Tectono-stratigraphic history of northern Amdrup Land, eastern North Greenland: implications for the northernmost East Greenland shelf

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The NW–SE-oriented Sommerterrasserne fault in Amdrup Land marks the southern limit of Mesozoic compression related to the transform plate boundary between North Greenland and Svalbard. Structural style in Amdrup Land changes across the fault; Carboniferous, Permian and Jurassic sediments in northern Amdrup Land north-east of the fault are gently folded, with NE–SW-trending fold axes, whereas they are gently dipping south of the fault. The Sommerterrasserne fault is regarded as the south-eastern extension of the Trolle Land fault zone of eastern Peary Land. Upper Moscovian carbonates of the Foldedal Formation rest unconformably on isoclinally folded Upper Proterozoic sediments of the Independence Fjord Group in northern Amdrup Land and are conformably overlain by chert-rich limestones of the Permian Kim Fjelde and Midnatfjeld Formations. Locally, up to 70 m of Jurassic sandstone and siltstone are preserved in the axes of the synclines, resting conformably on Permian limestones; the folding thus post-dates their deposition. The folding of the sediments to the north-east of the Sommerterrasserne fault most likely took place during the latest Cretaceous; it is post-dated by a post-Paleocene extensional event.

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The Wandel Sea Basin in the north-easternmost part of Greenland was an area of accumulation during the Early Carboniferous to Palaeogene. It is located at the margin of the stable Greenland craton, at the intersection of the Caledonian and Ellesmerian orogenic belts (Fig. 1; Dawes & Soper 1973; Håkansson & Stemmerik 1989). The onshore deposits in Greenland form part of a large system of interconnected intracratonic basins that cover the Barents Shelf and the northern part of the East Greenland shelf. The structural and depositional history of the western Barents Shelf has been described in considerable detail over the past 15 years as the result of hydrocarbon exploration in the area (Gabrielsen *et al*. 1990; Johansen *et al*. 1993). In contrast, data from the northern East Greenland shelf are limited; most information comes from regional aeromagnetic and gravimetric surveys (Dawes 1990). There is sparse seismic data from the area south of 80°N but most data are confidential and information is only available in a generalised form (Escher & Pulvertaft 1995).

The main structural elements controlling the evolution of the Wandel Sea Basin are the East Greenland, Trolle Land and Harder Fjord fault zones (Fig. 1; Håkansson & Stemmerik 1989). The Trolle Land fault zone in eastern Peary Land forms the southern part of the Trolle Land fault system (Håkansson & Pedersen 1982; Zinck-Jørgensen 1994). This fault system constitutes an important structural element related to the development of the transform plate boundary between eastern North Greenland and Svalbard (Håkansson & Pedersen 1982). The fault system is well exposed in eastern Peary Land where it is composed of five major NW–SE-striking, sub-vertical faults with a lateral distance of 7–10 km (Zinck-Jørgensen 1994). These faults are suggested as continuing towards the south-east to Kronprins Christian Land, where they are largely unexposed due to extensive ice cover (Fig. 1).

This paper discusses the tectono-stratigraphic his-

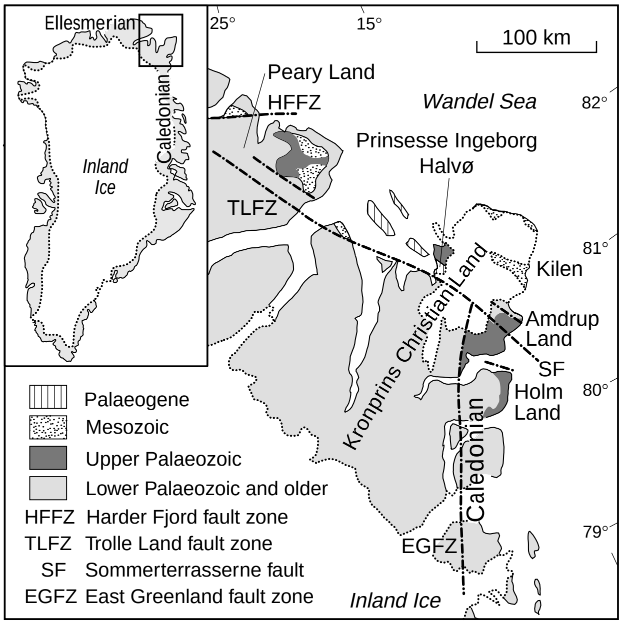


Fig. 1. Map of the eastern part of the Wandel Sea Basin showing the major structural lineaments. The blank area on northern Kronprins Christian Land is ice. Modified from Håkansson & Stemmerik (1989).

tory of northern Amdrup Land and its implications for the East Greenland shelf areas based on new structural, biostratigraphic and sedimentological observations. The Sommerterrasserne fault in northern Amdrup Land forms the easternmost extent of the Trolle Land fault zone. It divides structurally deformed Carboniferous and younger deposits from flat-lying undeformed Upper Palaeozoic sediments. The depositional record and structural style of northern Amdrup Land differ significantly from that recognised at Kilen and Prinsesse Ingeborg Halvø further to the north in the Trolle Land fault system in Kronprins Christian Land (Håkansson *et al.* 1989, 1992, 1993). The preserved Upper Palaeozoic succession is much thinner than that recorded from northern Prinsesse Ingeborg Halvø by Håkansson *et al.* (1989); it resembles that of Holm Land and southern Amdrup Land (Fig. 2; Stemmerik unpublished data). Also, the Mesozoic succession is thinner and stratigraphically condensed compared to Kilen (Håkansson *et al.* 1991). Northern Amdrup Land thus forms a unique area within the Wandel Sea Basin where the Upper Palaeozoic depositional evolution is related to the Holm Land – Amdrup Land segment of the basin and the structural style to the Trolle Land fault system. This may have some important implications for the petroleum potential of the adjacent shelf areas and for the structural evolution of the region.

