

## ***Interactive comment on “The effect of a permafrost disturbance on growing-season carbon-dioxide fluxes in a high Arctic tundra ecosystem” by A. E. Cassidy et al.***

**Anonymous Referee #3**

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This article attempts to evaluate the influence of an arctic disturbance – retrogressive thaw slump (RTS) – on the carbon dynamic using CO<sub>2</sub> fluxes, net ecosystem exchange (NEE), ecosystem respiration (Re), and gross primary production (GPP) comparing disturbed and undisturbed areas. CO<sub>2</sub> emissions and depositions were measured in summertime (for 32 days) using a footprint analysis (although the term “footprint” is never mentioned in the manuscript) using simultaneously two eddy covariance towers placed in the edges of one RTS in Ellesmere Island, northern Canada. In parallel, ecosystem exchanges were evaluated using a chamber (although no quality control was described, such as blank quality).

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The authors report real interesting results that should be published since the impact of landscape changes in arctic environments is poorly documented. I have minor remarks that will maybe help to improve the manuscript.

I am little bit confused with the general structure of the introduction (particularly from line 90 to line 126), where some interesting things (e.g., the importance for NEE measurements or the influence of tundra vegetation) should be before detailing the objectives, whereas some information (such as the design developed in this study or the use of static chamber) should be placed in the materials and methods section. Also, it would be nice to know which mechanisms are proposed to hypothesize that RTS will impact the carbon balance (lines 80-82).

Finally, is it possible to go further in the discussion to put into perspectives quantitative estimates of such landscape disturbance? I know that this is probably tough since the authors may not have good estimates of disturbance areas (just based on personal communication) and there are gaps for fall, winter, and spring seasons.

Minor comments

Abstract

Line 29: Please precise the country (Canada)

Introduction

Line 52: “ground”, do you mean soil or top soil? Precise please.

Line 80: Remove “(Lantz et al., 2009)”

Line 88: Use either “retrogressive thaw slump” or “RTS” in the text.

Line 130: Same than for the Abstract, please add “Canada”

Results

Lines 307-308: Can you indicated the DOY corresponding to the periods that you

C8943

evoked (“end of July”, “middle of July”) to be consistent with the Figure 2.

Lines 321-322: This explanation for the choice of the three periods should appeared before (in 3.1).

#### Discussion

Lines 410-411: The inter-annual variability is controlled by temperature. In which direction?

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