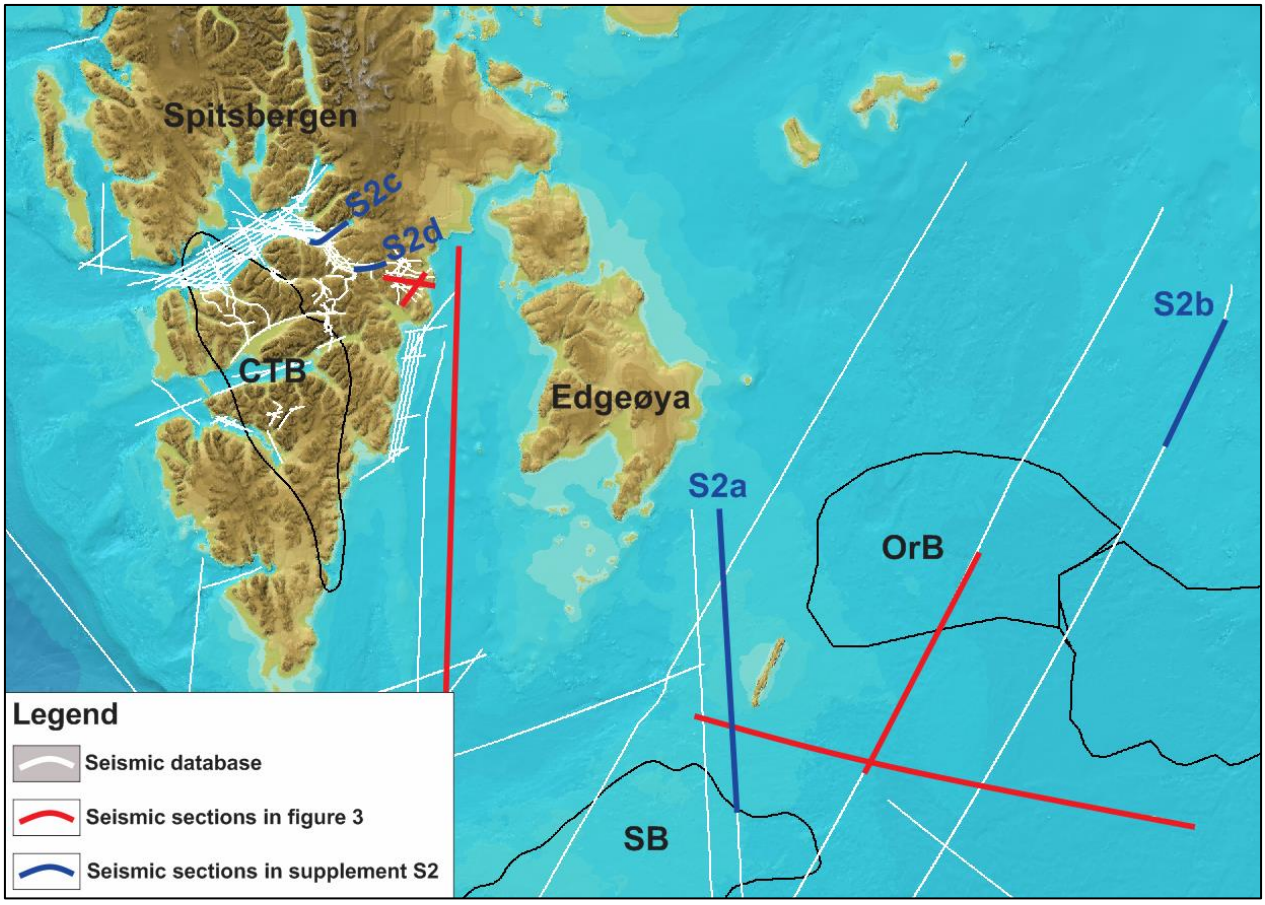
