Response to interactive comment from Mauri Pelto

We thank Mauri Pelto for the interesting and valuable comments which are addressed point-by-point below.

Comment: Schwikowski et al. provide a valuable multi-year accumulation record from a core record from a location that has defied measurement of this nature to date. This is a valuable contribution. The comments below are mainly looking for reference to work completed in Alaska and British Columbia that are likely the best region for comparison. More detail on the frequency of ice layers during specific years and the overall distribution of thicknesses would be valuable.

Response: *Most of the ice lenses we observed were thin, with 338 ice lenses having a thickness of about 1 cm (class 25%) out of a total number of 478. Please see as example the photo of core #27 in the response to reviewer 2. It was impossible to include all those ice lenses in a figure; therefore we decided to show melt percent averages over 1 m depth in Fig. 3. The number of ice lenses per meter depth varied from 0 at 32 m depth to 24 at 44 m depth. We will include this information in the revised manuscript.*

Specific Comments

5293-7: Should mention the tidewater glacier cycle. This cycle leads glaciers to be relatively insensitive to climate during portions of the cycle (Meier and Post, 1987). In Alaska today Taku and Hubbard Glacier, neither surging, are at maximum positions while most of their neighboring glaciers have experienced exceptional retreat (Ritchie et al., 2008; Pelto et al., 2008).

Response: *This is a good comment. We will discuss it in the revised manuscript.*

5297-11: It would be useful to identify the distribution of ice layer thickness through the core. Did the number of layers differ greatly between different years?

Response: *See comment above.*

5298-3: Given the timing of the drilling late in the winter season would this lead to the just below 0 C temperature, and would this rise to 0 c during the melt season? This has been observed in the accumulation zone of several Alaskan glaciers to be the case.

Response: *We can only speculate. The major energy input is through latent heat release. It is hard to imagine that air temperature penetrates deeper than 10 to 15 m. The 10 m temperature is already much higher than the estimated -12.44℃ mean winter temperature.*

5298-10: What percentage of the surface melt is refrozen, all of it?

Response: *With our rough estimation of latent heat release based on the observed melt features we are able to explain the difference between estimated air temperature and measured ice temperature. This suggests that there is not much melt water drainage. However, this estimation has large uncertainties and limited melt water drainage cannot be excluded, but can also not be quantified. The preservation of seasonality in stable isotopes and chemical species for most of the core is another indication that melt water mostly refreezes.*

5299-2: Regarding Figure 4, the proposed attribution of annual layers is simply based on derived time scale. This is fine, but does the annual layer thickness results differ if instead the thickness is measured from maximum value to maximum value?

Response: *We actually determined the annual layer thickness measuring from maximum to maximum. This was probably not so clear because the dashed lines in Fig. 4 were misplaced (except the one at 15 m weq). This is a mistake which will be corrected in the revised manuscript. When we measure from minimum to minimum we get a range of annual accumulation from 5.33 to 6.6 m weq with a slightly higher average of 6.0 m weq.*

5300-15: Any idea why there four and not six maxima for the pollen records, and each is missing during different years?

Response: *We will rephrase the text to clarify: Pollen was not detected in every spring season identified in the stable isotope records. The absence of pollen during a particular spring-summer season can be explained by the fact that trees do not flower regularly and in some years widespread non-flowering occurs. Thus, the pollen records alone do not allow dating, but they confirm the identification of annual layers based on stable isotopes.*

5300-25: Put this in context of other maximum accumulations noted. In southeast Alaska another region that can compete for the wettest-snowiest Rasmussen et al (2011) noted maximum depths of on Columbia Glacier of 4-5 meters. Pelto and Miller (1999) noted maximum depths on Taku Glacier of 4 m. It is important to relate your core results to the results from Mount Waddington BC (Neff et al., 2012). They observed similar accumulation to those reported here and also a seasonal isotope signal. This makes the observations exceptional as is expected. How do your results differ from Waddington?

Response: *Thank you for referring to these publications. However, it was not our intention to publish a record of maximum accumulation. This study has its clear focus on the area of the Patagonian Icefields for which few data are available. We think putting this into global context is out of scope of the manuscript.*

5301-7: Why is the observed net accumulation considered a lower limit? The site was selected to have less wind erosion than typical. Wind erosion is a key process that impacts snow accumulation and only be avoided in relatively few selected locations, that would likely not be representative.

Response: *We observed some snow erosion during the two weeks on the glacier and we also see it in the stakes data (Fig. 7). Therefore we consider the net accumulation as lower limit.*

5301-20: Date range of temperature maximum?

Response: *For this comment we refer to Fig. 8 shwoing the temperature data.*