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Determining the ice seasons severity during 1982-2015 using the ice extents sum as a new characteristic

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Sea ice is a key climate factor and it restricts considerably the winter navigation in sever seasons on the Baltic Sea. So determining ice conditions severity and describing ice cover behaviour at severe seasons interests scientists, engineers and navigation managers.
The present study is carried out to determine the ice seasons severity degree basing on the ice seasons 1982 to 2015. A new integrative characteristic is introduced to describe the ice season severity. It is the sum of ice extents of the ice season id est the daily ice extents of the season are summed. The commonly used procedure to determine the ice season severity degree by the maximal ice extent is in this research compared to the new characteristic values.
The remote sensing data on the ice concentrations on the Baltic Sea published in the European Copernicus Programme are used to obtain the severity characteristic values. The ice extents are calculated on these ice concentration data.
Both the maximal ice extent of the season and a newly introduced characteristic - the ice extents sum are used to classify the winters with respect of severity.
The most severe winter of the reviewed period is 1986/87. Also the ice seasons 1981/82, 1984/85, 1985/86, 1995/96 and 2002/03 are classified as severe.
Only three seasons of this list are severe by both the criteria. They are 1984/85, 1985/86 and 1986/87. We interpret this coincidence as the evidence of enough-during extensive ice cover in these three seasons.
In several winters, for example 2010/11 ice cover extended enough for some time, but did not endure. At few other ice seasons as 2002/03 the Baltic Sea was ice-covered in moderate extent, but the ice cover stayed long time.
At 11 winters the ice extents sum differed considerably (> 10%) from the maximal ice extent. These winters yield one third of the studied ice seasons.
The maximal ice extent of the season is simple to use and enables to reconstruct the ice cover history and to predict maximal ice extent values. A shortage of this characteristic is its failure to account with the ice cover durability.
The ice extents sum enables to describe the ice cover behaviour more adequately. However using this characteristic we lack the option to compare its values with those in the past as the ice cover extent was not daily measured then. We can use ice extents sum only for those ice seasons on which we have enough data.
Using the ice extents sum of the season adds the temporal dimension to the ice season severity study.