The Danish subsurface has potential for storage and usage of geothermal energy, CO₂, hydrogen, natural gas, or other resources facilitating the green transition, with multi-level reservoirs in large geological structures. Mapping and understanding the formation of such structures with their reservoir and seal successions are important to constrain framework of more detailed geological models to develop resource facilities, including CCS. The Stenlille structure in western Zealand of Denmark is a structure with a good sandstone reservoir quality (Gassum Formation), which has been used in more than thirty years for geological storage and usage of natural gas below a tight seal of mudstones and shales (Fjerritslev Formation). Onshore Denmark it is the structure with the most subsurface data available including twenty wells and 2D/3D seismic coverage. Thus, it is a very good site to study the geological evolution and setting, which may be used as an analogue to be applied to other sites with potential for CCS or as a demonstration site for CCS. The Stenlille structure and its adjacent region is underlain by Paleozoic to Mesozoic formations on crustal basement in the Danish Basin, where structures include Paleozoic rotated rift blocks and later mobilized salt pillows, which shaped the Mesozoic overlying successions. Reservoir quality sandstones are known from the Upper Triassic to lowermost Jurassic Gassum Formation and the deeper Lower Triassic Bunter Sandstone Formation, which both include regionally well-known geothermal energy reservoirs, but also have potential for CCS. The sandstones and interbedded mudstones of the Gassum Formation known from the wells in the Stenlille area, were formed during several depositional events (sequences) during relative sea-level fluctuations and were probably sourced through fluvial systems and nearshore environments from structural highs associated with the Ringkøbing-Fyn High to the south and the Sorgenfrei-Tornquist Zone to the east. 3D seismic data and wells show that channel systems in periods were formed around and partly across the Stenlille structure. Later, during Early Jurassic time the Gassum Formation was transgressed and covered by thick marine mudstones of the Fjerritslev Formation forming a main seal succession with a few thin sandy layers, particularly in the lower part. Subsidence and increasing thicknesses of the mudstone successions provided deeper burial, that probably conditioned mobilization of the Zechstein salt. The regional tectonism of the mid-Cimmerian phase may have been a factor that triggered faulting and contributed to mobilization of salt during the Jurassic time. The tectonism is reflected by several faults, most of which are striking SW−NE with small throws and also a few SSW−NNE striking faults. Most of the faults can be tracked to near the top of the Fjerritslev Formation and less faults appear into the Chalk Group. The top of the preserved Fjerritslev Formation at the top of the Stenlille structure is of Toarcian age (latest Early Jurassic time). It is mapped at a marked unconformity (the Mid-Cimmerian Unconformity), which is overlain by onlapping successions of the Lower Cretaceous Vedsted Formation, thus indicating a major hiatus at the unconformity. The Top Fjerritslev surface approximately mimics the topography of the Top Zechstein (top of the salt pillow) and the Stenlille structure is a four-way dip closure mainly formed by salt pillow growth and uplift with erosion of the upper part of the Fjerritslev Formation from the late Early Jurassic and later through Jurassic time. Some of the faults seem to compartment some of the Gassum Formation reservoirs and restrict lateral gas distribution in some cases and are important for other studies building static reservoir models and fluid/gas flow simulations. The results from the Stenlille structure may be applied to other similar structures such as the Havnsø structure located...
about 25 km further northwest - a structure which is also a four-way dip closure underlain by a salt pillow and affected by Jurassic and/or later reactivated faults.

Keywords: Carbon Capture Storage; CCS; Denmark; Stenlille structure; Gassum Formation; Salt pillow; Mesozoic faults; Natural gas storage