Microscopic characterization of mineral building materials

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In this research project we will answer several currently existing unknowns in the characterization of mineral building materials and their weathering. The first phase of this project focusses on the multi-scale characterization of the mineral building materials. Micro-tomography (μCT) and scanning electron microscopy – energy-dispersive X-ray spectroscopy (SEM-EDS) will be used to identify the different components within the selected building materials. μCT is a non-destructive imaging technique which allows 3D characterization of structures within mineral building materials and the identification of minerals based on the attenuation coefficient as each mineral has a unique attenuation coefficient which depends on their mineralogical composition, its density and X-ray energy. Without prior knowledge of the identity of the present minerals, however, it remains very challenging to identify which grey value in the μCT image corresponds to which mineral as μCT does not provide compositional information in the way that SEM-EDS does.

Both μCT and SEM-EDS will be used in this project to characterize different mineral building materials and to pinpoint the limitations of the current μCT setup. Where possible, optimal scanning parameters will be applied to enhance the contrast between different minerals. Besides mineral identification, attention will be given to multiscale pore structure characterization. As there is an important trade-off between resolution and sample size, a workflow will be set-up in order to characterize the material at different resolutions in order to obtain the multi-scale pore characteristics. In a further stage of this project also information of features smaller than the resolution will be obtained.