Geophysical Research Abstracts
Vol. 15, EGU2013-5747, 2013
EGU General Assembly 2013

ICE stereocamera system – photogrammetric setup for retrieval and analysis of small scale sea ice topography

Dmitry Divine, Christina Pedersen, Tor Ivan Karlsen, Harald Aas, Mats Granskog, Angelika Renner, Gunnar Spreen, and Sebastian Gerland

Norwegian Polar Institute, Tromso, Norway (dima@npolar.no)

A new thin-ice Arctic paradigm requires reconsideration of the set of parameterizations of mass and energy exchange within the ocean-sea-ice-atmosphere system used in modern CGCMs. Such a reassessment would require a comprehensive collection of measurements made specifically on first-year pack ice with a focus on summer melt season when the difference from typical conditions for the earlier multi-year Arctic sea ice cover becomes most pronounced.

Previous in situ studies have demonstrated a crucial importance of smaller (i.e. less than 10 m) scale surface topography features for the seasonal evolution of pack ice. During 2011-2012 NPI developed a helicopter borne ICE stereocamera system intended for mapping the sea ice surface topography and aerial photography. The hardware component of the system comprises two Canon 5D Mark II cameras, combined GPS/INS unit by "Novatel" and a laser altimeter mounted in a single enclosure outside the helicopter. The unit is controlled by a PXI chassis mounted inside the helicopter cabin.

The ICE stereocamera system was deployed for the first time during the 2012 summer field season. The hardware setup has proven to be highly reliable and was used in about 30 helicopter flights over Arctic sea-ice during July-September. Being highly automated it required a minimal human supervision during in-flight operation. The deployment of the camera system was mostly done in combination with the EM-bird, which measures sea-ice thickness, and this combination provides an integrated view of sea ice cover along the flight track. During the flight the cameras shot sequentially with a time interval of 1 second each to ensure sufficient overlap between subsequent images. Some 35000 images of sea ice/water surface captured per camera sums into 6 Tb of data collected during its first field season.

The reconstruction of the digital elevation model of sea ice surface will be done using SOCET SET commercial software. Refraction at water/air interface can also be taken into account, providing the valuable data on melt pond coverage, depth and bottom topography –the primary goals for the system at its present stage. Preliminary analysis of the reconstructed 3D scenes of ponded first year ice for some selected sites has shown a good agreement with in situ measurements demonstrating a good scientific potential of the ICE stereocamera system.