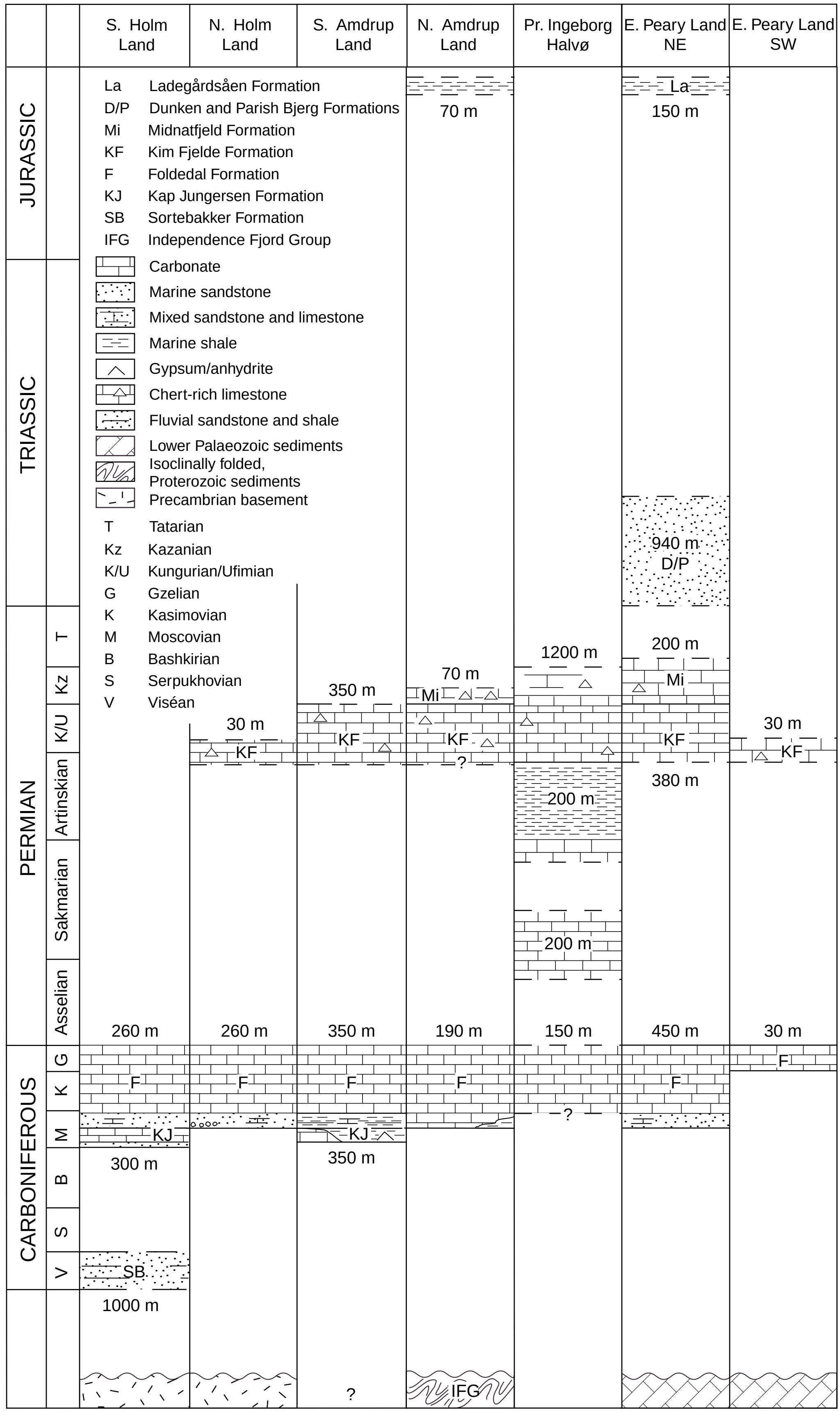
Geological framework

The post-Caledonian Wandel Sea Basin is located in a narrow fringe along the margins of the stable Greenland craton. The depositional area is delineated by the Harder Fjord, Trolle Land and East Greenland fault zones (Fig. 1; Håkansson & Stemmerik 1989). The Wandel Sea Basin deposits rest with a regional unconformity on Precambrian to Silurian rocks, which were deformed during the Caledonian and Ellesmerian orogenies.

Two main epochs of basin evolution have been recognised during previous studies of the basin fill; the earlier, Late Palaeozoic epoch is characterised by a fairly simple system of grabens and half-grabens (Stemmerik & Håkansson 1989; Stemmerik 1996) whereas the later, Mesozoic epoch is dominated by strike-slip movements and deposition in isolated pull-apart basins (Håkansson *et al.* 1991). The Mesozoic structural events only influenced the northern part of the basin, north of the Trolle Land fault zone and its eastward continuation (Fig. 1).

The Wandel Sea Basin deposits in northern Amdrup Land are located north of the Trolle Land fault zone and are affected by post-Jurassic structural events. They were deposited east of the East Greenland fault zone near the northern limit of a depositional area that connects southwards to the sedimentary basins of East Greenland and is dominated by east–west extension along Caledonian lineaments. The area is separated by a NW–SE-trending fault, the Sommerterrasserne fault (see Fig. 3), from the areas to the south that are unaffected by Mesozoic compression related to the transform plate boundary between eastern North Greenland and Svalbard. The Kilen and Prinsesse Ingeborg Halvø areas further to the north in the Trolle Land fault system have been affected by four tectonic pulses of mid-Jurassic to post-Paleocene age (Håkansson *et al.* 1989, 1992, 1993). These events are also documented in the Trolle Land fault system further to the west in eastern Peary Land (Zinck-Jørgensen 1994). They include the mid-Jurassic Ingeborg event, the mid-Cretaceous Kilen event, a latest Cretaceous strike-slip event and post-Paleocene extension (Håkansson *et al.* 1989, 1992, 1993).

Fig. 2. Lithostratigraphy and thickness of Upper Palaeozoic and Mesozoic sediments on Holm Land, Amdrup Land, Prinsesse Ingeborg Halvø and eastern Peary Land. Data from Håkansson *et al.* (1989) and Stemmerik *et al.* (1996).


