

Source rock potential of the Dutch northern offshore

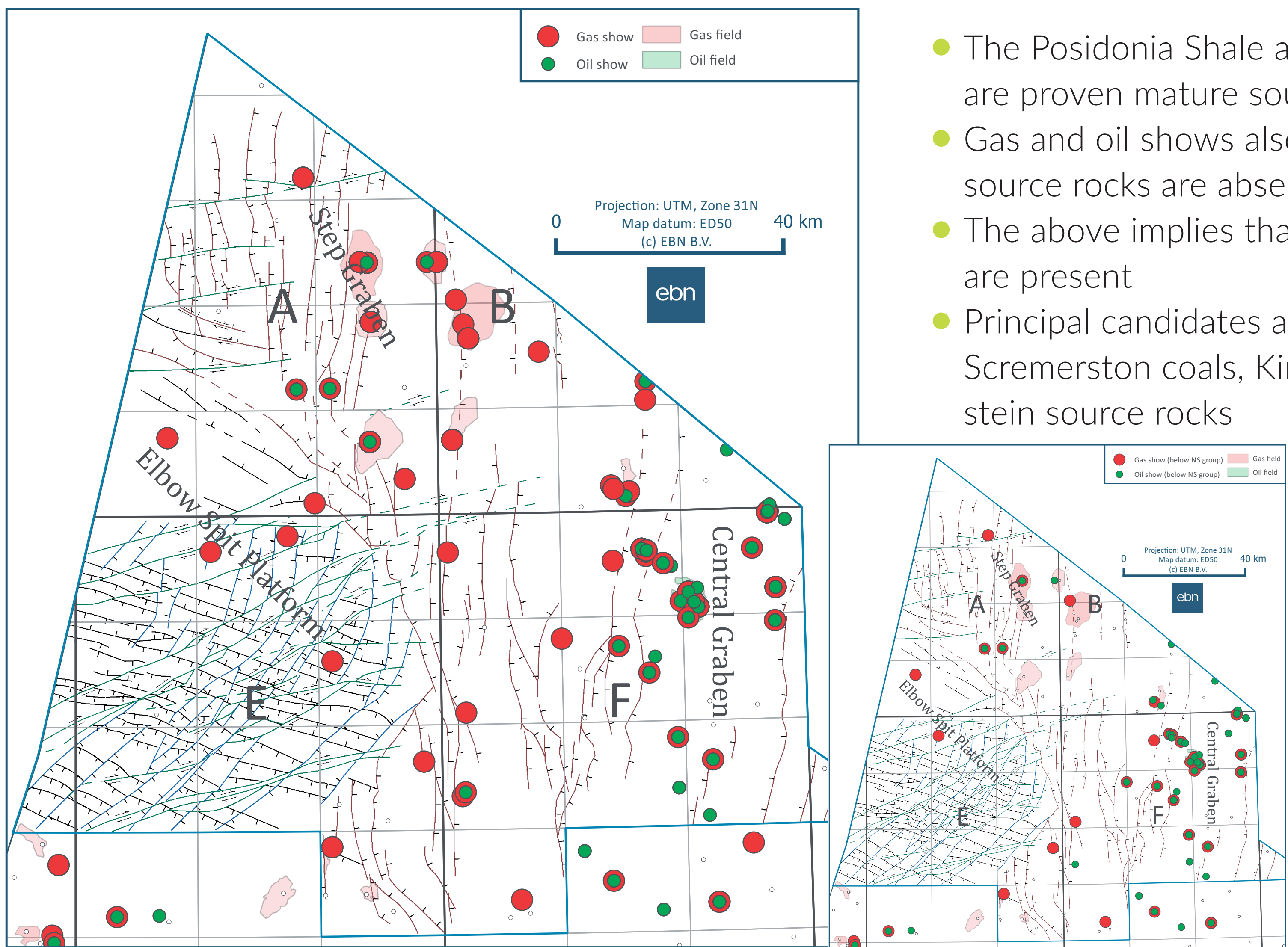


Fig. 1 Gas and oil shows. Inset: shows in the pre-Tertiary.

