Authors response to interactive comment on "Hydrological and meteorological investigations in a periglacial lake catchment near Kangerlussuaq, west Greenland – presentation of a new multi parameter dataset" by E. Johansson et al.

" Referee D.AaE. Rets"

1. …At the same time the choice of a site for hydrological and meteorological installations measurement doesn't seem so obvious in the context of the main goal of the project. As it is mentioned in the text the regional climate is dry and the main source of water in hydrological system is melt water from the ice sheet. In spite of this fact a precipitation-driven lake watershed that can't be representative for the region has been chosen.

   Answer: The main goal of the hydrological part of the GRASP project is to improve the understanding of water exchanges between surface water and groundwater in a periglacial environment. The TBL catchment is representative for periglacial hydrology in the region since the majority of the lakes in the Kangerlussuaq region are precipitation driven. In this context, glacial meltwater is regarded as a "disturbance", which makes it difficult to study the periglacial hydrology that is characteristic for the region. However, it should be noted that the glacial hydrology obviously also is of great interest, and is studied within other parts of the GAP project.

   No changes related to this comment have been made in the revised manuscript.

2. The dataset is detailed and contains some rare measurements, and can be used for modeling of some hydrological processes, especially in the soil, as the study seems to be focused on this aspect. However, isn't impossible to model the entire water cycle from precipitation to outflow from the watershed, as some crucial components are missing and some measurements are fragmental. For example, the snow water equivalent measurements were conducted only in 2011.

   Answer: The snow water equivalent was measured only once in 2011. However, the precipitation data in combination with data on air temperature enable calculation of the SWE. The SWE calculations can be verified by time lapse photos. Since the AWS measures both snow and rain, the SWE for each snow event is recorded. The redistribution of snow within the catchment due to wind-drift, and the influence of sublimation can be studied in the time lapse film. Thus, the single measurement made in 2011 is not the only or primary information regarding snow in the catchment. (For logistic reasons, it would be very difficult to perform regular/repeated manual measurements of the type made in 2011.)

   No changes related to this comment have been made in the revised manuscript.

3. The other totally missing component is lake water temperature measurements, which is needed to set start conditions for the model and to verify the results. The lake freezing process is of great importance to the water level regime and interaction with ground waters taking into consideration the climate specifics and lake coverage of the

watershed.

Answer: The need of detailed information on lake water temperature depends on the type of modelling to be performed. For hydrodynamic and thermodynamic process modelling and for biogeochemistry modelling of the lake this information is of great importance. Lake temperature has been measured in TBL, but the data will be presented together with ecosystem process parameters from the catchment.

For the hydrological modelling performed/planned within the GRASP project, air temperature data together with time lapse photos provides the necessary information about lake freezing and break up.

No changes related to this comment have been made in the revised manuscript.

Specific comments:

1. The total amount of groundwater wells makes a conspicuous figure. However an objectivity of groundwater level data for the watershed can be substantially diminished due to the uneven distribution of groundwater wells: mostly in valleys bottom.

   Answer: The reason for installing groundwater wells only in the valleys is due to the dry climate, and a water table above the permafrost is only present along the valleys of the catchment. Thus, the wells were installed where there was water that could be monitored. However, the wells are distributed along transects in the valleys from high to low elevated areas, enabling the study of transport of water from local recharge to local discharge areas (close to the lake). Also, the catchment contains large areas with bedrock outcrops and shallow soil depth, and installation of pressure transducers is not possible in these areas.

   No change made due to this comment.

2. It isn't quite clear how the ground surface and the top of casing (TOC) levels of each well were determined relative to the lake level, supposing the lake level to be a variable characteristic.

   Answer: The lake level monitoring started in September 2010 and the level at the start of monitoring (2010-09-04) is the reference level for all groundwater wells. The TOC of each well and the ground surface at each well are given relative to the lake level in September 2010.

   Changes in manuscript: In section 3.5, page 722, row 28 the following text is added:

   "Since no exact elevation reference point is present in the area, the reference level for all groundwater wells is the lake level at the start of monitoring in September 2010. "

   The heading of Table 2 is updated accordingly:

   "**Table 2.** Levels of top of casing (TOC) and ground surface (relative the lake level September 4th 2010) for each groundwater well relative to the lake surface. Automatic monitoring in the well is marked by an X."