S. Holm Land
N. Holm Land
S. Amdrup Land
N. Amdrup Land
Pr. Ingeborg Halvø
E. Peary Land NE
E. Peary Land SW
JURASSIC
TRIASSIC
PERMIAN
CARBONIFEROUS
T
Kz
K/U
Artinskian
Sakmarian
Asselian
G
K
M
B
S
V
La Ladegårdsåen Formation
D/P Dunken and Parish Bjerg Formations
Mi Midnatfjeld Formation
KF Kim Fjelde Formation
F Foldedal Formation
KJ Kap Jungersen Formation
SB Sortebakker Formation
IFG Independence Fjord Group
Carbonate
Marine sandstone
Mixed sandstone and limestone
Marine shale
Gypsum/anhydrite
Chert-rich limestone
Fluvial sandstone and shale
Lower Palaeozoic sediments
Isoclinally folded, Proterozoic sediments
Precambrian basement
T Tatarian
Kz Kazanian
K/U Kungurian/Ufimian
G Gzelian
K Kasimovian
M Moscovian
B Bashkirian
S Serpukhovian
V Viséan
70 m
La
150 m
940 m
D/P
1200 m
200 m
70 m
Mi
350 m
Mi
30 m
KF
KF
KF
KF
?
30 m
KF
380 m
200 m
200 m
260 m
260 m
350 m
190 m
150 m
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300 m
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SB
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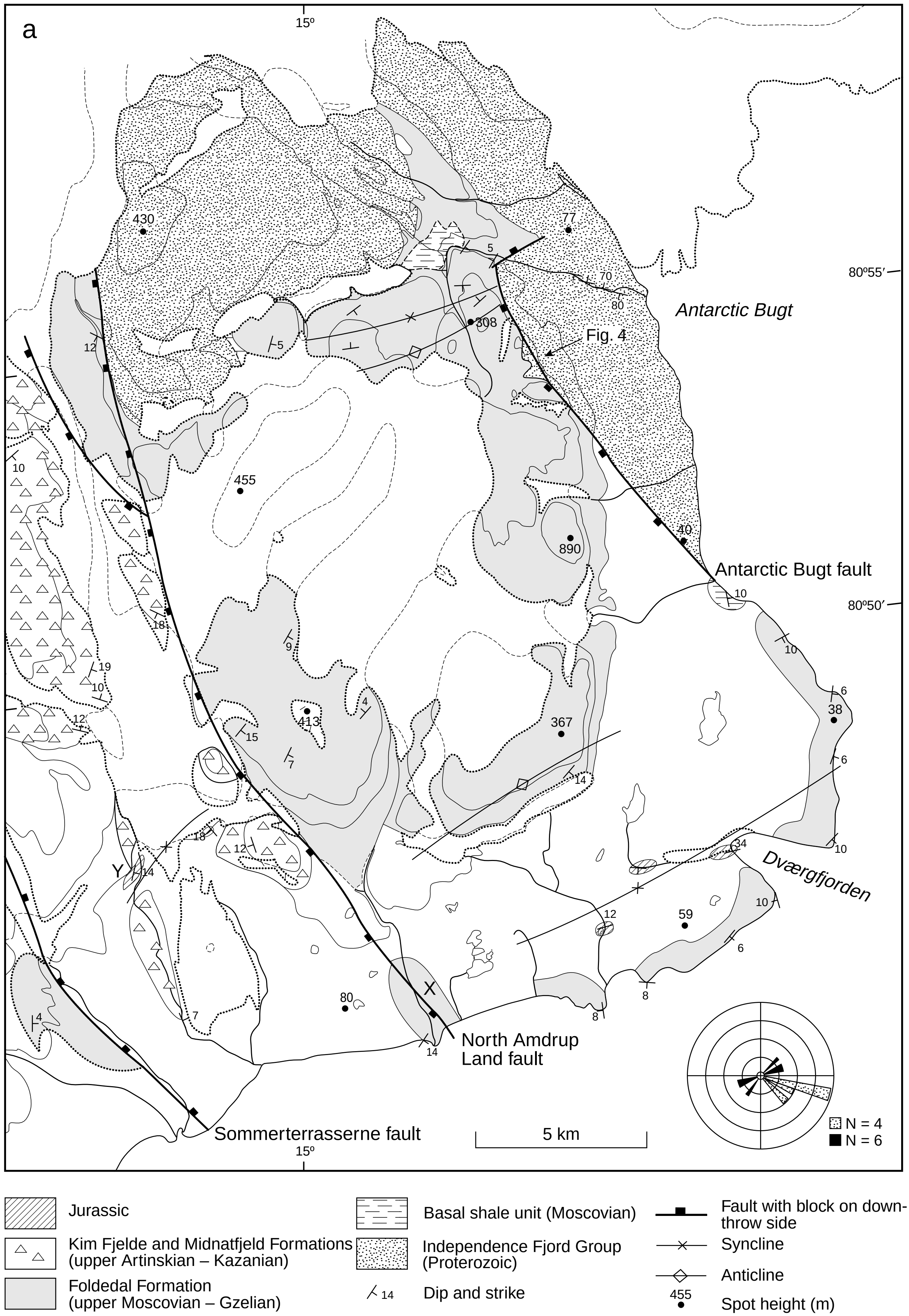

