DOCTORAL CANDIDATE:	Thea Hatlen Heimdal
DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Department of Geosciences, Centre for Earth Evolution and Dynamics - CEED
AREA OF EXPERTISE:	Volcanism and climatic/environmental effects
SUPERVISORS:	Henrik H. Svensen, Sara Callegaro, Morgan T. Jones & Reidar Trønnes
DATE OF DISPUTATION:	6th of December 2018
DISSERTATION TITLE:	*Large-scale sill emplacement of the Central Atlantic Magmatic Province (CAMP) in the Amazonas and Solimões basins, Brazil: a multidisciplinary approach to unravel the implications for the end-Triassic crisis*

I løpet av Jordas historie har det oppstått fem store masseutryddelser, hvor over 70 % av livet ble utryddet og det oppstod store klimatiske endringer. Fire av utryddelsene korrelerer i tid med store vulkanutbrudd, og det har lenge hersket enighet i at hendelsene har en sammenheng. Men hva er det som gjør disse vulkanutbruddene så dødelige? Heimdal har i sin avhandling forsket på gassdannende interaksjoner mellom lavaer og sedimentære bergarter, og finner at sub-vulkanske prosesser spiller en viktig rolle ved masseutryddelser og klimaendringer, da den totale mengden klimagassutslipp øker betraktelig.

The end-Triassic crisis, a prominent mass extinction- and global warming event in the geological record, occurred at the same time as the Central Atlantic Magmatic Province (CAMP), around 201 million years ago. CAMP intrusions (un-erupted lavas) are present in the Amazonas and Solimões sedimentary basins (Brazil), which comprise many layers of salt- and carbon-rich rocks. Interactions between the intrusions and such sedimentary rocks could have led to significant greenhouse gas generation, with profound effects on the environment if released to the atmosphere. However, previous studies have mainly focused on the extrusive section (erupted lavas) of the CAMP, and detailed studies regarding the intrusive rocks have been absent.

This doctoral study explores a multidisciplinary approach to unravel the extent and implications of interactions between the intrusions and sedimentary rocks. The main findings are as follows: A) Thermal modelling demonstrates that contact metamorphism (heating) of the carbon-rich rocks could have generated 88,000 Gt CO2. For comparison, the annual anthropogenic CO2 emissions are estimated to ~ 35 Gt. B) Numerical modelling demonstrates that the release of this carbon led to major carbon cycle disturbances, which match that of which is previously documented by end-Triassic sedimentary records. C) Geochemical evidence shows that interactions between the sills and salt-rich rocks likely increased the release of toxic chlorine gases. Parts of the results from this thesis are published in the Nature journal *Scientific Reports* (cf. Heimdal et al., 2018, Scientific Reports, 8, 41).

The findings in this PhD study strengthens the case for an active involvement of CAMP in the end-Triassic crisis, and that sub-volcanic processes are of major importance in driving climate change and mass extinctions.