令和元年度　環境科学院　修士論文内容の要旨

Distribution and area changes of glacial lakes in Nepal by Sentinel-2

（Sentinel-2 によるネパールの氷河湖の分布と面積変化に関する研究）

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Since the 1960s, the number and area of glacial lakes in Nepal have increased and expanded rapidly due to climate change. This study upgraded the former inventory of glacial lakes (>0.1 km^2) across the Nepal Himalaya by manual digitization of Sentinel-2 images, and identified 141 glacial lakes (>0.1 km^2) in Nepal, which covered a total area of 46.70 ± 1.90 km^2 in 2018. Small glacial lakes of <0.4 km^2 contribute 83% of the total number of the glacial lakes, but only 7 glacial lakes of >1km^2 were account for 33.5% of the total lake area. Small lakes (size between 0.1 and 0.4 km^2) have larger number and area, and 95.7% of the glacial lakes lie above 4000 m. Unconnected glacier-fed lakes dominate in area and number. Glacial lake shows the difference in the spatial distribution: Province No.1 and Karnali Province have larger number and area of glacial lakes. The total area of glacial lakes (>0.1 km^2) in the Nepal Himalaya increased from 46.7 km^2 in 2016 to 47.98 km^2 in 2018 at an increasing rate of 0.64 km^2 per year. The total number of glacial lakes had no change in these 3 years. For the small lakes (size between 0.1 and 0.4 km^2), unconnected glacier-fed lakes exhibited the most rapid area change, but for the larger lakes (>0.1 km^2), proglacial lakes exhibited the most rapid area change. Also, glacial lakes show dissimilar rates of expansion in different provinces and altitudes of Nepal. The glacial lakes in Province No.1 has experienced rapid expansion. In addition, the rapid area expansion of glacial lakes had occurred at altitudes between 4500 m and 5500 m from 2016 to 2018. The results show that the Lower Barun located in the Province No.1 has the highest expansion rate among 7 large glacial lakes (>1 km^2) in 2018. This study found that Sentinel-2 has good potential to update glacial lake inventory regularly and monitor annual area change of large glacial lakes because it can help in understanding glacial lake expansion with high accuracy. It is also recommended to conduct on-site surveys to assess the risk of GLOFs in addition to surveys by Sentinel-2.