Fig. 3. *See facing page for caption.*

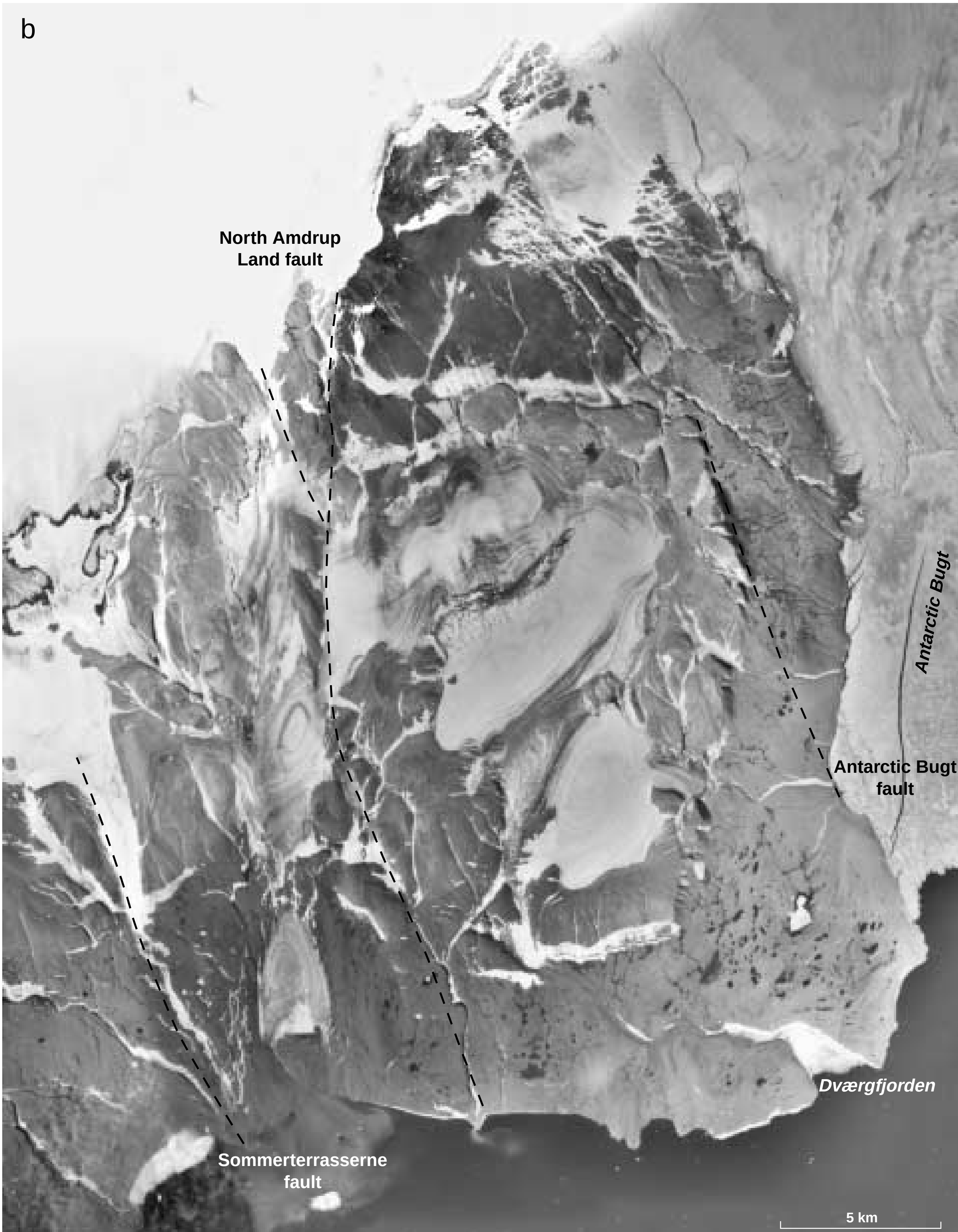

Fig. 3. **a**: Geological map of northern Amdrup Land showing sediment outcrops and major structural elements. Based on field observations and photogrammetric interpretations. **X** and **Y** refer to localities mentioned in the text. The rose diagram shows the directions of fold axes in the area between the Sommerterrasserne and north Amdrup Land faults (**black**) and between the north Amdrup Land and Antarctic Bugt faults (**stippled**). Spot heights in metres. **b**: Aerial photograph of northern Amdrup Land at the same scale as the map showing the topographic expression of the main structural elements. Photo: 876L 2864 (with parts of 876K 1831, 1834), August 1978, National Survey and Cadastre, Copenhagen, Denmark.

Fig. 4. Upper Moscovian carbonates (**UM**) onlapping Independence Fjord Group strata (**IF**) immediately south-west of the Antarctic Bugt fault. Note the topographic scarp defined by the fault; for location, see Fig. 3. The cliff is approximately 200 m high.

Stratigraphy

In northern Amdrup Land, the Wandel Sea Basin deposits rest unconformably on strongly deformed Proterozoic sediments and volcanics of the Independence Fjord Group (Figs 2–4). The Proterozoic rocks are isoclinally folded with axes plunging 10° towards WNW (285°–315°). They crop out mainly in the northern part of the study area and on the wide coastal plain along Antarctic Bugt (Fig. 3).

The oldest post-Caledonian sediments are black shales with thin beds of resedimented carbonates. These, so far undated sediments crop out locally along a NNW–SSE-trending topographic lineament that possibly corresponds to a major fault, the Antarctic Bugt fault (Figs 3, 4). They are laterally confined to this zone; elsewhere shallow marine carbonates or locally sandstones rest on the irregular basement surface. The oldest carbonates are dated as late Moscovian and they can be correlated to the lower part of the Foldedal Formation in southern Amdrup Land (Fig. 2). Lower Moscovian deposits, equivalent to the Kap Jungersen Formation in southern Amdrup Land and southern Holm Land, are not present in northern Amdrup Land. The upper Moscovian – Gzelian succession attains a maximum thickness of about 190 m compared to more than 350 m at Kap Jungersen in southern Amdrup Land (Fig. 2). These sediments dominate the outcrops north-east of the north Amdrup Land fault (Fig. 3). They are faulted against younger Carboniferous, Gzelian carbonates of the upper Foldedal Formation in the southern part of the study area (locality X in Fig. 3a).

Mid- to Upper Permian limestones, cherty limestones and cherty shales of the Kim Fjelde and Midnatfjeld

Fig. 5. Upper Jurassic sandstone (**J**) conformably overlying Upper Permian limestone (**P**). The sediments form the northern flank of a synform, locality Y in Fig. 3. **Q**: Quaternary sediments. The outcrop is approximately 30 m high.