- The Posidonia Shale and Westphalian coal measures are proven mature source rocks
- Gas and oil shows also occur in areas where these source rocks are absent (fig. 1)
- The above implies that additional mature source rocks are present
- Principal candidates are Lower Carboniferous Scremerston coals, Kimmeridge Clay and intra-Zechstein source rocks

- **Shallow gas** can be sourced from biogenic and thermogenic sources. Shallow amplitude anomalies occur throughout the Step Graben and Central Graben (fig. 2)

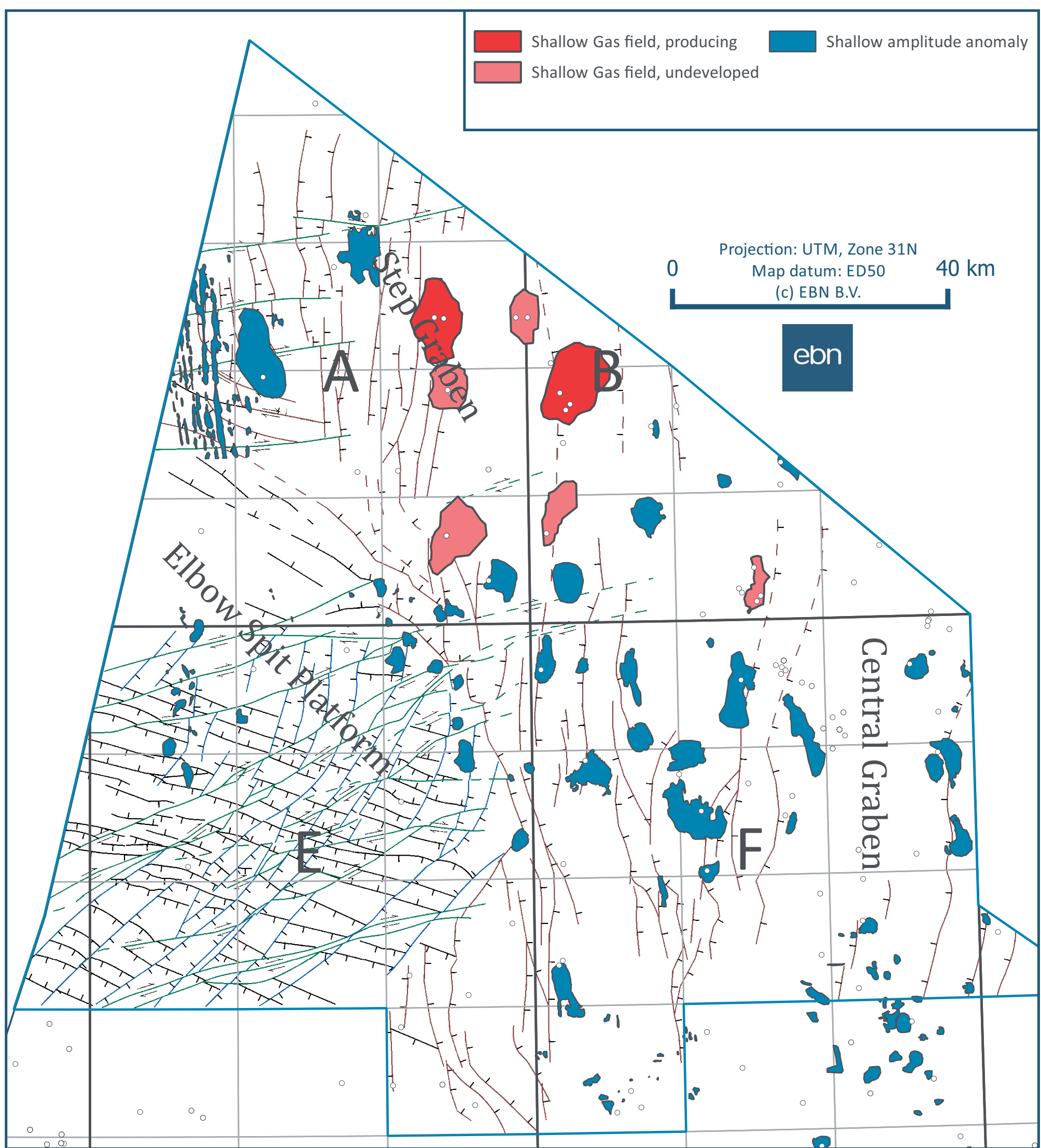


Fig. 2 Shallow gas fields and shallow seismic anomalies.

