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CHARACTERIZATION OF ICE COVER EXTENT FROM MODIS IMAGERY DURING DIFFERENT WINTER SCENARIOS IN THE GULF OF RIGA, BALTIC SEA

L. Raag [a], R. Uiboupin [b], L. Sipelgas [b]

[a] Marine Systems Institute at TUT, Akadeemia Rd 15A, Tallinn 12618, Estonia – laura.raag@msi.ttu.ee
[b] Marine Systems Institute at TUT, Akadeemia Rd 15A, Tallinn 12618, Estonia

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ABSTRACT:

Baltic Sea is well known for seasonal ice cover. Current study is focused on Gulf of Riga that is located in the eastern part of the Baltic Sea. Previous studies have shown that the ice conditions in Gulf of Riga can vary significantly from year to year depending on the weather conditions. Depending on the year the ice cover season starts between late November and middle January. The length of the ice season which can last until late April is in the range of 3-5 months. In addition to interannual ice cover variations there are significant spatial variations between different Gulf areas.
The use of remote sensing methods enables to monitor ice extent during different winter scenarios. Although during the last years the emphasis in operational ice remote sensing has been on exploiting the capabilities of active sensors (e.g. SAR) the optical imagery can provide valuable information as well. Data from Moderate Resolution Imaging Spectroradiometer (MODIS) can be used for ice extent monitoring and for characterization of average winter conditions. We used MODIS data from visible range channels of spectrum with 250 m resolution (620 – 670nm ; 841 – 876 nm) to detect ice extent in the Gulf of Riga (Baltic Sea). In total 366images were used for ice extent detection.
After processing all the 366 images the average ice cover maps for different months and years were calculated. The ice cover probability maps were calculated which showed the percentage of time that each pixel was covered by ice. Based on the negative degree days, calculated from the data obtained in Kihnu meteorological station, the winter scenarios were defined. In case the sum of negative degree days (ºC day) is above 400 the winter was considered as severe (2003, 2006, 2010 and 2011). In case of medium (2004 and 2005) winters the corresponding value was between 200 and 400 and for mild (2007, 2008 and 2009) winters the sum of negative degree days was below 200.