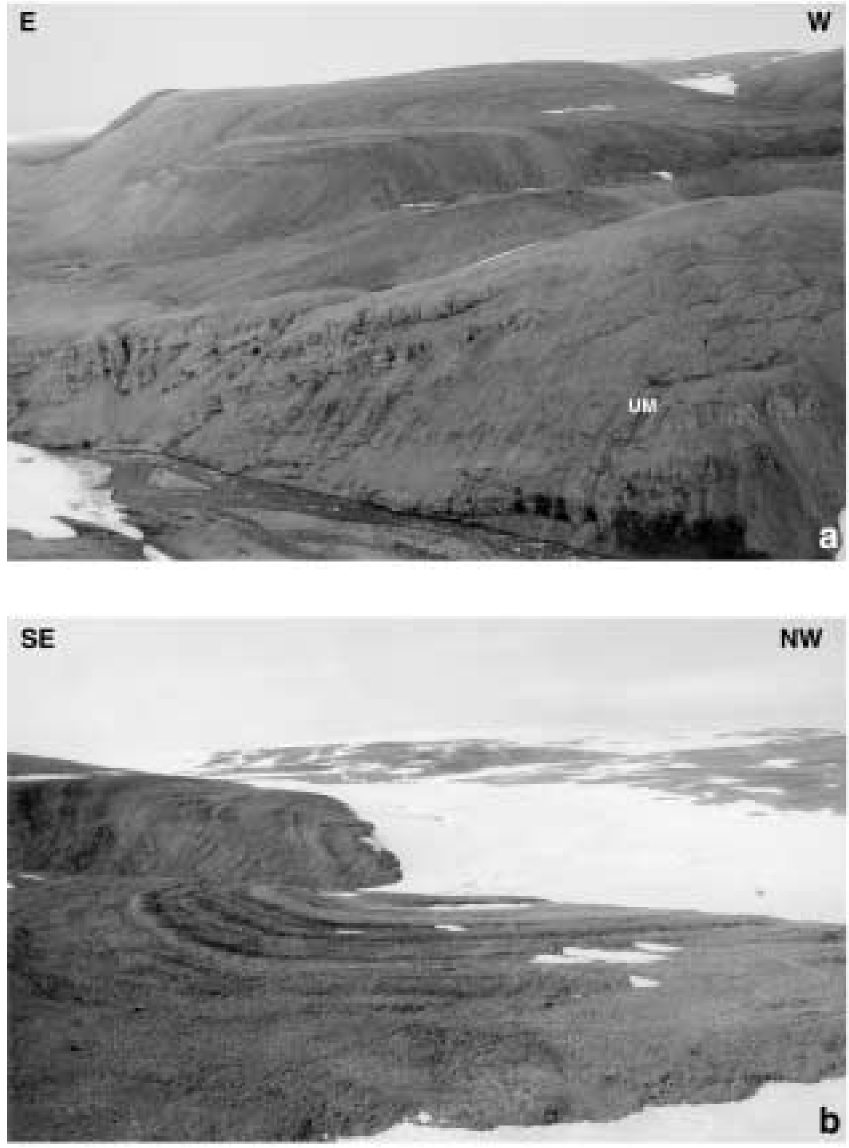

Fig. 6. **a**: The basal part of the Wandel Sea Basin succession in northern Amdrup Land. Black shales are conformably overlain by upper Moscovian carbonates (**UM**). Note the gentle folding of the sediments in the distant outcrops that are approximately 200 m high. **b**: Detail of upper right corner of Fig. 6a showing domal folding of the Carboniferous carbonates. Width of ridged ground in the middle distance is about 200 m.

Formations are widely exposed in the down-faulted area between the Sommerterrasserne and north Amdrup Land faults. North-east of the north Amdrup Land fault, sediments of Middle to Late Permian age are confined to a narrow zone north-west of Dværgfjorden (Fig. 3). Sediments belonging to the Kim Fjelde Formation are widespread in southern Amdrup Land whereas the Midnatfjeld Formation is unknown from Holm Land and southern Amdrup Land (Fig. 2). The latter formation is present in eastern Peary Land but only in the north-eastern exposures (Håkansson 1979; Stemmerik *et al.* 1996).

Sediments of Triassic – Middle Jurassic age are not known from Amdrup Land. Upper Jurassic sediments occur locally in the cores of two synforms in the southern and eastern parts of the study area where they rest conformably on Permian carbonates (Figs 3, 5). The Jurassic succession attains a maximum thickness of 70 m in the southernmost outcrops where the sediments are unconformably overlain by Quaternary fluvial deposits. The sediments are dated as Oxfordian based on the finds of two ammonites (J.H. Callomon, personal communication 1996) and they correspond in age to the basal part of the Ladegårdsåen Formation of eastern Peary Land. There is no evidence of younger Mesozoic or Palaeogene sediments in Amdrup Land although there are more than 2000 m of Cretaceous sediments at Kilen immediately to the north (Håkansson *et al.* 1991). Post-Permian sediments are not known from the areas south of the Sommerterrasserne fault.

Structural geology

Northern Amdrup Land is relatively poorly exposed and the present structural study of the Wandel Sea Basin sediments therefore focused on major lineaments and folds. It is based on a combination of photogrammetric analysis of aerial photographs at a scale of 1:50 000 and field observations (Larsen 1996). The study forms an integrated part of the regional mapping between 78°N and 81°N at a scale of 1:500 000 (Henriksen 1995, 1996) where another GEUS mapping team was responsible for mapping of the pre-Wandel Sea Basin rocks (Hull & Friderichsen 1995).

