Changes in glaciers are among the most visible manifestations of a changing climate. Retreating mountain glaciers have significant impacts on global sea-level rise and stream flow of rivers. Modeling the response of glaciers to climate change is important for many reasons including predicting changes in global sea level and water resources. The mass balance of a glacier provides a robust way of ascertaining whether there has been a net loss or gain of ice from the glacier. The mass balance reflects all of the meteorological forcing of the glacier – from the accumulation of snow and the combined losses from ablation and sublimation. The glaciers in the Himalayan region are considered sensitive to climate change and their fate under climate change is critical to the billions of humans that rely on rivers originating from these glaciers. Owing to complex terrain and harsh climate, Himalayan glaciers have historically been poorly monitored and this makes it harder to understand their past and predict their future.

In this study we model the observed mass balance of Himalayan glaciers using the methods of Radic and Hock (2011) and analyze the response to future changes in climate based on the model projections from the Coupled Model Intercomparison Project Phase-5 (CMIP5; Taylor et al., 2012). We make use of available observations of mass balance from various sources for 14 glaciers across the Himalayas. These glaciers are located across distinct climatic conditions - from the Karakoram and Hindu Kush in the West that are fed by winter precipitation caused by westerly disturbances to the Eastern Himalayas where the summer monsoon provides the bulk of the precipitation. For the historical observed period, we use the ECMWF Re- Analysis (ERA-40) for temperature and VASClimO (GPCC) data at 2.5°x2.5° resolution to calibrate the mass balance model. We evaluate the CMIP5 model simulations for their fidelity in capturing the distinct climatic conditions across the Himalayas in order to select suitable models to study future response of the glaciers in this region.