SARと光学画像によるカナダ・ユーコン地域におけるサージ型氷河の動態
Dynamics of surge-type glaciers in Yukon, Canada, inferred from SAR and optical images

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Ice flow speed is one of the essential components to know glacier variations. Short-term speed-up events such as seasonal fluctuations and glacier surging are attributed to enhanced basal sliding, which can be influenced by evolution of subglacial drainage system and effective water pressure (ice overburden pressure minus basal water pressure). Due to logistic problems, the mechanism has not been fully understood.
Recent advances in space geodetic technique have enabled us to reveal the spatial and temporal changes in ice speed over entire ice sheet and mountain glaciers. We first revealed the spatial and temporal speed changes at surge-type glaciers in Yukon, Canada, using ALOS/PALSAR radar images between 2007 and 2011, and we found winter speed-up at their quiescent phases (Abe and Furuya, 2015). In the absence of surface meltwater input in winter, we suggested the importance of englacial water storage in basal crevasses, and extracted water with high water pressure may enhance the basal sliding.
In 2014, two new SAR satellites were successfully launched, one of which is ALOS-2 with L-band SAR sensor PALSAR-2 operated by JAXA and the other is Sentinel-1 with C-band sensor operated by ESA. They can acquire higher resolution images with shorter intervals, which will reveal more detail information about basal condition, where it is extremely difficult to observe directly.
Landsat optical images have been also used for glaciological research for a long time. Recently, Landsat 8, which was launched in 2013, has given significant impacts on glacier velocity mapping of ice sheets and mountain glaciers (e.g., Fahnestock et al., 2015). Thus, we have also derived the spatial and temporal speed changes near the border of Alaska and the Yukon, using similar feature tracking program (Abe et al., 2015), and we found three ongoing surging events (Klutlan, Steele, and Walsh). Each glacier has the different pattern of spatial and temporal velocity changes associated with the surging event, which is reflected in the meteorological condition and the thermal structure at each glacier.
In our presentation, we will report some new findings derived from satellite images, and discuss future prospects in order to better understand glacier dynamics focusing on the differences between the radar and optical images.

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