One of the most striking changes in the Arctic environment is the decline in the sea ice cover, currently shrinking at a rate of -12.4%/decade during September from 1979-2010. The high albedo of sea ice allows much less solar energy to be absorbed by the darker ocean. As the areal extent of Arctic sea ice continues to decrease, the heat input into the ocean increases, further warming the ocean mixed layer, delaying autumn freeze-up, slowing ice growth and leading to amplified autumn and winter warming. The recent pattern of record low Arctic sea ice extents is consistent with the ice-albedo feedback in the Arctic system that enhances the link between warming and reduced ice.

The lack of high quality and high spatial/temporal resolution sea ice albedo observations is a critical observational gap. This work attempts to fill that gap by developing a MODIS sea ice albedo algorithm, with applicability to other optical sensors. The approach utilizes multiple sensors/observations (e.g. MODIS, MISR, and AMSR-E) to derive daily sea ice albedo. The work is an extension of the Direct Estimation Algorithm to include a multi-temporal/angular/sensor approach coupled with enhanced snow and ice radiative transfer modeling that accounts for non-sphericity of particles, snow and ice impurities, surface roughness, and snow and ice optical thicknesses. In this talk we outline our progress to date and challenges encountered. In this talk we summarize our progress to date in deriving sea ice albedo from MODIS and discuss challenges/limitations of the approach.