Figure Legend

Figure 1. The southern Inylchek Glacier in central Tien Shan, Kyrgyzstan (black box region in inset map). The glacier outline (red) is adapted from the GAMDAM glacier inventory (Sakai and others, 2015). The purple box is the study site shown in Fig. 2. Image is Landsat-8/OLI taken on 4 September 2017.

Figure 2. Study area imaged by UAV (purple box in Fig. 1). (a) The study area in 2017 (2 × 2 km2). (b) Same as (a) except 2018 and larger area (2 × 2.5 km2). (c) Same as (b) except for 2019. Regions shown in subsequent figures outlined with black and white boxes and labeled. (d) Lake area distribution in the study area on the dates shown.

Figure 3. Lake locations and water-level variations from July to August 2017. (a) Location of lakes with ID numbers. Region is the white rectangle in Fig. 2a. The ortho-image was made from UAV data on 23 July 2017. (b) Daily water-level variations (based on DSM data) for the numbered lakes in a).

Figure 4. UAV ortho-images of lakes 8 and 9 before and after drainage. White arrows show an ice wall along the englacial conduit that was exposed after drainage. Black arrow shows drainage direction.

Figure 5. Drainage event on 13 May 2018. (a) Water-level (thick line) and temperatures (thin line) variations of four lakes from water-level logger data. Lake 8 discharged at 5:00 AM on 13 May. b) Sequential images of lake 4 that discharged on 12–13 May. (c, d) PlanetScope and Sentinel-2 images taken on 12 and 13 May. Left images are enlargements of the black box in the right images. Yellow circles show lakes in the simultaneous drainage event. White arrows show ice wall along englacial conduit that was exposed after drainage. Black, solid arrows shows drainage direction (with drainage date in d, right side). All times shown are local (GTM +9:00).

Figure 6. Lake locations and water-level variations in July 2018. (a) Location of lakes with ID numbers on 17 July. Region is the white rectangle in Fig. 2b. IDs with orange highlight are lakes that drained simultaneously, IDs with white highlight are lakes unaffected by the multi-lake drainage event. IDs with green highlight are lakes that drained on another day. The ortho-image was made from UAV data on 17 July. (b) Same as (a) except the next day. (c) Daily water-level variations (based on DSM data) in lakes that simultaneously drained. Lake 8 includes former lake #9 of 2017 due to a merging of the lakes prior to this image. (d) Same as (c) except for the lakes that did not simultaneously drain.

Figure 7. Field photos near several lakes. (a, b) Lake 7 before and after drainage on 17 July 2018. Red circles show landmark stones. (c) Lake 4 after drainage on 17 July 2018. (d) Lake 5 after drainage on 17 July 2018. (e) Lake 3 situation after drainage on 16 July 2018. f) Separated englacial conduit at location marked in Fig. 2a.

Figure 8. Drainage of lake 15 on 17 July 2018. Drainage route is marked by the black arrow and exposed ice wall is marked by white arrows in (b). New white areas in (b) show newly exposed ice. Ortho-images (a, b) were made from UAV data on 17 and 18 July 2018. Location is marked in Fig. 2b.

Figure 9. Drainage of lake 3 on 16 July 2018. Newly exposed ice occurs in (b) along the englacial conduit with some parts exposed on the surface due to debris washed away during the drainage. Black arrows show water-flow directions. Some lake water flowed to lake 4. Seven lakes drained the next day. Right box shows close-up of inset region. White arrows show exposed ice along englacial conduit where most water flowed. Ortho-images (a, b) were made from UAV data on 16 and 17 July 2018.

Figure 10. Estimated englacial network changes in the study site. (a) Distribution of lakes and englacial conduits. (b) First, lake 5 drains due to a newly opened connection between its branch and the main englacial conduit. (c) Simultaneous drainage of four lakes due to opening of the main englacial conduit. (d) Recharging of each lake due to closure of the branch englacial conduits by debris and ice. (e) Re-discharge of each lake due to opening of a branch englacial conduit. (f) Simultaneous drainage occurs due to the opening of another route of the main englacial conduit.

Figure 11. Development process of lake basin. (a) Vertical channel type. Lake basin connects to main englacial conduit through a branch englacial conduit. (b, c) Lake basin connects directly to the main englacial conduit due to ice melting. (d-e) Horizontal channel type. Lake basin and main englacial conduit become closer to the glacier surface due to glacier melting. (f) Supraglacial conduit. The englacial conduit becomes exposed on the glacier surface.

Figure 12. Estimated locations of the main and branch englacial conduits 2018–2019. The circled exchange point of the channel shows the location where main englacial conduit changed from May 2018 to July 2018.

Figure 13. Characteristics of supraglacial lakes before the simultaneous drainage event on 17 July 2018. (a) Water-level increases of lakes 1, 4, 7, and 8. (b) Locations of supraglacial lakes. Red-outlined lakes participated in the drainage event. Blue lakes are not related to the drainage event. Location is marked in Fig. 2b. (c) Water-level differences for each lake, depending on distance to lake 8. Red points (1, 4, 5b, 7, 8) are lakes that drained simultaneously. The blue points (2, 3, 10, 11, 16, 17, 18, 19, 20, 21, 22) are lakes unrelated to the drainage event. The black point (5a) is the water level of lake 5 before the first drainage on 8 July 2018, whereas 5b marks the water level before the second drainage on 17 July 2018.

Supplementary Table 1. Data of water level derived from DSM and water-level data logger in 2017 and 2018.

Supplementary Table 2. Time line of the simultaneous drainage events, satellite, and UAV data.

Supplementary Fig. 1. Characteristics of supraglacial lakes before simultaneous drainage event on 16 July 2018. (a) Locations

of lakes 20, 23, 25, 28, and 32. (b) Distribution of supraglacial lakes. Red lakes that lie on the hydraulic gradient line

(dashed) are connected to the same englacial conduit through which water from lake 3 drained.