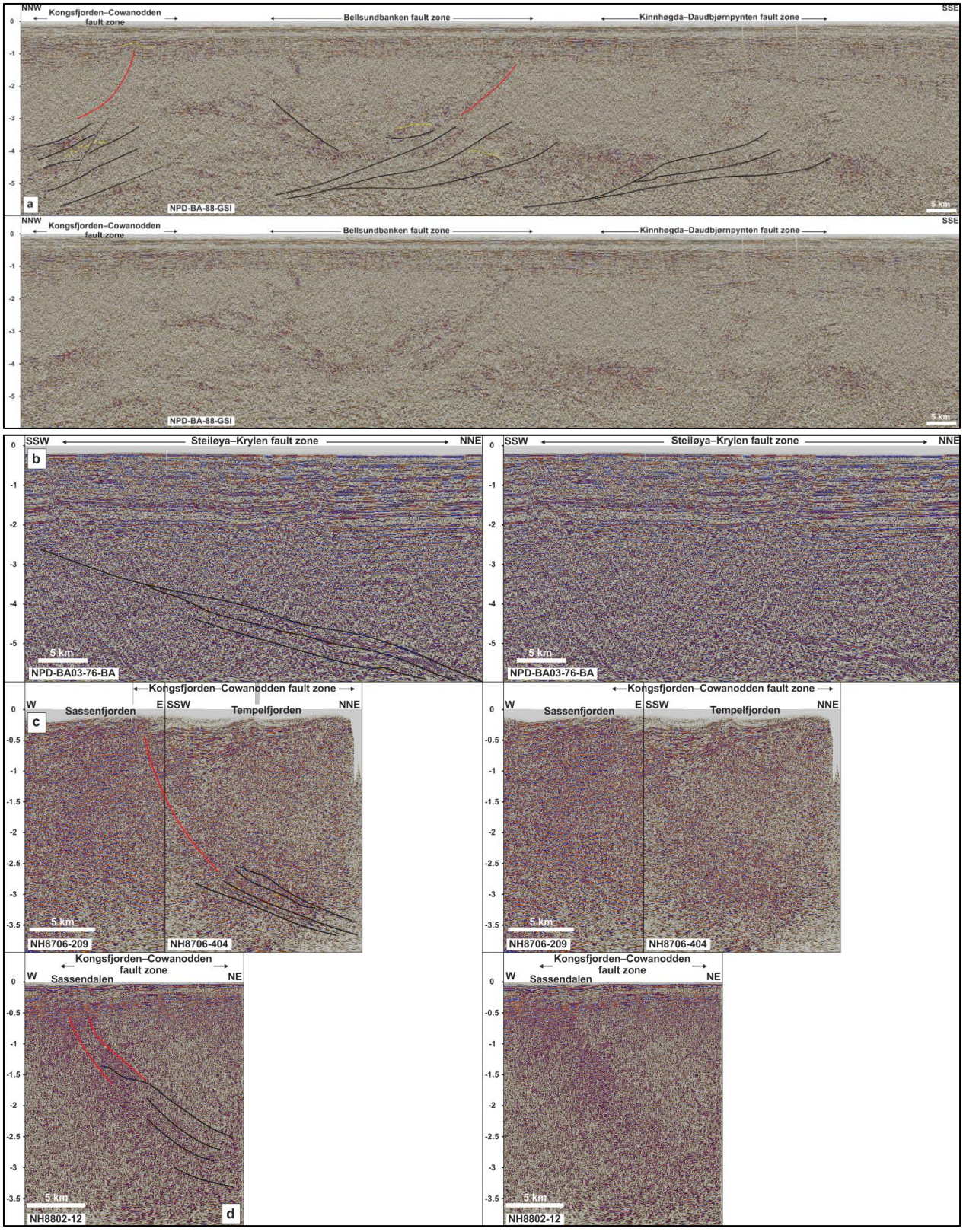


