Oxygen first appeared in the Earth's atmosphere approximately two billion years ago, during the “Great Oxygenation Event”, setting the stage for the evolution of increasingly complex life. Shortly afterward, O₂ concentrations declined to very low, but non-zero values, referred to as the “Oxygen Overshoot”. However, it is unclear whether the decline occurred rapidly or over tens of millions of years, and how much O₂ levels decreased. To better understand the evolution of O₂ during this critical interval, I will collaborate with Dr. Stefan Lalonde at the Institute Universitaire Européen de la Mer (IUEM). IUEM is home to one of only three laboratories in the world with the proven capability to measure the stable isotope composition of molybdenum in carbonate rocks, which reflects the oxygenation of the atmosphere under which these rocks formed. Through measuring a large collection of rock samples that formed 2.02 – 1.87 billion years ago, a high-resolution dataset constraining O₂ will be constructed. Ultimately, this will help to understand the Great Oxygenation Event and Oxygen Overshoot, and their influence on the evolution of early life.