Geophysical Research Abstracts, Vol. 9, 02911, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02911

Pleistocene East Antarctic Ice Sheet variations in the Ricker Hills

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The Ricker Hills area (75˚40'S, 159˚20'E) is a key site for glacial geological and geomorphological studies of northern Victoria Land. Located at the boundary of the East Antarctic Ice Sheet (EAIS), about 100 km from the coast, the nunatak is not affected by alpine glaciers. Thus, its relict glacial features and deposits are a direct proof of past EAIS fluctuations.

At least five glacial drifts (RH 1–5) can geomorphologically be distinguished in the Ricker Hills. The youngest drifts RH 1 and RH 2 represent glacial activities during the Holocene and Late Glacial, respectively. Glacial sediments related to a late Wisconsinan ice level variation are called RH 3 drift, while RH 4 stands for an older Pleistocene drift deposit. The oldest unit RH 5 is the Ricker Hills Tillite, which can be correlated to the Sirius Group. Whereas a detailed geomorphological map of the area exists, an absolute chronology is missing.

With surface exposure dating with in situ produced terrestrial cosmogenic nuclides (^{10}Be and ^{21}Ne) we try to shed light onto the time structure of Pleistocene EAIS variations. Our main interest is to date the older glacial drift RH 4. Therefore, we collected several erratic boulders from this drift. Where available, we sampled quartz-bearing erratics to benefit from the multiple cosmogenic nuclide analyses (^{10}Be, ^{21}Ne) that are possible in quartz. In addition to the sandstone and quartzite samples we collected

some dolerites for cosmogenic ^{21}Ne measurements in pyroxenes. The obtained ^{21}Ne minimum exposure ages for the RH 4 drift vary considerably from 83 $\pm$ 14 kyr to 929 $\pm$ 29 kyr. The ^{10}Be results are quite consistent with the noble gas data, indicating no complex exposure history for the oldest samples and only a short time of burial or pre-exposure for the younger samples. The ^{21}Ne-^{10}Be erosion rate for the oldest sample (quartzite) is 35 $\pm$ 10 cm/Myr. If the youngest sample was really deposited in an early phase of the Wisconsinan, or its young age is a result of overturning after deposition due to periglacial activity, is not clear yet. However, our data suggest that the glacial drift RH 4 was not deposited in one single event but is the result of different – at least two – changes in the EAIS surface level. One event seems to have occurred around 270 kyr, the other one occurred earlier around 930 kyr before present.