The structural style in Amdrup Land changes across the NW–SE-oriented Sommerterrasserne fault (Fig. 3). South-west of this fault sediments have not seen compressional deformation; they are dipping gently (< 4°) towards the east and south-east with some disturbance along minor N–S-trending faults. In contrast, the Wandel Sea Basin sediments are gently folded with NE–SW fold axes north-east of the fault (Figs 3, 6). The Sommerterrasserne fault, defining the southern limit of the Trolle Land fault system in Kronprins Christian Land, is poorly exposed and the fault has not been observed in the field. Outcrops south-west of the fault consist of eastwards dipping carbonates of the Upper Carboniferous Foldedal Formation whereas folded Permian sediments of the Kim Fjelde and Midnatsfjeld Formations are exposed north-east of the fault (Fig. 3). This indicates a downthrow of the area to the north-east of at least 120 m. The NW–SE-striking north Amdrup Land fault, 7–8 km further to the north defines the northern limits of a narrow graben where outcrops are dominated by folded Permian and Jurassic sediments. The fault is exposed in a creek on the eastern coastal plain (locality X in Fig. 3a) where it strikes 150° and dips 70° towards the south-west. At this locality, Gzelian sediments are down-thrown at least 60 m compared to older Carboniferous sediments north-east of the fault. A possible third fault, the Antarctic Bugt fault, is suggested in the northern part of the study area (Fig. 3). On the coastal plain north of this lineament, isoclinally folded sediments of the Proterozoic Independence Fjord Group are faulted against upper Moscovian sediments by a normal fault striking 44° and dipping 50° to the north-west (Fig. 7). The throw on this fault exceeds 50 m. Immediately to the east of this fault, the basal black shales of the Wandel Sea Basin are thrust over younger Moscovian carbonates along a fault plane striking 178° and dipping 66° to the west (Fig. 7).

In the graben area between the Sommerterrasserne fault and the north Amdrup Land fault, the succession dips gently towards the south-east. The Permian and Jurassic strata are folded in gentle, *en echelon* domal folds with an amplitude of approximately 100 m, a wave length of 1–1.5 km and a lateral extent of 4–4.5 km (Figs 3, 8). Fold axes strike north-east with some local variations. North-east of the north Amdrup Land fault, the Moscovian sediments are folded in somewhat larger domal folds following a more easterly trend, and a larger domal synform with an amplitude of 250–300 m, a wave length of 3.5 km and a lateral extent of 7.3 km exposes Carboniferous, Permian and Jurassic sediments near Dværgfjorden (Figs 3, 8).

Fig. 7. Faulted contact between the Independence Fjord Group (**IF**) and Moscovian carbonates (**UM**). Immediately to the south of this view, the basal Moscovian shales (**BS**) are thrust over younger carbonates. The foreground exposures are approximately 30 m high.

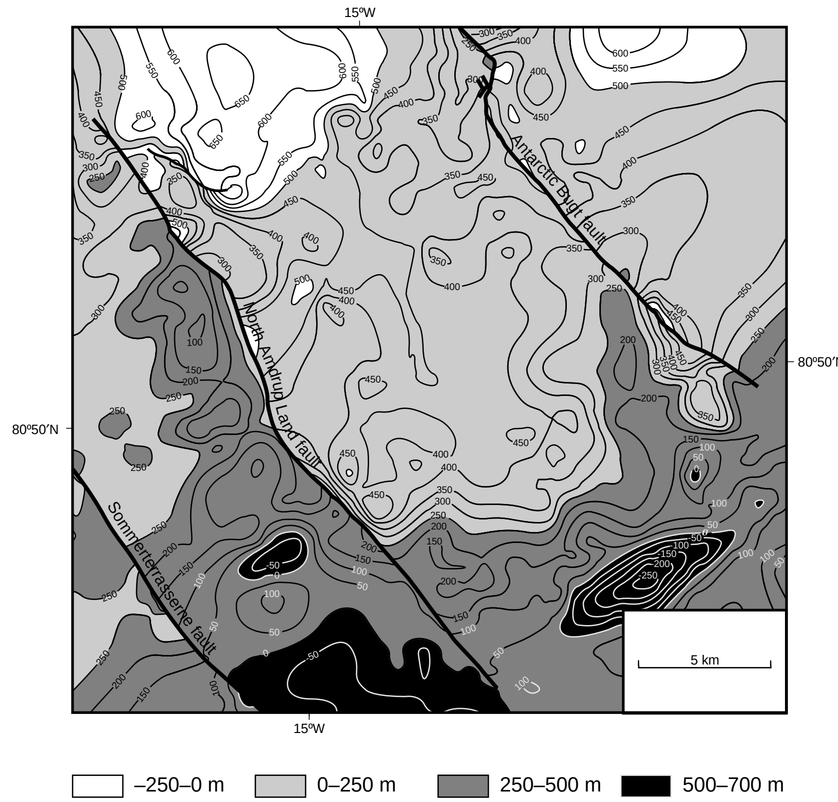

Fig. 8. Synthetic structural map of the base of the Kim Fjelde Formation based on constructed cross-sections. Note the large domal folds and the overall south-eastwards dip of the strata. The map area corresponds roughly to that of Fig. 3a. The main faults are marked and the depression towards the south-east corresponds to the Dværgfjorden syncline in Fig. 3a.

Discussion

The change of structural style across the Sommerterrasserne fault shows that this fault defines the southern limit of deformation related to the plate movements between Greenland and Spitsbergen in Amdrup Land, and therefore forms the easternmost landward part of the Trolle Land fault zone.

The conformal structural relationships between the Upper Permian strata and the Upper Jurassic sediments in northern Amdrup Land suggest minor tectonic activity during the Early Mesozoic. This is different from the pattern seen at Kilen and Prinsesse Ingeborg Halvø in northern Kronprins Christian Land and in eastern Peary Land where a major tectonic event, the Ingeborg event, has been recognised. In eastern Peary Land, the Upper Jurassic Ladegårdsåen Formation rests unconformably on tectonically disturbed Carboniferous – Middle Triassic strata (Håkansson 1979; Zinck-Jørgensen 1994).

