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P-2 A Synthetical Estimation of Northern Hemisphere Sea-ice Albedo Radiative Forcing and Feedback between 1982 and 2009

The decreasing surface albedo caused by continously vanishing sea ice over the Arctic plays a very important role in Arctic warming amplification. However, the quantification of the change of radiative forcing at top of atmosphere (TOA) introduced by the decreasing sea ice albedo and its generated feedback to the climate remain uncertain. Two recent representative studies showed a large difference with each other: Flanner et al. (2011) used a method of synthesis of surface albedo and radiative kernels and found that the change of sea ice radiative forcing (ΔSIRF) in Northern Hemisphere (NH) from 1979 to 2008 was 0.22 (0.15 – 0.32) W m^{-2}, and the corresponding sea ice albedo feedback (SIAF) was 0.28 (0.19 – 0.41) W m^{-2} K^{-1}; while Pistone et al. (2014) directly used the observed planetary albedo to estimate the NH ΔSIRF from 1979 to 2011and draw a result of 0.43 ± 0.07 W m^{-2}, which was nearly twice as larger as Flanner's result. Motivated by reconciling the difference between these two studies and obtaining a more accurate qualification of the NH ΔSIRF, we used a newly released satellite-retrieved surface albedo product CLARA-A1 and made an attemptation in two steps: Firstly, based on synthesising the surface albedo and raditive kernels, we calcualted the ΔSIRF from 1982 to 2009 was 0.20 ± 0.05 W m^{-2}, and estimated the NH SIAF was 0.25 W m^{-2} K^{-1}; After comparing with TOA observed radiative flux, we found it's quite likely the kernel methods yield an underestimation for the all-sky ΔSIRF; Then, we made an attempt to use TOA observed broadband radiative flux to adjust the estimated with kernels, after an adjustment with, the NH all-sky ΔSIRF was 0.34 ± 0.09 W m^{-2}, and the corresponding NH SIAF was 0.43 W m^{-2} K^{-1}.