

IASOA Radiation & Cloud Working Group

March 7, 2018

Attendees: Sara Morris, Chris Cox, Lei Liu, Allison McComiskey, Chuck Long, Jeff Key, Alessio Bozzo, Barbara Casati, Bob Stone, Matthew Shupe, Andreas Massling, Aaron Letterly, Yinghui Liu, Gabriela Schaeppman-Strub, Elin McIlhattan, Von Walden

Role Call of group members

Presentation: Changes in Sea-Ice Extent Will Outweigh Changes in Snow Cover in Future Arctic Climate Change (Key):

- Primary dataset: AVHRR Polar Pathfinder Extended (APP-x) 1982-2015, 25km, high-sun time
 - o Surface radiation, surface temp, surface albedo, cloud properties, and more
- Reanalysis: NASA MERRA2
- Study area: land and ocean, 60-90 °N latitude (Summit ignored/not included)
- Trends in absorbed solar radiation
 - o The magnitude and rate were different over land and ocean
 - o Look at average monthly (annual monthly average) SW absorption per year for combined land and ocean, land only, and ocean only
- Spatial distribution of trends
 - o Strong increase in absorption due to decreasing springtime snow cover is seen in May
 - o June to October, the ocean area absorption rate increased faster than absorption over land
- APP-x vs MERRA2
 - o Show similar patterns
 - o Larger magnitudes in APP-x
- Cloud cover
 - o Over land: an increase in highly reflective cloud cover is associated with a decrease (increase) in surface absorption
 - o Over ocean: changes in cloud cover, but the effect on trends in absorption is less because most of the ocean is ice-covered and the reflectivities of ice and cloud are similar
- Timing of the low albedo
 - o Over ocean, movement of lower albedos to earlier in the year means that more sunlight was absorbed over the ocean in 2015 than in 1982
 - o Over land, the regression of low albedo towards earlier in the year still results in an increase in absorbed energy, but it can only increase asymptotically due to decreasing sunlight
- Albedo feedbacks
 - o The magnitude of the ice-albedo feedback is four times that of the snow-albedo feedback in summer
- Summary
 - o The trend of solar absorption over the ocean is more than double that over land
 - o The magnitude of the ice-albedo feedback is four times that of the snow-albedo feedback in summer

- The low albedo period each year has been changing such that over ocean it is moving toward the summer solstice, while over land it is moving away from the solstice
 - Decreasing sea ice cover, not changes in terrestrial snow cover, may be the foremost radiative feedback mechanism affecting future Arctic climate change

Action Items:

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