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Interactive comment on "Self-regulation of ice flow varies across the ablation area in South-West Greenland" *by* R. S. W. van de Wal et al.

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This paper presents an extremely rich data set of ice velocity, meteorological and subglacial water pressure observations from the western margin of the Greenland ice sheet (GrIS). The data extend from the ice sheet margin to above the equilibrium line altitude (ELA) and cover in detail the period 2005 to 2012. The data come from an area of the ice sheet that has been a focus of considerable research concerning interactions between the hydrology and dynamics of a land-terminating sector of the ice sheet and the data presented in this paper make a valuable addition to this literature, in particular because of the length of the velocity-melt time series.

Nevertheless, while the observations presented are extremely valuable, it is important that the findings and scope of the paper are placed in the appropriate context relative to previous work. In particular, the citations to some of the existing studies incorrectly limit the spatial and temporal coverage of the earlier observations. For example, the authors state that observations by Tedstone et al. (2013) "only covered the lower ablation zone" (p 4622, l 13) and that Sole et al. (2013) "showed that in the lower ablation zone" (p4628, l6). This is incorrect; both studies presented observations from the ice sheet margin to approximately >115 km inland to an elevation of >1700 m. Thus observations extended across the whole of the ablation zone to above the ELA. (see Sole et al. (2013), Figures 1 and 2). Furthermore, the results presented in the current manuscript regarding "self-regulation" of the ice-sheet were made strongly in the papers by both Sole et al. (2013) and Tedstone et al. (2013) which, between them, include four years of ice motion data (2009-2012) across the whole ablation area, incorporate the exceptional 2010 and 2012 melt years and state unequivocally in their abstracts that strong summer melt (and associated ice motion) is followed by a compensating winter slowdown (i.e. self-regulation), e.g. "despite record summer melting, subsequent reduced winter ice motion resulted in 6% less net annual ice motion in 2012 than in 2009" (from Tedstone et al.'s 2013 abstract). Thus the current paper valuably extends and supports findings that have already been stated and this should be made clearer.

Many statements in the current paper are made about rapid and significant velocity responses in 2012 at S9 (e.g. p 4630, l 15), but the effect of these on annual velocities is not shown clearly. The statement "S9 accelerated to over double its previous velocity maximum" needs additional context regarding the duration of this acceleration to clarify its overall effect on net ice motion. The closing statement from the abstract therefore appears unfounded; "During the extreme melt in 2012 a large velocity response near the equilibrium line was observed, highlighting the possibility of rapidly changing bed conditions in this part of the ice sheet that may lead to a doubling of the annual ice velocity." This may refer to the afore-mentioned acceleration of S9 to over double its previous maximum velocity or the doubling of mean annual velocity between S10 and S9.

There is however no convincing evidence presented in the current paper to support the notion that such a transient velocity increase could lead to a doubling of annual velocity. Indeed, Tedstone et al. (2013) also observed pronounced speed-ups in 2012 at their S6 (at 1482m elevation compared with S9 at ∼1520m) but no net annual speed-up in 2012 compared with the 'normal' melt-year of 2009. The fact that mean annual ice-velocity doubles from ∼50 to ∼100 m/yr between S10 and S9 before actually dropping again to ∼75m/yr at S8 also suggests that local driving stresses (e.g. surface gradient) are far more likely to be the key difference between the velocities along this section of the transect rather than "rapidly changing bed conditions". Overall, a table displaying the mean annual ice velocities and annual mass balance at each site for the 7 years of detailed GPS data would be extremely illuminating and help the reader assess the importance of the velocity variations referred to.

Regarding 'spring-events', the paper uses very convincing data to state (p4622, l23) that "The delay of the spring event the higher on the ice sheet is illustrated in Fig. 4 and confirms the idea that the spring event is related to the onset of the melt season". It would be helpful to add references to the papers (from the wider Alpine and Greenland literature) which these new observations are confirming.

The availability of the borehole water pressure data is a very valuable component of the paper as reported in section 4. It would however greatly strengthen this section if some of the copious literature from the Alps on borehole water pressure (e.g. Iken and Bindschadler, 1986; Hubbard et al, 1995 etc.), drainage system evolution and ice motion was used to aid your interpretation here.

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