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Unmanned Aerial System measurements of surface albedo for the melting season during the MOSAiC expedition

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The University of Colorado, Boulder, deployed unmanned aerial systems (UAS) over the sea ice during Leg 4 (June-August 2020) of the MOSAiC expedition. Among the different UAS platforms operated, a hexacopter, the HELiX, was dedicated for characterizing the surface properties, such as the surface albedo and the sea ice/melt pond fractions. The HELiX was equipped with two pyranometers to measure incoming and reflected broadband shortwave irradiance, and a multispectral camera to map the surface of the ice floe. Three flight plans were conducted with this platform, including (1) grid patterns at 10 m.asl to map out the distribution of albedo at this altitude, (2) hovering flights at 3 m.asl over identified surfaces (sea ice, melt pond, ocean, ridge, etc.) to get a detailed look at the albedo of each surface individually, and (3) profiles up to 100 m.asl. to evaluate the convergence height where surface heterogeneity is obscured when using a hemispheric sensor. In total, 34 flights took place in varied weather conditions, from clear sky to foggy weather with very low visibility. The UAS observations bring complementary results to a variety of other albedo observations collected during MOSAiC (albedo lines, sled-based, tethered balloon-based, and ship-based measurements). These observations spanned the majority of the melt season, capturing seasonal evolution in surface reflectivity, as well as melt pond fraction and resulting impact on surface albedo. In this presentation, we will present results from these flight activities and offer perspectives on the evolving sea ice pack during the summer portion of the MOSAiC expedition.