POPULAR SCIENTIFIC SUMMARY

DOCTORAL CANDIDATE: Alban Souche

DEGREE: Philosophiae Doctor

FACULTY: Faculty of Mathematics and Natural Sciences

DEPARTMENT: Department of Geosciences

SUPERVISOR(S): Prof. Torgeir B. Andersen,
Dr. Sergei Medvedev,
Dr. Marcin Dabrowski

DISSERTATION TITLE: Thermal evolution in sedimentary basins above large shear zones and detachments

POPULAR SCIENTIFIC SUMMARY:

The temperature of the crust is an important parameter for the exploration of natural resources such as petroleum and ore deposits, or for the use of geothermal energy. These temperatures can be predicted using numerical simulations but require a good knowledge of the geological system and a correct identification of the thermal processes within the crust. Two major heat sources are usually considered; the internal heat coming from the inner part of the Earth; and the radioactive heat production from upper crustal rocks. However, depending on the geological setting, additional heat sources and thermal processes may bring complexity to the thermal structure of the system.

Based on the study of the Devonian basins of western Norway, this doctoral thesis documents and quantifies the importance of additional thermal processes such as *shear heating* and *thermal convection*. The Devonian basins formed above a large extensional fault (detachment) active when Greenland started to drift away from Norway after the Caledonian mountain building. The determination of the peak-temperatures of the sediments show a characteristic increase toward the fault and suggest that an important heat source contributed to the heating of the basins close to the detachment. The numerical modeling presented in this study demonstrate that the deformation of rocks within the detachment was accompanied with a significant thermal feedback, so-called *shear heating*, exceeding 100 times the heat produced by radioactivity within the crust. Different numerical scenarios considering the fluid mobility in the sediments suggest that *thermal convection* most probably redistributed heat in the basins and along structural pathways and efficiently cooled the upper part of the basins.

Alban Souche's thesis demonstrates that *shear heating* and *thermal convection* may have controlled the thermal structure of the Devonian basins of western Norway and the results of his work may have implication for better understanding thermal processes in sedimentary basins formed above large-scale detachment zones.