STUDY OF SNOWMELT IMPACT ON SST AND TSM FIELDS IN THE COASTAL ZONE OF BARENTS SEA

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1. INTRODUCTION

Barents Sea is known for the extensive algal blooms throughout the summer periods. Sea ice melting which increases the concentration of organic matter along the ice edge contributes to the growth of alga. Previous studies have shown that the blooms usually occur after the melting of sea ice which provides nutrients and organic matter necessary for plankton growth [1]. Another source of organic matter that induces algal activity in the coastal zone is snowmelt runoff. Particulate and dissolved organic mater originating from land (snow/ice melt and river runoff) plays an important role on sea water optical properties in the coastal Arctic areas [2]. This is also the case along the coast of Novaja Zemlja in Barents Sea (where current study is focused). The relative amounts and the periods when large quantities of melt water (that transports organic matter) enter the coastal sea can be observed using SAR data which enables to estimate snowmelt runoff [3].

Another important factor that strongly influences algal activity (besides the organic matter, nutrients, CDOM concentration and light conditions) is sea surface temperature. Previous studies have shown that higher TSM (total suspended matter) concentrations influence the SST and the retrieval of SST from remote sensing data [4, 5]. The interaction between SST and biological parameters in coastal area can be monitored using remote sensing data from MERIS and AATSR sensors which provide information about SST, Chl a, CDOM and TSM.

2. STUDY AREA

The coastal zone of Novaja Zemlja is a region with high biological activity compared to the surrounding area (open sea) as the melt water provides the organic matter necessary for plankton growth during the summer period. There are periods when the input of organic matter to the coastal sea increases due to more active snowmelt runoff which results in increased algal growth.

3. AIM

In this study we observe interaction between SST and TSM (Chl a, yellow substance) in the frontal zone along coast of Novaja Zemlja in Barents Sea. Also we analyze the impact of Chl a, CDOM and TSM on SST retrieval in the coastal Arctic zone using AATSR and MERIS data. The effect of chlorophyll concentration variations on surface radiation budget (SST) will be analyzed based on case studies. Also the impact of snowmelt runoff (estimated from ASAR imagery) on the biological parameters in the coastal zone wil be analyzed. The study provides additional information about the relation between SST (AATSR) and biological parameters derived from MERIS data. Two cases were observed one along the coast of Novaja Zemlja. Along the western coast in July and along eastern coast in August 2009.

4. DATA AND METHODS

Level 2 data from AATSR and MERIS sensors was used to study the variations of SST and TSM fields during a period from 27 to 30 July 2009 when a front of TSM was observed along the western coast of Novaja Zemlja. The input of snowmelt runoff was estimated from ASAR data prior to the analysis MERIS and AATSR data along the coast. Single pass data from AATSR and MERIS was analyzed. Only the images which covered the same area within 2 hour differences were compared. Meaning, only data from two consecutive ENVISAT overpasses or data from the same overpass covering the mutual area was used.

5. RESULTS

ASAR data showed decrease in NRCS value after 18 June 2009 which is ~20 before the increase of Chl a concentration was observed on MERIS images. This suggests that the melt water input to the coastal sea increased after this date. Previous studies [1] have shown that the Chl a concentration increases after melt of sea ice, reaching the peak values 2-3 weeks after the melting. This is also the case when CDOM rich melt water reaches the coastal sea.

The correlation between different parameters of the case (27-30 July 2009) mean values was found. Also comparative analysis was carried out between SST and biological imagery from single pass image pairs. The comparison showed that there is clear correlation between SST and biological parameters derived from MERIS data in the coastal zone.

11. REFERENCES

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