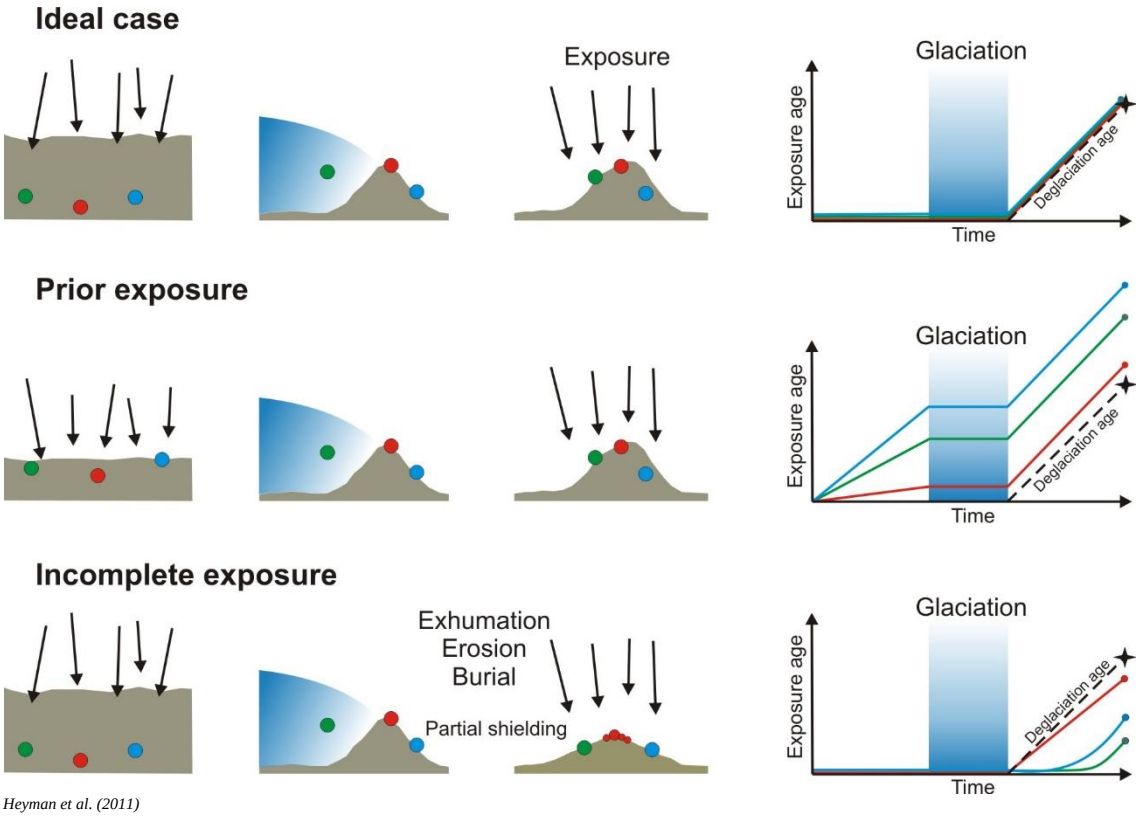
One of the most intriguing geological remnants of the past glaciations are large erratic boulders scattered across areas formerly covered by glaciers and ice sheets. In the "DatErr 2.0" project we will use these large boulders to reconstruct the chronology and dynamics of the past ice sheet retreat. Our research area is located in Poland and Germany, in regions which were repeatedly covered by the southern fringe of one of the largest Pleistocene ice sheets – the Scandinavian Ice Sheet (SIS). The scientific goal of this project is to constrain the exposure history of erratic boulders deposited within the southern fringe of the SIS and to reconstruct chronology and dynamics of the SIS`s southern margin during the last two glacial episodes of the Pleistocene: the Saalian glaciation and the maximum extent of the Weichselian glaciation. Our project will focus on surface exposure dating of erratics deposited within the marginal zone of the SIS with multiple cosmogenic nuclides produced in-situ in quartz: ^{26}Al, ^{10}Be and ^{14}C. In-situ cosmogenic nuclides build-up predictably with time in minerals exposed to the cascade of secondary cosmic rays. The use of these nuclides over the last thirty years has revolutionized our abilities to detect and quantify dates and rates of geomorphic processes, including reconstruction of the past ice sheets. Thus, direct dating of surfaces released from below the ice cover (bedrocks or erratics) with in-situ cosmogenic nuclides is currently one of the most widely used technique to develop chronologies of glacial events.

The realization of the project is planned within the next five years. Two PhD students will be involved in the project, and the cooperation with external collaborators from the *European Centre for Research and Teaching of Environmental Geosciences (CEREGE)* in France and from the *Cosmic Ray Isotope Sciences at Dalhousie (CRISDal) Laboratory* and the *André E. Lalonde AMS Laboratory* in Canada is planned. The research methodologies that we are going to apply consist of three main types of methods: (1) fieldwork, (2) laboratory work and (3) data analysis. Fieldwork will provide a detailed investigation of erratic boulders and their sampling for in-situ cosmogenic analyses. The laboratory work will include sample preparation for in-situ cosmogenic nuclides analyses, as well as Accelerator Mass Spectrometry (AMS) measurements of in-situ ^{26}Al, ^{10}Be, and ^{14}C. Data analysis will include appropriate statistical treatment of the surface exposure ages with the analysis of the statistical distribution of the ages within the dataset. This will enable to properly interpret the obtained results and reconstruct a reliable chronology of the SIS retreat. The exposure/burial history of the erratic boulders will be quantified with two-nuclide approach. The entire geochronological dataset will be integrated with relative chronologies inferred from geomorphology, and with geological data indicating ice margin oscillations, using Bayesian approach. We expect that the new, accurate chronology, together with existing data, will allow us to confidently reconstruct the dynamics of the former ice margin along its southern front during the Saalian glaciation and the maximum extent of the Weichselian glaciation.



Heyman et al. (2011)