



EGU Session NH6.3

AIRBORNE SFM MODELLING FOR AVALANCHE AND DEBRIS FLOW PATHS IN STEEP TERRAIN WITH LIMITED GROUND CONTROL

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Photo: NTB Scanpix

Årnes debris flow path

Jølstravatnet, Sunnfjord Municipality, Norway

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[Top] Precipitation map indicating torrential rainfall in the Jølstravatnet lake area on July 30, 2019 (map: Norwegian Meteorological Institute); [Right] False colour satellite image from August 2, 2019 (imagery: Copernicus Sentinel).



Vassenden (credit: Hallstein Dvergsdal)

Årnes (credit: HRS Sør-Norge)









Image plane location and orientation during the drone survey (total of 440 images captured)



High-resolution digital surface model created during SfM-MVS workflow; shown with numbered ground control points used for adjustments and accuracy assessment



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Upper Right: 7.33°E 62°N



[Top] Orthoview and **[Right]** Map view of East facing avalanche path on Sætreskarsfjellet above National Road 15, in Strynefjellet area, western Norway (imagery: Geodata AS, Kartverket)







(Maps: Geodata AS, Kartverket, Esri)







[Top] Flight lines displayed on top of SfM-derived orthophoto product, draped over a terrain model; ground control points displayed in red (background imagery: Geodata AS, Kartverket); **[Right]** Example of survey image at the foot of the avalanche path; area encircled in red is enlarged (inset) to illustrate ground control placement in the scene.





[Left] Ground control point error assessed within Agisoft Metashape software; **[Right]** Comparison of RPAS-SfM-derived and LiDAR-derived surface models (ground control points shown in red).

GCP	Photogrammetric error		Surveyed elevation (meters)		Difference
	Total (cm)	Image (pixel)	GNSS measurement	2012 LiDAR DTM	(cm)
1	0.20	0.25	879.86	879.89	2.29
21	0.56	0.67	1355.78	1355.70	-8.58
Total	1.11	0.61	-	-	2.31

0 75

150

225 300 375





[Top] Satellite image of Sætreskarsfjellet in late spring (credit: Maxar Technologies, Google).

[Right] Joint report published in collaboration with the Norwegian Public Road Administration and University of Washington researchers.



Drift og vedlikehold Fagressurser Drift og vedlikehold Geofag Drift og vedlikehold 6.5.2020



Nr. 655



Photogrammetry and Drones for Avalanche Monitoring

Preliminary Field Investigations on Bare Ground and Research Plan for Roadside Avalanche Operations







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