Abstract

We present an analysis of in-situ bio-optical measurements collected in Hudson Bay that shows a strong spatial variability of absorption properties. A cluster analysis shows that Hudson Bay can be partitioned into coastal and offshore regions having different water color parameters signatures that could be used to better process satellite remote sensing data. Seasonal variability of optical properties is also shown to be important with higher phytoplankton biomass in the fall period.

Introduction

Hudson Bay is a large inland sea (10^6 km²) located in central Canada. To study the impact of climate change on Hudson Bay primary production, it is necessary to use remote sensing data. However, there is a massive influx of freshwater providing Hudson Bay with estuarine conditions. This leads to complex optical properties limiting the use of satellite ocean data. However, there is a massive influx of freshwater providing Hudson Bay with estuarine conditions. This leads to complex optical properties limiting the use of satellite ocean data. Power (Fall 2010)

Methods

Objectives

- Determine the relationship between absorption coefficients and water color parameters
- Investigate the spatial and seasonal variability of absorption and WCPs
- Classify the water types in Hudson Bay by cluster analysis

Results

Spatial and seasonal variability of absorption properties and water color parameters in Hudson Bay

Figure 8. Clustered stations using BI-1 and BI-2 from fall 2005 (top) and summer 2010 (bottom).

Spatial and seasonal variability

Table 2. Statistics of spectral slopes \( S_a \) and \( S_h \) in both seasons.

Table 3. Mean bio-optical properties for waters in cluster analysis groups and positions.

Conclusions

Using data gathered during summer and fall, we were able to describe the spatial and seasonal variability of absorption properties and water color parameters in the surface layer of Hudson Bay. Results showed that:

1) Even though the spatial distribution of WCPs was similar for both seasons, concentrations are higher in the fall than in the summer. Differences in magnitude, similar patterns are observed with higher concentrations in near shore waters. Fig. 2 shows the spatial distributions of S\( _a \) and Chl-a in both seasons. With a few exceptions, measured values are higher in the fall than in summer, especially for Chl-a and ISM.

Cluster analysis: A classification was performed using hierarchical cluster analysis (square Euclidean distance as similarity measure, ward clustering and average linkage method) using all available data of TSM, Chl-a and CDOM. Fig. 8 shows the spatial distributions of S\( _a \) for nine stations sampled in both seasons. With a few exceptions, measured values are higher in the fall than in summer, especially for Chl-a and ISM.

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