3. A rain/snow precipitation threshold temperature was set in the research on 0_C that differs from commonly used values that are slightly above zero.

   Answer: By studying the time lapse photos for each precipitation event, which in this dataset is the best material to use in order to define a threshold temperature, no exact threshold temperature could be defined. The highest temperature recorded during snow fall was 2.6 °C. On the other hand, there were several rain events when the air temperature was around or below 1°C.

   The threshold temperature has only been used for correction of wind losses. Changing the threshold temperature from 0°C to 0.5°C results in a total increase of 4 mm for the whole data period, i.e approximately 1.5 mm/y. A threshold temperature of 1°C results in a total increase of 10 mm, 3.6 mm/y. Most of the snow precipitation fell during winter when the temperatures were low. The total annual precipitation was not sensitive to the selected threshold temperature.

   Since no clear threshold temperature could be defined by the time lapse photos and an increased threshold temperature did not cause significantly higher annual precipitation it was decided to set the threshold temperature to 0°C in the calculations of wind corrections. To define a better threshold temperature hydrological modelling for both summer and winter conditions has to be performed, which is out of the scope for the present paper.

   The threshold temperature applied in the wind corrections does not affect or restrict snow melt calculations. Each data user is free to use any threshold temperature for melting in his/her calculations.

   No change made due to this comment.

4. "The time series on lake level data (corrected for barometric pressure) was compared 5. to manual measurements of the lake surface level"– The result of the comparison is interesting, because in practice not all automatic water level measurement instruments provide an appropriate for the hydrological studies accuracy.

   Answer: No actual question is formulated.

   The aim of the comparison was to identify a possible drift in the pressure transducers. Two transducers were installed at the same site in the lake. A drift of approximately 3 cm was detected in one of the transducers and this data has been discarded from the time series presented in the present paper. Only data from the non-drifting transducer is presented.

   No change made due to this comment.

5. Point 5 is missing

6. It is mentioned that water level regime in well 13 and 14 is different from other wells situated downstream the TBL catchment area, but it is nor displayed in a figure, nor described.

   Answer: The location of the wells is marked in Figure 1. The time series for all wells are included in the dataset, however not all time series are displayed in the figures (serve as

examples). No change made.

7. In the Figure 8 A the soil water content seems not to react on precipitation events during the period from the beginning of July to the beginning of August. And then in mid-August soil water content experiences relatively sharp rises firstly in the deeper layer, then in the upper layer. How can this graph be explained?

   Answer: The aim of the present paper is to present the data, not to analyse it. The interpretation and analysis of the data will be presented separately in coming modelling studies. However, the response in soil water content to a rain event is related to evaporation and rain intensity. The rain events in June and July were short and preceded by long dry periods. The total accumulated rain volume was not big enough to cause an increased soil water content. During the first week in August the rain events occurred more frequently and the response in soil water content was stronger. No change made in the manuscript.

8. It is said a few times that some measurements were made "when field crew was present at the site" but never specified, how often that visits took place.

   Answer: In Section 3.1 page 720 row 5 it is stated that typically three field campaigns per year were organized. Field crew has been at the site in April, June and August/September every year.

   Changes in manuscript: In Section 3.1 page 720 row 5 : "Typically three field campaigns per year (in April, June and August-September) have been organized during the period for which data are presented."

9. The dataset can be easily downloaded from the site, everything seems quite clear in the files. But there are also some recommendations: a) it would be more convenient if there were also time periods in the "read me" file for time series. b) is it possible to watch the material from the time lapse camera frame by frame and how? c) it was mention that author possess data on surface topography and lake bathymethry. But it isn't present in the dataset

   Answer:
   a) The read me file will be updated with available time periods for each parameter
   b) It depends on the player. By using Quick time player it is possible to watch the material frame by frame. It is not possible to watch it frame by frame in Windows media player or Media player classic.

   c) See answer to question 3 from Referee no 1.

10. Misprints: A wrong reference on a figure in 5.5.2 and in 5.5.3. "Z_toc" and "Z_ground" is similar for 11 and 12 wells in Fig 7d.

    Answer: Figure 7d is updated with the right elevations and the figure references are corrected in the updated manuscript.