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Interactive comment on "Thin-ice dynamics and ice production in the Storfjorden polynya for winter-seasons 2002/2003–2013/2014 using MODIS thermal infrared imagery" *by* A. Preußer et al.

Anonymous Referee #3

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General comments

In the paper the spatial and temporal characteristics of the Storfjorden polynya for the winter seasons of 200-2014 are described based on thermal infrared satellite imagery. This 12 years data set is the major contribution of the paper. The created data set can be utilized as a reference set to other Arctic polynya statistics and also in the climate simulations. The method to calculate ice thickness from MODIS is well-known generally, and also used by the authors in other papers.

The only significant deficiency in the paper is that the trend and fluctuations observed in the polynya statistics are not set in any manner to a more general context. E.g.

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connections to the ice conditions in the surrounded seas like the Barents Sea and Fram Strait (or the effect of the Arctic Sea ice retreat generally) are not discussed. Neither any comparisons to other Arctic polynyas, e.g. in the Kara Sea or the Laptev Sea, are made. When these omissions and some other minor points are addressed the paper is worth to be published. I agree with the other referees that the paper is well written and easy to follow.

I have read the reviews by the referees #1 and #2. They raised several important points and questions. I tried to avoid to duplicate the comments already made. Hence I have just a few additional remarks.

Specific comments

P. 5765 L5-15: How does the thermodynamic ice production from the Storfjorden polynya compare to other Arctic polynyas, e.g. polynyas in the Kara and Laptev Seas. (see e.g. Kern 2005, 2008 for the Kara Sea and your own publications for the Laptev Sea).

Kern et al. (2005), A comprehensive view of Kara Sea polynya dynamics, sea-ice compactness and export from model and remote sensing data, Geophys. Res. Lett., 32. Kern (2008) Polynya Area in the Kara Sea, Arctic, Obtained With Microwave Radiometry for 1979–2003, Geoscience and Remote Sensing Letters, IEEE, 5(2), 171 – 175 .

P. 5771. L9-28. A crucial feature in your approach is the scaling approach. You mentioned it increases the ice volume estimates about 30 %. Hence it is important to have some estimate for the accuracy of the proposed method. This is not difficult to do. Pick a cloud free day, mask 45 % of the polynya area randomly and apply the scaling. When the procedure is repeated several times, you should have understanding how well the approach works. Using three consecutive cloud free days you can get an accuracy estimate for the interpolation procedure. Add the uncertainty estimates to the text and discuss their effect on the results.

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P. 5773. You write in the introduction that time series like this increase our understanding about the Arctic ice conditions. However, you have not linked in any way volume and area estimates of the polynyas to the ice conditions surrounding the Svalbard area, e.g. to ice cover in the Barents Sea and in Fram Strait. Especially interesting these comparisons would be when the IP is very low or very high relative to the mean IP during the covered time period.

P. 5774 L. 7-14. You should analyze the results in Table 2 in more detail. After all those results are one of the main contribution of your paper. When I looked at Table 2 the following points drew my attention. The increase per decade is 7.7-9.5 km3 for the IP estimates (no CC) and 16.1-17.7 km3 per decade for the IP volume estimates with CC. There occur large increases in the IP from winter 2003/2004 to 2004/2005 and again from 2011/2012 to 2012/2013. During the years from 2004 to 2011 the variation in the IP production (with or without CC) is relatively small.

P. 5775 L 10 "..the here presented last 12 winter-seasons show a positive trend of 20.2 km3.". Remove decadeˆ(-1). Add "during the analyzed period". See my earlier comment..

Interactive comment on The Cryosphere Discuss., 8, 5763, 2014.