S1: Map showing the location of supplementary seismic sections displayed in supplement S2. Topography and bathymetry are from Jakobsson et al. (2012).



S2: Additional seismic data (a) north of the Ora and Olga basins, (b) in Sassenfjorden–Tempelfjorden, (c) in Sassendalen, and (d) between Edgeøya and Hopen showing the Steiløya–

Krylen fault zone (a), that the Kongsfjorden–Cowanodden fault zone extends into central Spitsbergen (b and c), and that all three major thrust systems in Storfjorden extend east-southeast of Edgeøya (d). The locations of the supplementary seismic lines shown in supplement S2 are shown in supplement S1. See legend in Fig. 3.

Time conversions Plurdalen-1 and Raddedalen-1 wells

(a)

Average velocities (Gernigon et al., 2018)		Average velocities used
Water	1470 m.s-1	1470 m.s-1
Lower/Mid Triassic	4000-4550 m.s-1	4250 m.s-1
Permian	5000-5250 m.s-1	5000 m.s-1
Pennsylvanian	5500 m.s-1	5500 m.s-1
Devonian-Mississippian	5500-5800 m.s-1	5650 m.s-1
Upper basement/Neoproterozoic	5900-6300 m.s-1	6100 m.s-1

(b)

Raddedalen-1	From well completion report (Bro and Shvarts 1983)			Thickness (ms)	Thickness (ms TWT)
	Stratigraphy	Averaged Top (m)	Averaged Base (m)		
Permian	0-400/415 m	0	407,5	81,50	163,00
Pennsylvanian	400/415-605/760 m	407,5	682,5	50,00	100,00
Mississippian	605/760-850/895 m	682,5	872,5	33,63	67,26
Ordovician-Silurian	850/895-2880 m	872,5	2880	329,10	658,20

(c)

Plurdalen-1	From well completion report (Harland and Kelly 1997)			Thickness (ms)	Thickness (ms TWT)
	Stratigraphy	Top (m)	Base (m)		
Triassic	0-128,5 m	0	128,5	30,24	60,47
Permian	128,5-700 m	128,5	700	114,30	228,60
Pennsylvanian	700-760,5 m	700	760,5	11,00	22,00
Mississippian	760,5-839 m	760,5	839	13,89	27,79
Devonian	839-2351 m	839	2351	247,87	495,74

(d)

Elevation well tops (m)	
Raddedalen-1	84
Plurdalen-1	144,6

With removal of interval/stratigraphy above sea-level

(e)

Raddedalen-1	From well completion report (Bro and Shvarts 1983)			Thickness (ms)	Thickness (ms TWT)	Depth (TWT)
	Stratigraphy	Averaged Top (m)	Averaged Base (m)			
Permian	0-400/415 m	0	323,5	64,70	**129,40**	**129,40**
Pennsylvanian	400/415-605/760 m	323,5	598,5	50,00	**100,00**	**229,40**
Mississippian	605/760-850/895 m	598,5	788,5	33,63	**67,26**	**296,66**
Ordovician-Silurian	850/895-2880 m	788,5	2796	329,10	**658,20**	**954,85**

(f)

