Reply

The Tertiary orogenic belt of West Spitsbergen: Seismic expressions of the offshore sedimentary basins. A reply

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The grabens on the inner shelf of West Spitsbergen are discussed and arguments for a Tertiary age of the graben infill are given.

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We thank Townsend & Mann (this vol.) for comments on our interpretations (Eiken & Austegard 1987), and certainly we agree that one should be cautious about postulating ages of the graben infill before the basins have been drilled. Nevertheless, we still consider an early Tertiary age of the basins to be most likely.

First, we are not confident about the significance of the grab-sampling results of Dibner (1978). We admit that the absence of Tertiary samples is a little suspicious, particularly for the presumably broad basin west of the Nordenskiöld Coast. But Dibner (1978) found upper Triassic and upper Permian samples even at the outer shelf and at the continental slope west of Spitsbergen, in contradiction to the Neogene age suggested in several papers (e.g. Myhre & Eldholm 1988), based on ties to the DSDP drillhole site 344 (Talwani et al. 1976).

Secondly, we see no inconsistency between Tertiary basins offshore and outcrops of older sediments onshore. In fact, Tertiary outcrops are present several places landwards of the coastline: in the Forlandsundet area, at Renarodden and at Øyrlandet. Furthermore, the offshore area is closer to the zone of separation between Svalbard and Greenland in Tertiary time and therefore more likely to have experienced extension. The West Sørkapp Land basin may extend offshore, but in our opinion the 20 km gap between Hornsundneset and the eastern end of line UB 38–81 is too large to justify a straightforward extrapolation.

Thirdly, we stress that seismic velocities of about 2.2–3.5 km/s observed in the basin sediments are much lower than in sediments of Carboniferous to Triassic age in the Central Spitsbergen basin (Eiken 1985) and in the Sørkapp area (Grønlie 1978). To our knowledge no velocity, density or porosity observations from the West Sørkapp Land Basin are available to determine if the diagenesis of the sediments there is much different from the area further east.

In 1987 a seismic line, SVA–3, which fills the gap between the West Sørkapp Land Basin and the offshore basin, was shot during the Mobil Search programme for Norwegian Universities as a two-ship wide-aperture profile (Fig. 1a). A velocity section and a coarsely processed reflection section are shown in Fig. 1c and 1b. We observe that the offshore basin is bounded to the east (or northeast); landward of s.p. 600 is an area with distinctly higher velocities and with no visible reflections. In our opinion this shows that the discussed graben is not the offshore portion of the West Sørkapp Land Basin.

We agree, however, that the small basin at the mouth of Isfjorden, where we have poor velocity control, might contain pre-Tertiary sediments only.

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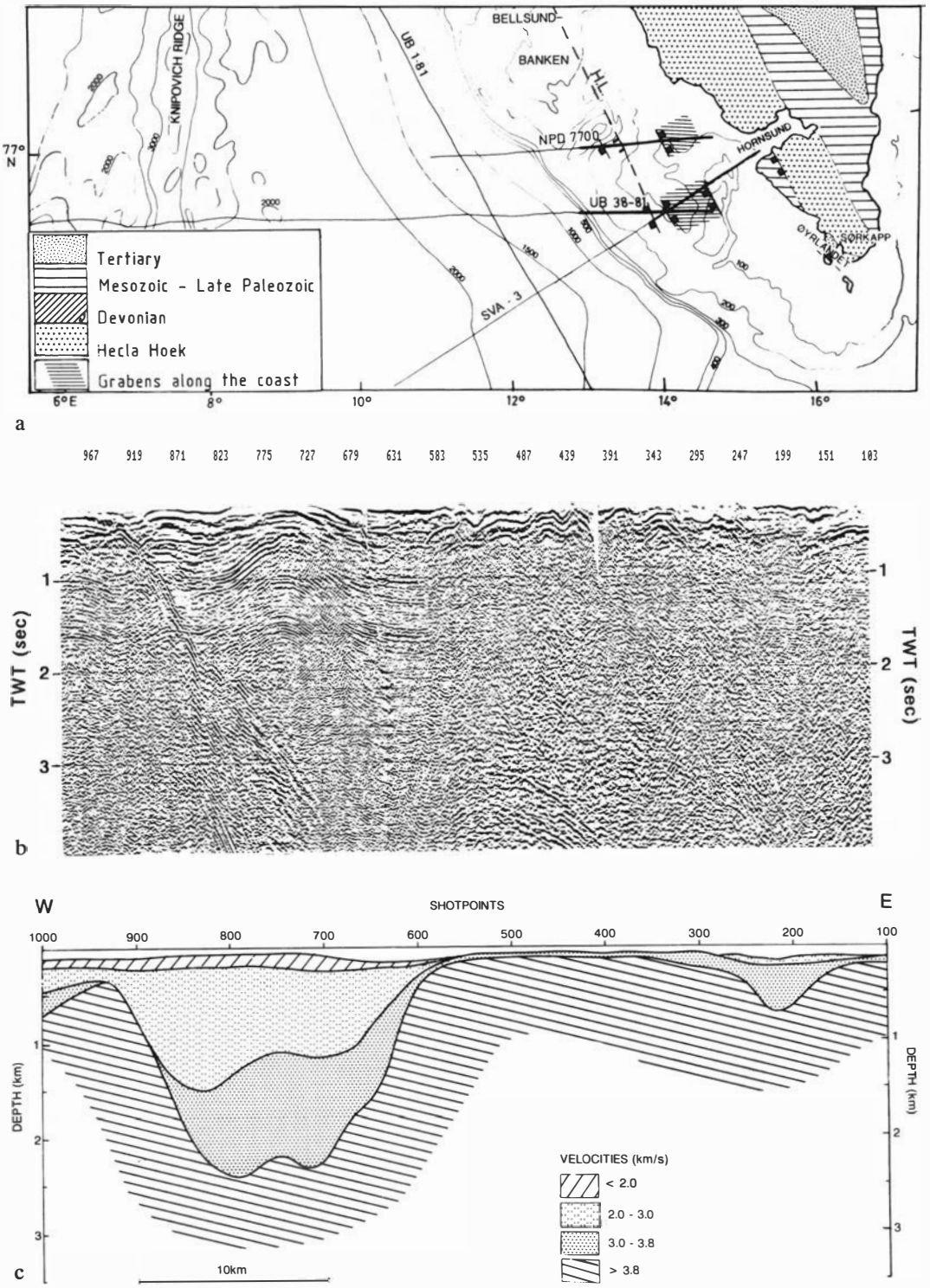

Fig. 1. Reflection profile (b) and velocity section (c) from the seismic profile SVA–3 west of Hornsund. The position is indicated by a thick line on the map (a).

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