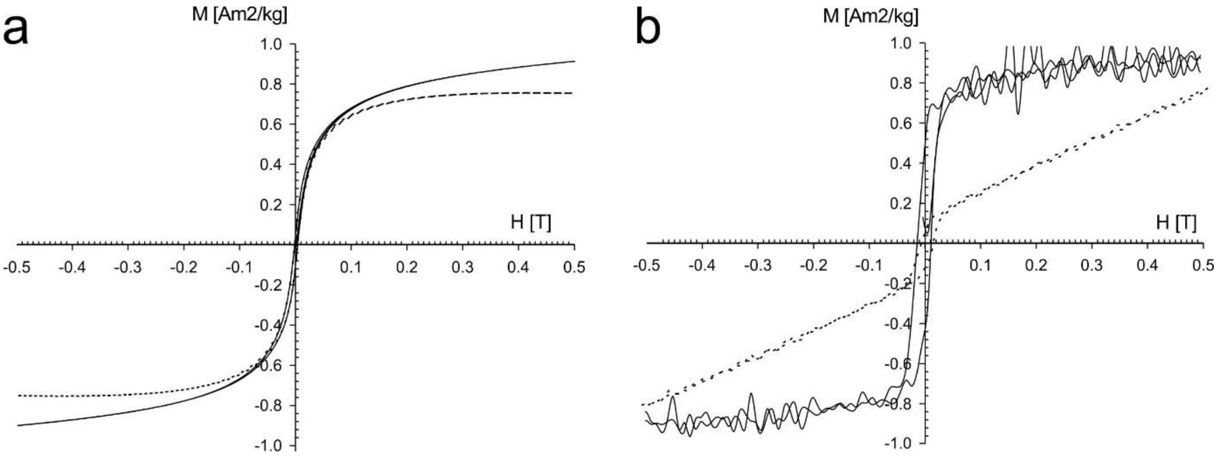

Figure S4. Examples of the hysteresis loops of magnetic separates. Diagram (a) shows the loops typical of magnetite and volcanic lithoclasts, diagram (b) exhibits the loops obtained for sulphide aggregates; dashed line indicates the hysteresis loops before correction for paramagnetic minerals, and the solid line represents loop after correction.