

**Anonymous Referee #2** Received and published: 21 December 2018

The paper presents a novel analysis of the role of “moisture transport for precipitation” on the interannual and interdaily fluctuations of in Arctic sea ice extent. The study complements an earlier study of the authors that focused on the long-term trend. Interesting differences/contrasts are found between the patterns on these different time scales, which has important implications on understanding the ongoing and future changes in the Arctic sea ice. I have a few minor comments for the authors to consider to improve the presentation.

Overall suggestion: the two components of the analysis, i.e., interannual and interdaily, needs to be better consolidated by some serious reworking of the text. Currently the paper reads as if it's a merger of two separate analyses. For example, there're quite a few different time scales between interannual and interdaily, and so the introduction should have done a much better job explaining why these two time scales are selected for the current study. Similarly, there's too sudden a jump in topic from 4.1 to 4.2.

**Answer:** The temporal variability of the SIE is dominated by the annual cycle. However, there is an important variability that appears once this annual cycle is removed, which is found at multiple scales with the long-range and inter-annual scales being the most widely studied.. In our previous article (Gimeno-Sotelo et al, 2018) we analyzed the change of the MTP with the SIE long-range decline, remaining to analyze the change of MTP with the high-frequency interannual fluctuations of SIE superimposed on this negative trend. Additionally it has shown that the higher influence of moisture transport to the Arctic in in the way of moisture incursions (Woods, C. and R. Caballero (2016)), defined as extreme individual moisture transport events highly correlated with changes in Arctic temperature and crucial to understand changes in the sea ice extent (Yang, W. and Magnusdottir, G. (2017).. Because these events influence the interdaily SIE variability and because ultimately the monthly average MTP studied at the interannual scale results from the sum of the contributions from individual transport events, we reported the interannual and the interdaily scales in this one article, and we intend to present the synoptic and intraseasonal scales in a future report.

**Changes in the manuscript:** We have modified a paragraph in the introduction to account for the different time scales related to the extent of the Arctic Sea Ice and we also explain why we have used interannual and interdaily periods in this study. This helps to address the apparent jump in topic between 4.1 and 4.2.

**Where it previously read (lines 61-65) :** In our previous work (Gimeno-Sotelo et al, 2018) we addressed the changes in patterns of MTP linked to the annual mean decline by comparing two periods (before vs. after the major change in 2003). However, some substantial high-frequency interannual fluctuations are also superimposed on this negative trend, and these modulate the annual observations of SIE, but have attracted less attention. Additionally, to our knowledge the role of extreme MTP events on the daily march of SIE has never been analysed.

## It now reads

Lines 72 to 86  
now read

*“The temporal variability of the SIE is dominated by the annual cycle. However, there is an important variability that appears once this annual cycle is removed, which is seen at multiple scales with the long-range and inter-annual scales being the most widely studied. In our previous work (Gimeno-Sotelo et al, 2018), we addressed the changes in patterns of MTP, obtained via a Lagrangian approach, and linked to the annual mean decline, by comparing two periods (before vs. after the major point of change in 2003). However, some substantial high-frequency interannual fluctuations are also superimposed on this negative trend, and these modulate the annual observations of SIE, but have attracted less attention. Additionally, to our knowledge the role of extreme MTP events on the daily progress of the SIE has never been analysed. This is relevant because one of the strongest influences of moisture transport on the Arctic Sea Ice is via moisture incursion (Woods and Caballero 2016), with extreme individual moisture transport events being highly correlated with changes in Arctic temperature, and being crucial to the understanding of changes in SIE (Yang and Magnusdottir, 2017). Because these events influence the interdaily variability of SIE, and because ultimately the monthly averaged MTP studied at the interannual scale results from the sum of contributions from individual transport events, our focus here is on the interannual and the interdaily scales, with the synoptic and the intraseasonal scales being the subject of future studies”.*

Overall suggestion on table/figure captions: most of the captions are overly simplistic – an extreme example being Figure 3 caption. Please add some necessary details to guide the readers. (I understand some of the details are provided in the main body of the paper, but captions should be as informative as possible.)

**Answer:** We agree with the Reviewer on this point

**Changes in the manuscript:** We have expanded the descriptions given in the captions

Title: I think the “the role in . . .” is more commonly used than “the role on . . .”.

changed

L23-24: I couldn't understand this last sentence of the abstract without reading the paper; please re-write/elaborate.

rewritten

L90: “rewides”: resides?

changed

L110 is a repetition of L108

Changed