

Reply on comment from Anonymous Referee No. 3 from 17 January 2012

Dear Reviewer,

thank you for your positive feedback and your helpful comments and remarks. Below, I give statements regarding to your mentioned issues.

1) Thank you!

2) I will edit the final version regarding grammar and spelling. Thank you for the examples.

3) The use of ANN for remote sensing data has been motivated by the realization that the human brain is very efficient at processing a huge amount of information in a very short time. Neurons in the human brain receive inputs from other neurons and produce an output which is then passed to other neurons. This behavior is the basis for the architecture of the ANN. A multilayer perceptron (MLP) consists of multiple layers of computational units (= nodes or neurons), usually interconnected in a feed-forward way. That means, that each node in one layer has directed connections to the nodes of the immediately next layer, but has no connections to the nodes of the previous layers. As the signal passes from node to node, it is modified by the weights associated with the connection [Atkinson, 1997]. The weight values are established by a supervised learning technique, using a priory information about the actual output corresponding to the input data [Gonzalez Vilas, 2011]. A typical MLP structure includes an input layer, one or more hidden layers and an output layer. The input layer only distributes the input signal into the network to the nodes of the first hidden layer without processing them. The nodes in the hidden layers and the output layer transform their input signal usually using a non-linear sigmoid function [Atkinson, 1997].

4) Clouds are indeed a problem in optical remote sensing methods. As already mentioned in the comment of Marc Tschudi (RC C1368: 'comments', Mark Tschudi, 22 Nov 2011), the cloud mask we use from the MOD09 product is not always reliable. With the masking of pixels with a high uncertainty (see AC C1578: 'Reply to the comment of M. Tschudi', Anja Rösel, 16 Dec 2011) we try to improve the quality of the melt pond fraction. Additionally, the used weekly MOD09A1 product is a collection of the "best" (in the sense of "cloud-free") pixels of the satellite acquisitions within one full week. Unfortunately, the MOD09A1 product has no timestamps. Therefore, the identification of the exact date of the inbound pixels is not possible.

5) You are right, I need to rewrite this sentence. The used three-class model with open water, melt ponds, and snow and ice fractions cannot resolve the spectral signature of thin ice properly and assigns this signature to the melt pond class.

6) and 7) The given example is a case study on a situation where an unusual high melt pond fraction is observed. In general, the influence of melting sea ice, especially of melt ponds on the sea ice surface, causes uncertainties in microwave-based retrieval algorithms and is documented by e.g. [Cavalieri (1990), Steffen (1991), Comiso (1996)]. In how far there is a relation between MODIS ponds and AMSR-E sea ice concentrations (like  $A_p(\text{MODIS}) + A_w(\text{MODIS}) = A_w(\text{AMSR-}$

E)) needs to be identified in a further study, as well as the strength of the influence of MODIS ponds on sea ice concentrations.