

Burcu Ozsoy-Cicek, Hongjie Xie, Steve Ackley

Remote Sensing and Geoinformatics Lab, Department of Geological Sciences

University of Texas at San Antonio

Email: burcu@drcicek.com

Website: <http://www.utsa.edu/LRSG/>

Abstract:

Sea Ice in Climate Change from Space

Sea ice is an important component of the Earth system that affects local- and global-scale climate and environmental systems. Sea ice regulates heat, moisture, and salinity exchanges between the polar oceans and the atmosphere, which could affect local cloud cover and precipitation. Ice thickness, its spatial extent, and the fraction of open water within the ice pack can vary rapidly and profoundly in response to changes in weather and climate. Although the impact of sea ice on global climate is recognized, the influence of the Antarctic sea ice zone is not well understood because its seasonal and regional sea ice thickness changes are still unknown.

Both passive and active microwave remote sensing have provided useful information about changes in sea ice extent in both Polar Regions over the last 30 years. For Antarctic sea ice, however, computational algorithms deriving sea ice thicknesses from satellite data are still in a developmental stage and data validation is in progress. Ice thickness data from ground-based surveys and surface elevation, combined snow depth, and ice elevation, reveal a more complex relationship between surface elevation and the sea ice thickness than predicted by simple isostasy using satellite laser altimetry. Moreover, the existence of areas flooded by sea water at the ice surface-snow interface in the Antarctic, differs from the Arctic and suggests that thickness algorithms based on positive ice elevation may need re-evaluation and adjustment for the Antarctic flooded condition with negative ice elevation. Reliable estimates for seasonal and regional variations in the Antarctic sea ice can be accomplished if the baseline thickness of the Antarctic sea ice is accurately predicted. This presentation focuses on recent findings on the baseline thickness of the Antarctic sea ice through field measurements (in particular, the Sea Ice Mass Balance in the Antarctic project cruise) with joint remote sensing analysis (ICESat, RADARSAT, ENVISAT, and AMSR-E with the support of NASA, ESA, and other agencies). Also, determining the sea ice mass balance using derived ice thickness, could provide estimates of annual variations in the total gain and loss of ice volume within a certain time frame, which could subsequently be used to compute global-scale atmospheric and oceanic forcing, and fluxes between the atmosphere and ocean in the southern polar region.