Presence of source rock bearing units

- Oil shows in the A quadrant may be linked to early mature Upper Jurassic 'hot shale', similar to Jurassic source rocks in the Danish and German offshore
- Gas and oil shows indicate that **intra-Zechstein** source rocks are present and mature in the Step Graben
- **Namurian shales** may provide additional charge in the southern E and F blocks
- **Westphalian coal measures** provide gas to Rotliegend and Carboniferous reservoirs

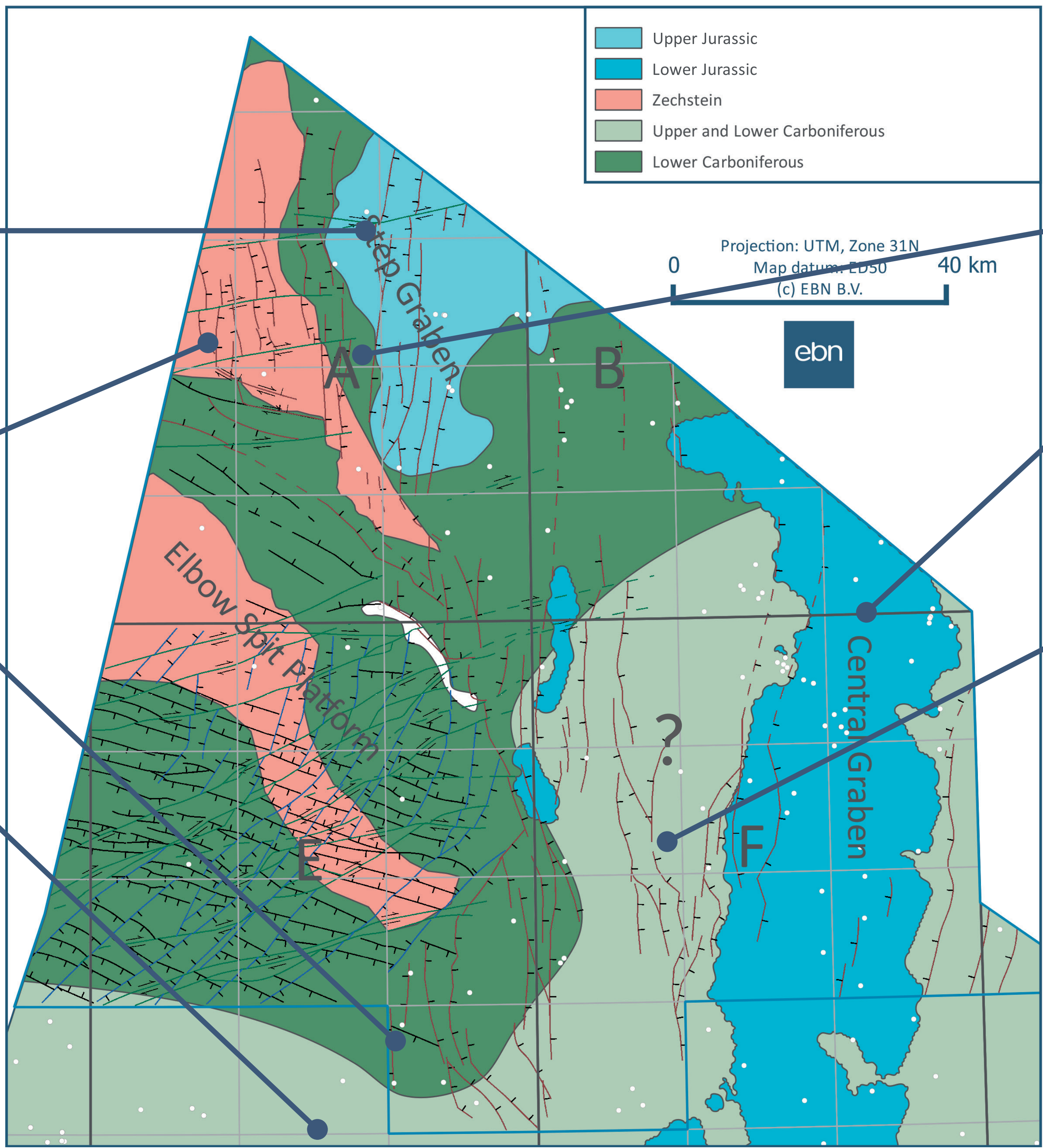


Fig. 3 Units with source rock potential. Where formations overlap only the shallowest formation is shown.