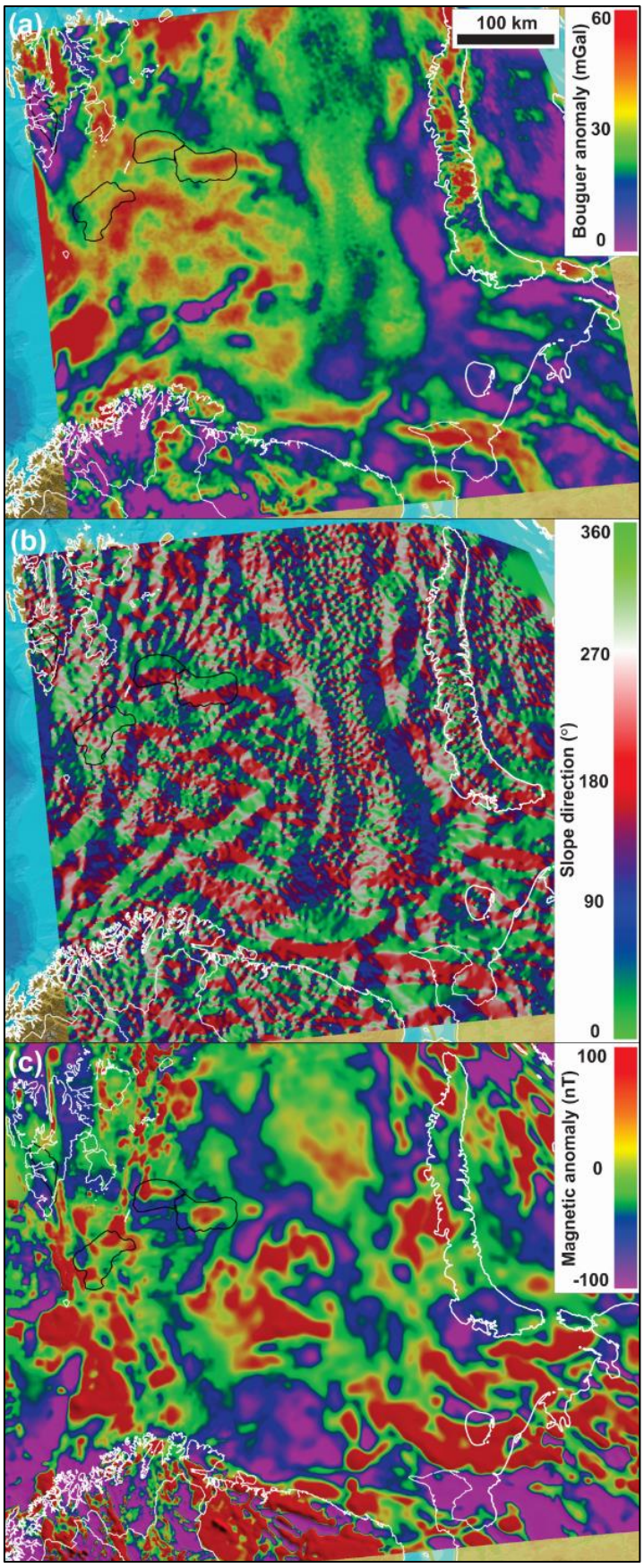
Plurdalen-1	From well completion report (Harland and Kelly 1997)			Thickness (ms)	Thickness (ms TWT)	Depth (TWT)
	Stratigraphy	Top (m)	Base (m)			
Triassic	0-128,5 m	0	0	0,00	**0,00**	**0,00**
Permian	128,5-700 m	0	683,9	136,78	**273,56**	**273,56**
Pennsylvanian	700-760,5 m	683,9	744,4	11,00	**22,00**	**295,56**
Mississippian	760,5-839 m	744,4	822,9	13,89	**27,79**	**323,35**
Devonian	839-2351 m	822,9	2334,9	247,87	**495,74**	**819,09**

Depth conversion offset Agardhbukta Fault in Nordmannsfonna (fig. 3e)

(g)

	Thickness (s TWT)	Lithostratigraphy	Thickness (m)
Offset	0,8	Upper basement	2440

S3: Depth and time conversion tables including (a) averages of the velocity values from Gernigon et al. (2018) used in the present study, (b–f) well data from Bro and Shvarts (1983; Raddedalen-1 well) and Harland and Kelly (1997; Plurdalen-1 well) and associated time conversion for well–seismic tie, and (g) depth conversion of the offset of the Agardhbukta Fault in Nordmannsfonna, eastern Spitsbergen (see also fig. 3e in the manuscript). The averaged Tops and Base from Bro and Shvarts (1983) in (b) and (e) imply that the exact depths of the stratigraphic units is not known but correspond to depth intervals that were averaged to a single depth for simplicity. The values used for well–seismic tie are displayed in bold red in (e) and (f) (e.g., in the Raddedalen-1 well Permian was found up to a depth of 400–415, which corresponds to a TWT depth of 129.40 ms on seismic data). The red value in (g) represent the calculated top-west reverse offset of the Kongfjorden–Cowanodden fault zone by the Agardhbukta Fault in Nordmannsfonna.


(a)
100 km
Bouguer anomaly (mGal)
60
30
0
(b)
Slope direction (°)
360
270
180
90
0
(c)
Magnetic anomaly (nT)
100
0
-100

S4: Uninterpreted gravimetric and magnetic data.