Improving hydrological models focusing not on hydrology

V. Emetc

Australian National University, Research School of Earth Sciences, Australian Capital Territory
Email: veronika.emetc@anu.edu.au

Abst The problem with describing the whole hydrology of the Earth is very diverse and the uncertainties of the future predictions come from various sources. Whereas new methods for the calculation of soil moisture, evaporation, surface runoff, stream flow and ground water have being developed, the input to the global hydrological cycle of mountain glaciers and ice sheets, in particular of the melted ice from Antarctica, has being taken arbitrary due to the difficulty to estimate the overall mass balance and find triggers of the current downward trends.

Here we are focusing on Antarctica, but the method can be applied to other floating ice tongues as well. One part of the problem comes from the ice sheet models ignoring description of processes that might be crucial for the future stability of the ice sheet. Particularly, we are focusing on is calving of icebergs from the floating parts of the ice sheet, or ice shelves. None of the existing ice sheet models describe the calving process in a comprehensive way. However, only the surface melting that models include so far can have just a minor or indirect influence on the stability of the ice sheet.

The main complication is caused by the large number of processes such as cracks propagation, depth and direction of cracks, penetration of surface melted water into cracks, changing geometry of the basin, tides and basal melting, that may cause calving. In our work we are focusing not on the direct physical influence of each of the above processes, bur on the correlation between calving events and the possible triggers. In other words, we calculate the value showing how each process inputs into a calving at every particular ice shelve. After, by calculating the probability of every event to occur we estimate the combined effect and thus knowing how likely a calving to happened. Thus,we are able to know where calving is more likely to occur and to calculate more precisely the overall loss of the ice from Antarctica. It's a challenge, because not only the calving process at ice tongues has been added to the current models, but neither the growth of the ice tongues, so that the grounding lines are static.

Thus, our work includes three main steps: allowing ice shelves to grow, putting conditions when calving from the ice shelves must occur and constraining the model adding data from satellite images into the calving function. The information about the calving rate can give as a more clear idea about the amount of melted water from Antarctica. Having develop more precise modelling of the ice sheet we can make the current hydrological models be more reliable and will allow us to make better future projections on the global scale.

Keyw *Antarctica, ice shelves, calving rate*