

Uplift and faulting of the Utsira High basement: evidence from low-T thermochronology

A.K. KSIENZYK^{1*}, J. JACOBS¹, H. FOSSEN¹, I. DUNKL² AND K. WEMMER²

¹*Department of Earth Science, University of Bergen, P.O. Box 7803, 5020 Bergen, NORWAY*

*(*correspondence: anna.ksienzyk@uib.no)*

²*Geoscience Centre, University of Göttingen, Goldschmidtstraße 3, 37077 Göttingen, GERMANY*

The Utsira High is a basement horst in the northern North Sea, flanked to the west and east by the Viking Graben and Stord Basin respectively, and composed of Caledonian granitic and gabbroic rocks. Since Caledonian times, the North Sea region has been affected by extensional tectonics leading to rifting, active fault tectonics and uplift of basement blocks. Extensive drilling due to recent hydrocarbon exploration has made the basement of the Utsira High accessible for thermochronological investigations that aim to reconstruct its tectonic history.

Zircon (U-Th)/He, apatite fission track and apatite (U-Th)/He dating on seven samples yielded Middle-Late Devonian, Late Permian-Late Jurassic and Middle Jurassic-Pliocene ages respectively, tracking cooling through successively lower closure temperatures and subsequent re-heating during sedimentary burial since the Jurassic. Generally basement rocks of the Utsira High reached near surface temperatures already in Carboniferous-Triassic times, much earlier than the oldest overlying sediments (Middle Jurassic-Cretaceous) might indicate. Surface exposure already in the late Paleozoic-early Mesozoic is in good agreement with clay formation in saprolites, dated at ca. 240-230 Ma (Fredin et al., 2012). The Utsira High is dissected by faults into several fault-bound basement blocks. Differences in cooling history between some of these blocks suggest that the faults were active in the late Paleozoic and Mesozoic. This is confirmed by K/Ar illite dating of fault gouge material recovered from one basement core, indicating a Jurassic age for that fault.

References:

Fredin, O., Sørli, R., Knies, J., Zwingmann, H., Müller, A., Vogt, C., Grandal, E.M. and Lie, J.E., 2012. NGF Abstracts and Proceedings 2, 22-23.