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Studies on changes of Greenland ice sheet under the East Greenland Ice Core Project (EGRIP)

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Greenland Ice Sheet has been recently experiencing drastic changes such as extended summer melting and increasing mass losses. There is an urgent need to understand the mechanisms of such changes, since they are directly linked to the global sea level rise. Greenland ice cores have so far provided valuable information on melt events and changes in the surface mass balance in the past. Moreover, the data obtained from multiple deep ice cores drilled during the last few decades, combined with modeling studies, have recently enabled us to reconstruct the past changes of Greenland Ice Sheet elevation. The previous ice cores were drilled at sites with minimal horizontal ice flow, as the main purpose of the past ice coring projects were to reconstruct the past climate and environment at the drill sites. Information on ice flow dynamics obtained from such ice cores has therefore been limited.

Understanding of the mechanisms of basal sliding and ice deformation is prerequisite for better projections of the future changes of Greenland Ice Sheet and sea level rise. To understand the Greenland Ice Sheet dynamics, East Greenland Ice Core Project (EGRIP) was proposed by the University of Copenhagen. Japan, Germany, France and Switzerland have been invited to participate in this international project. Under EGRIP, a deep ice core to the bed will be drilled at the onset of the North Greenland Ice Stream (NEGIS), where horizontal flow velocity is expected to be several tens of kilometers per year. As NEGIS is the largest ice stream in Greenland, the EGRIP ice core will certainly advance our knowledge on the dynamics and past changes of Greenland Ice Sheet. The EGRIP core will also give us an ideal opportunity to reconstruct the climate and environment changes during the early Holocene, which was considered to be warmer than today and would be an excellent analogue to the future Greenland affected by global warming. The results from the EGRIP core will fill the gap of our knowledge due to the lack of the high resolution and detailed ice core records from early Holocene.

Keywords: Greenland, Deep ice core, EGRIP, Ice sheet dynamics, Ice stream