The folding of the Wandel Sea Basin deposits north-east of the Sommerterrasserne fault took place after deposition of the Upper Jurassic sediments. It should therefore be correlated to either the mid-Cretaceous Kilen event or the latest Cretaceous strike-slip event of Pedersen (1988). The mid-Cretaceous Kilen event is described as a dextral extensional event along the NNW–SSE-trending faults in the Trolle Land fault system (Håkansson & Pedersen 1982). Several pull-apart basins, including the Kilen basin that has more than 1500 m of Upper Cretaceous sediments, were formed during this event. Thermal maturity data from the Jurassic sediments in northern Amdrup Land indicate a maximum overburden of 200–300 m (Stemmerik *et al.* 1998), and evidently the Kilen event did not lead to major subsidence of northern Amdrup Land. The NE–SW-trending fault that separates the Wandel Sea Basin sediments from the Proterozoic basement north-east of the Antarctic Bugt fault (locality Y in Fig. 3a) may be related to dextral extensional movements during the Kilen event.

The folding of the Wandel Sea Basin sediments in northern Amdrup Land most likely took place during the latest Cretaceous strike-slip event. This event is described as a dextral compressional event that in the Trolle Land fault system mainly led to E–W-trending domal folds and N–S-oriented thrusts (Håkansson *et al.* 1989). The observed ESE–WNW to ENE–WSW *en echelon* orientation of the folds corresponds to a dextral sense of displacement along the Sommerterrasserne, north Amdrup Land and Antarctic Bugt faults. From the structural map (Fig. 8) it is evident that the north Amdrup Land and Sommerterrasserne faults were active during this event. The north-easterly orientation of the fold axes in the graben area between the Sommerterrasserne and north Amdrup Land faults compared to the more easterly directions north-east of the north Amdrup Land fault may imply that the graben area saw the highest strike-slip intensity. However, the structural deformation of northern Amdrup Land is much less intense than seen further to the north in Kronprins Christian Land where the domal folds are associated with deformed thrust complexes (Håkansson *et al.* 1989, 1992, 1993).

The latest structural event in the area is extension along the Sommerterrasserne and north Amdrup Land faults. This event post-dates folding and led to formation of a graben between these faults. It is suggested that it correlates with a post-Paleocene extensional event described from other parts of the Trolle Land fault system (Håkansson *et al.* 1991).

Tectono-stratigraphic evolution

Deposition in northern Amdrup Land started during the mid-Moscovian. This is later than in southern Amdrup Land and southern Holm Land where it started during the early Moscovian but synchronous with the onset of sedimentation in northern Holm Land and eastern Peary Land (Fig. 2; Stemmerik & Håkansson 1989, 1991; Stemmerik *et al.* 1996). The depositional patterns led Stemmerik & Håkansson (1989, 1991) to suggest deposition on isolated fault blocks separated by NW–SE-trending lineaments (Fig. 1). Possibly, the Sommerterrasserne or north Amdrup Land faults, or both, were active during the late Carboniferous, forming the southern limits of a narrow block with a condensed late Carboniferous succession (190 m compared to > 350 m in southern Amdrup Land). Condensation is also seen on the southernmost fault block of the Trolle Land fault system in eastern Peary Land where Gzelian carbonates rest directly on Lower Palaeozoic rocks (Fig. 2; Stemmerik *et al.* 1996). The northern limits of the block most likely were defined by the Antarctic Bugt fault. This could explain the distribution of the basal shale unit, which is confined to the down-dip northern parts of the fault block whereas more coarse-grained sandy sediments occur up-dip along the north Amdrup Land fault.

The Early Permian event of non-deposition and prolonged subaerial exposure recorded elsewhere in the basin (Stemmerik *et al.* 1996) also affected northern Amdrup Land. Deposition started again during the mid-Permian and during Late Permian times, deeper shelf carbonates and cherty shales were deposited. There is no direct evidence of Triassic or Lower Jurassic sediments in the area. However, comparing thermal maturity of the Upper Permian and the immediately overlying Upper Jurassic (Oxfordian) sediments suggests deposition and removal of nearly 2000 m of post-Permian sediments prior to deposition of the Oxfordian sediments (Stemmerik *et al.* 1998). This is taken as indirect evidence of tectonic uplift and erosion during the mid-Jurassic Ingeborg event. The Upper Jurassic sandstones and siltstones were deposited in shallow marine environments. They form the youngest deposits in northern Amdrup Land and there is no evidence of extensive sedimentation in post-Oxfordian times.

The mid-Cretaceous Kilen event only affected the areas north-east of the Antarctic Bugt fault whereas strike-slip movements along the three major faults led to folding of the sediments of the Wandel Sea Basin possibly during the latest Cretaceous. Later, post-Paleocene movements led to formation of a graben between the Sommerterrasserne and north Amdrup Land faults.

Implications for the East Greenland shelf

The shelf areas east of Amdrup Land are regarded as the northernmost parts of the N–S-elongated Kronprins Christian Land basin (Haimila *et al.* 1990). Geophysical information from this northern part of the shelf is limited due to the ice conditions and consists mainly of regional aeromagnetic and gravimetric surveys with some additional refraction seismic data (Dawes 1990). Geophysical data from the shelf areas south of 80°N indicate that a series of N–S-oriented basins dominate this part of the shelf (Larsen 1990; Hinz *et al.* 1991; Escher & Pulvertaft 1995). Unpublished gravity data combined with the structural style of unpublished seismic lines acquired by Nunaoil A/S allowed Escher & Pulvertaft (1995) to outline a large salt basin between *c.* 76°30´N and 79°N; the northern limit is uncertain due to lack of data (Fig. 9). The absence of detailed geophysical information means that at present the geological understanding of the northernmost parts of the East Greenland shelf is based on onshore data.