- Lower Carboniferous **Scremerston coals** are a promising source rock for gas in the A, B, E and F quadrants (see below)
- The Lower Jurassic **Posidonia shale** is a proven oil source rock in the Central Graben
- The Westphalian may be present in the Step and Central Graben

Scremerston coals: a 'new' source rock in the Dutch northern offshore

- Wells show increase in coal content in Scremerston Fm towards the N (fig. 4)
- 23 m coal in 39/07-1, 30 m in A09-01
- Coals coincide with high contrast seismic facies in well 39/07-1
- High contrast seismic facies also present in A quadrant (fig. 5)
- Yoredale Fm and Klaverbank Fm (Lower Carboniferous) also contain coal: up to 7.5 m encountered in wells

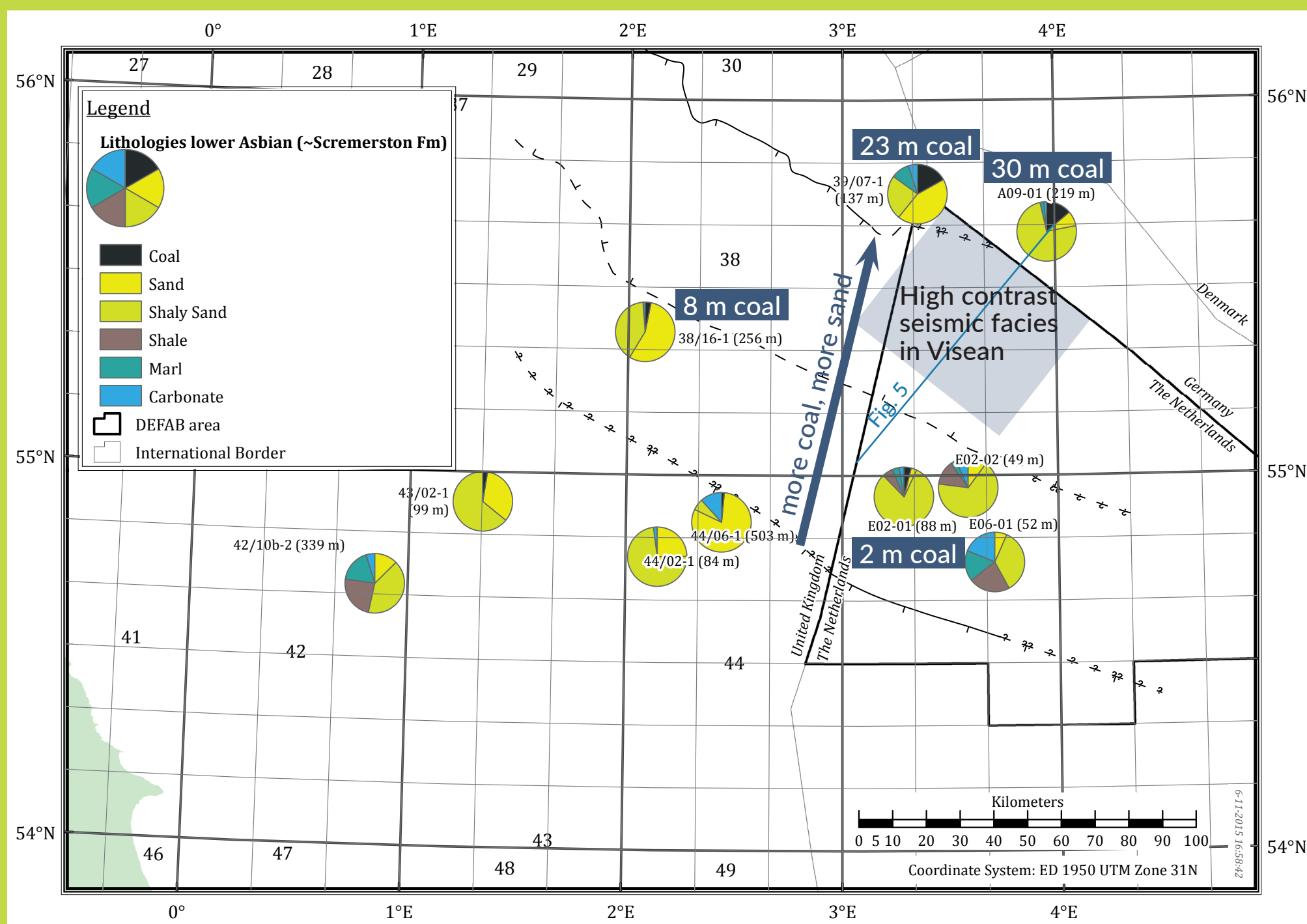


Fig. 4 Lithologies in the Lower Asbian (roughly equivalent with the Scremerston Formation)

Fig. 5 High contrast seismic facies in the Elbow Fm. (partial equivalent of the Scremerston Fm.). The projected position of well A09-01 (30 m coal) is shown. Public seismic line NSR32294, available through <http://www.nlog.nl/>.

