

## Heavy rainfall-induced displacement of more than 2.5m in the Kushiro Marsh in 2016, detected by ALOS-2 SAR

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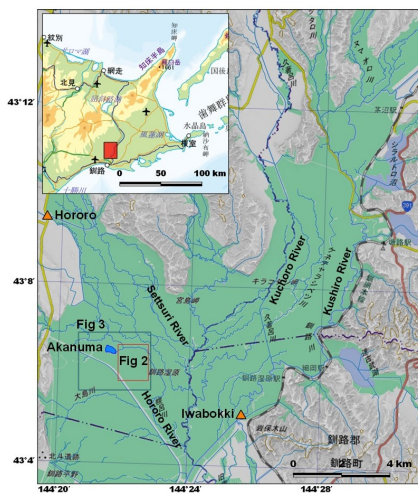
### 1. GSI of Japan

The Kushiro Marsh in eastern Hokkaido is the largest wetland in Japan. Monitoring changes in environmental conditions is important to support preservation of the wetland. In the summer of 2016, Hokkaido was affected by several typhoons and suffered record-breaking heavy rainfall. We constructed ~50 ALOS-2 SAR interferograms, covering the Kushiro Marsh for the period 2014 to 2018, including the summer of 2016. A time series of vertical displacement of the wetland detected by the interferograms corresponded with water level changes in the rivers in the wetland. This implied that the SAR data had successfully detected the height change of the water surface in the wetland. Between August 6, 2016 and September 5, 2016, an area of the wetland (~1 km) to the southeast of Akanuma shifted ~2.7 m horizontally in the downstream direction, which coincided with a large and rapid increase in the water level caused by the heavy rains. This large displacement remained after the water level decreased. Prior to this large horizontal shift, an uplift of ~10 cm was identified in almost the same region. This uplift might have been caused by the leaking of groundwater from the basement of the Akanuma pond, and implied that the peat layer, which had a thickness of several meters floated slightly, like a floating islands, possibly causing the large horizontal shift.

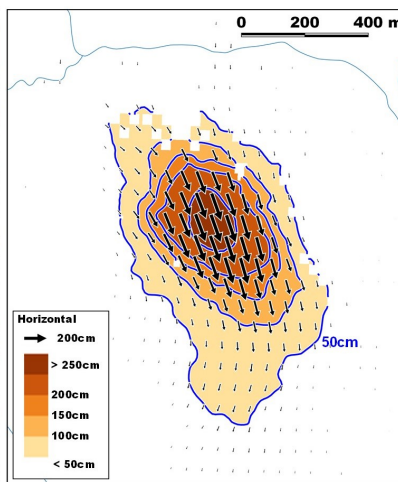
### Reference

Fujiwara et al. (2019): Heavy rainfall-induced displacement of more than 2.5m in the Kushiro Marsh in 2016, detected by ALOS-2 SAR, *Journal of Geography (Chigaku Zasshi)*.

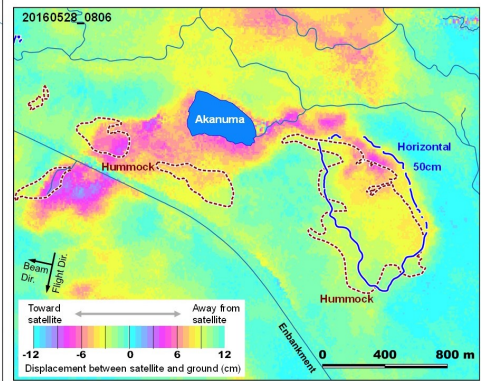
Keywords: Kushiro Marsh, environment of wetland, underground water, heavy rainfall, surface displacement, ALOS-2



**Fig 1** Map of the Kushiro Marsh. The light green areas denote the wetlands. The red rectangles denotes the area shown in Fig 2, and the dark blue rectangle corresponds to the area shown in Fig 3.



**Fig 2** Horizontal displacement to the southeast of Akanuma in the summer of 2016 detected by ALOS-2 SAR.



**Fig 3** ALOS-2 SAR interferogram of around Akanuma. The blue line denotes the area with large horizontal displacement (> 50cm). The brown broken lines denote hummocks.