The structural study of northern Amdrup Land shows that the Sommerterrasserne fault forms a continuation of the Trolle Land fault zone and that this lineament marks the southern limit of Late Mesozoic structural deformation. In eastern Peary Land it marks the boundary between the stable Greenland craton to the south

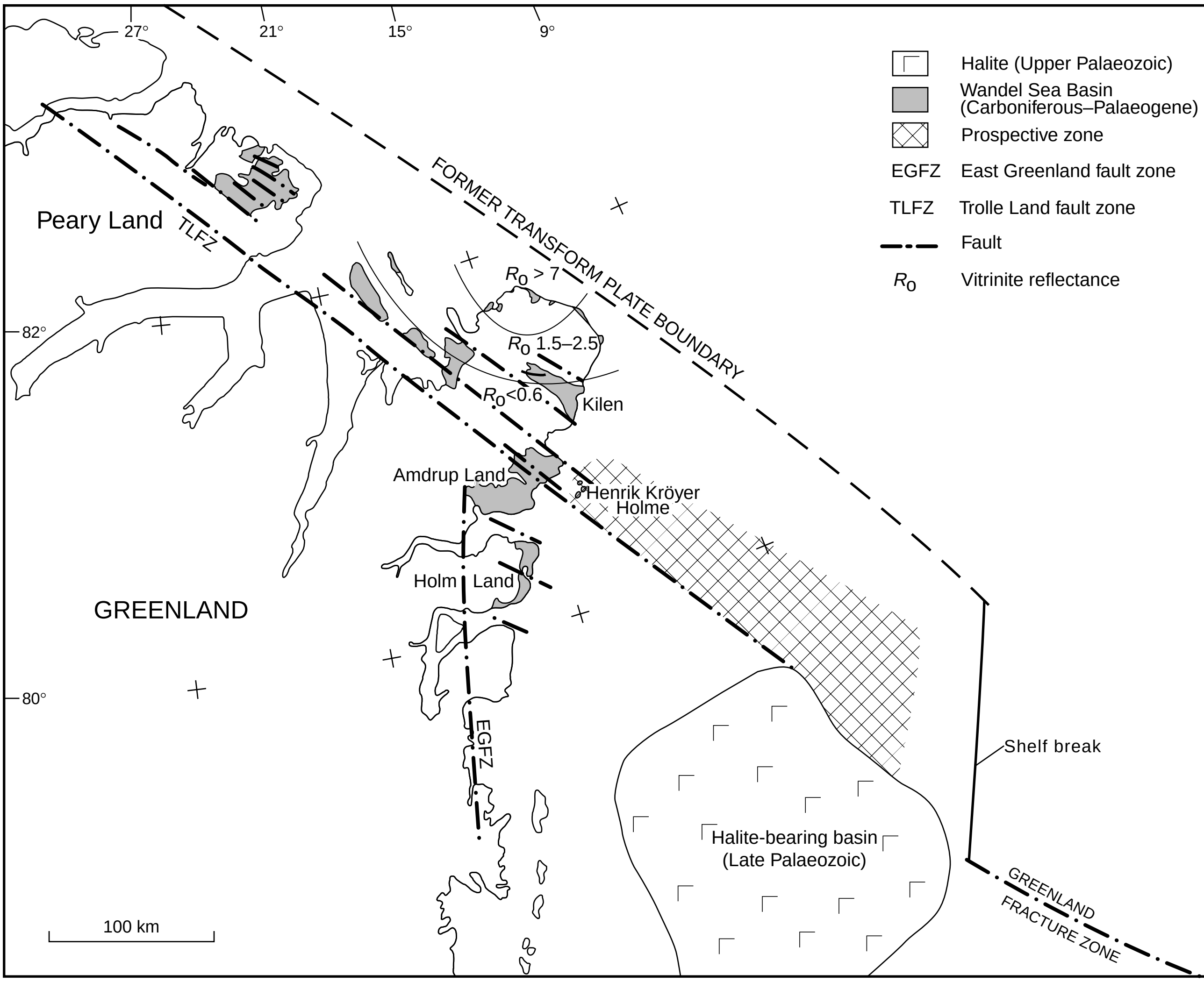

Fig. 9. Map of north-eastern Greenland and the northern part of the East Greenland shelf showing position of major depositional basins with inferred structural and thermal data. Vitrinite reflectance data (R_o) from Håkansson *et al.* (1994). The outline of the Palaeozoic salt basin and the general outline of the shelf are based on Escher & Pulvertaft (1995). Ice cover is not shown.

and the Carboniferous and younger depositional basins to the north (Håkansson & Stemmerik 1984, 1989; Stemmerik & Håkansson 1989; Stemmerik *et al.* 1996). In Amdrup Land, the East Greenland fault zone takes up this position and the Sommerterrasserne fault transects the area of deposition (Stemmerik & Håkansson 1989, 1991). It is therefore suggested that deposition occurred both north-east and south-west of the Trolle Land lineament in the offshore areas from the Carboniferous and onwards (Stemmerik & Worsley 1989, 1995). The eastward continuation of the structural style described from northern Amdrup Land into the offshore areas is confirmed by observations on the small islands of Henrik Kröyer Holme some 40 km east of Amdrup Land where folded Carboniferous carbonates crop out (Fig. 9).

Based on structural and stratigraphic studies in northern Kronprins Christian Land it is therefore assumed that the entire East Greenland shelf north of the Trolle Land fault zone was affected by late Mesozoic deformation. Structural studies of Kilen and Prinsesse Ingeborg Halvø in northern Kronprins Christian Land have outlined intense deformation associated with the latest Cretaceous strike-slip movements in these areas. Furthermore, thermal maturity studies of Carboniferous to Cretaceous sediments suggest that these northern areas were affected by a latest Cretaceous to Palaeogene thermal event that has destroyed most organic material (Christiansen *et al.* 1991; Håkansson *et al.* 1994). The combined structural and thermal maturity data therefore suggest that the pre-Paleocene sediments are post-mature with respect to petroleum generation and of limited economic interest in the northernmost parts of the shelf. In contrast, the sediments east of northern Amdrup Land and Antarctic Bugt are assumed to have lower thermal maturity based on data from the onshore areas. There, the Permian sediments are early mature with respect to hydrocarbon generation whereas the Upper Jurassic sediments are immature (Stemmerik *et al.* 1998). We therefore suggest that there is a prospective zone parallel to and immediately north of the Trolle Land fault zone with large domal structures and adequate thermal maturity (Fig. 9). South of this zone a very different structural style dominated by extensional structures is to be expected.

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