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Drone based structural mapping at Holuhraun indicates fault reactivation and complexity

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Accompanied by an intense seismic swarm in August 2014, a dike laterally formed, starting under Icelands Vatnajökull glacier, propagating over a distance of more than 45 km within only two weeks, leading to the largest eruption by volume since the 1783-84 Laki eruption. Along its propagation path, the dike caused intense surface displacements up to meters. Based on seismicity, GPS and InSAR, the propagation has already been analysed and described as segmented lateral dike growth. We now focus on few smaller regions of the dike. We consider the Terrasar-X tandem digital elevation map and aerial photos and find localized zones where structural fissures formed and curved. At these localized, regions we performed a field campaign in summer 2015, applying the close range remote sensing techniques Structure from Motion (SfM) and Terrestrial Laser Scanning (TLS). Over 4 TLS scan were collected, along with over 5,000 aerial images. Point clouds from SfM and TLS are merged and compared, and local structural lineaments analysed. As a result, we obtained an unprecedentedly high-resolution digital elevation map. With this map, we analyse the structural expression of the fissure eruption at the surface and improve understanding on the conditions that influenced the magma propagation path. We elaborate scenarios that lead to complexities of the surface structures and the link to the underlying dike intrusion.