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Supplement of

Extraordinary runoff from the Greenland ice sheet in 2012 amplified by hypsometry and depleted firn retention

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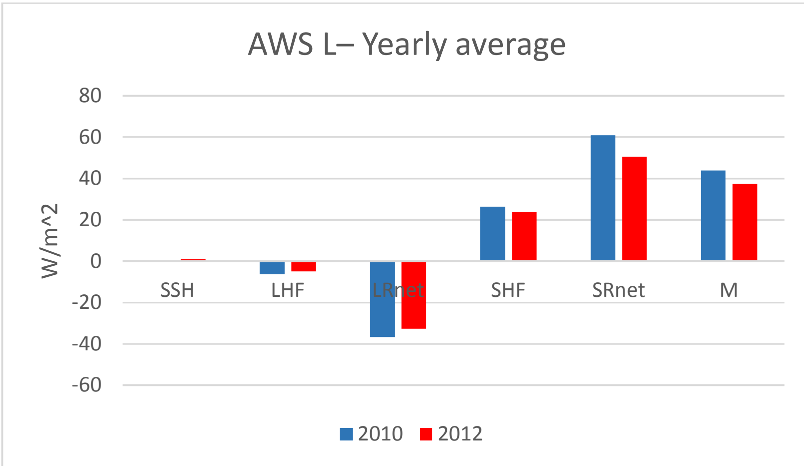
Supplementary Figures

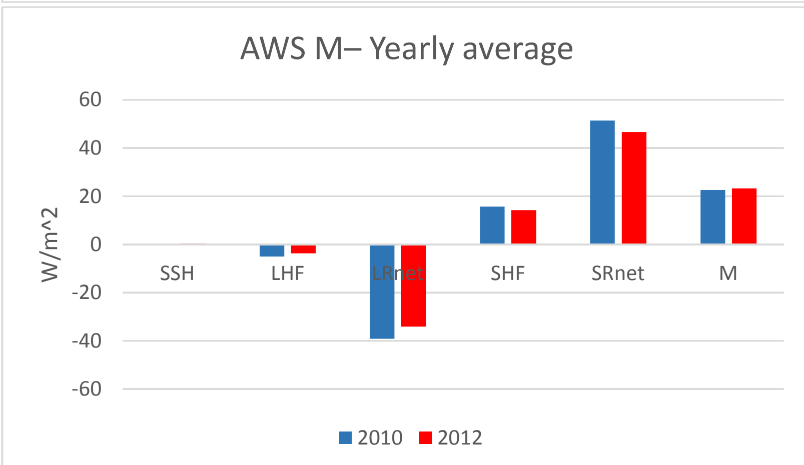
Energy balance for the three weather stations AWS_L, AWS_M and AWS_U (located at 680, 1270 and 1840 m a.s.l. respectively), as based on the surface engergy balance model explained in section 2.5. The energy balance is shown as the yearly averaged energy fluxes for the respective 100 m elevation interval corresponding to the weather stations at each elevation interval. The componets shown are SSH = sub-surface heat flow, LHF = latent heat flow, LRnet = net long wave radiation, SHF = sensible heat flow, SRnet = net short-wave radiation. M = energy available for melt. Energy input from rain is omitted on the figure given it is contributing with a maximum of 0.1 W m^{-2} when averaged over a year. When the number is positive, the energy flux is directed towards the surface and vice versa when it is negative.

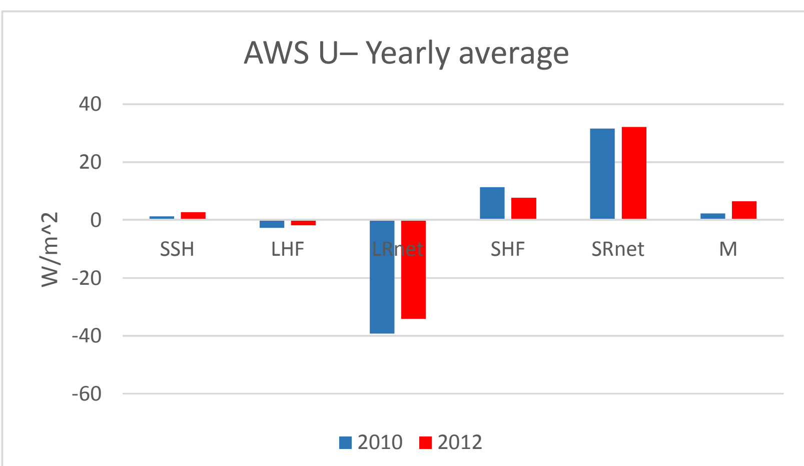
For AWS_L, the main difference between year 2010 and 2012 is a 10.2 W m^{-2} smaller SRnet influx of energy over the year. The energy input from SHF is 2.6 W m^{-2} smaller for the averaged year and the loss of energy through LRnet is 3.9 W/m^2 samller in 2012 compared to 2010. The removal of energy through LHF is 1.4 W/m^2 smaller in 2012 compared to 2010, where SSH is 1.24 W m^{-2} larger in 2012. Overall the resulting energy available for melt is 6.5 W m^{-2} smaller for the KAN_L elevation in 2012, as compared to 2010.

For AWS_M, the energy input for SRnet and SHF was 4.7 and 2.4 W m^{-2} smaller respectively in 2012 compared to 2010. The removal of energy via LRnet and LHF was respectively 5 and 1.4 W m^{-2} samller in 2012 compared to 2010. SSH represented a positive flux towards the surface, that was 0.4 W/m^2 larger in 2012. The resulting energy available for melt is almost equal between the two years with a 0.6 W m^{-2} larger energy input in 2010.

For AWS_U, the energy input for SRnet was 0.6 larger in 2012 relative to 2010, where SHF was 3.7 W m^{-2} smaller in 2012 compared to 2010. The removal of energy via LRnet and LHF was respectively 5.1 and 0.8 W m^{-2} samller in 2012 compared to 2010. SSH represented a positive flux towards the surface, that was 1.5 W/m^2 larger in 2012. The resulting averaged energy available for melt in 2012 was 4.3 W m^{-2} larger than in 2010.


AWS L– Yearly average
W/m^2
80
60
40
20
0
-20
-40
-60
SSH
LHF
LRnet
SHF
SRnet
M
2010
2012


AWS M– Yearly average
W/m^2
60
40
20
0
-20
-40
-60
SSH
LHF
LRnet
SHF
SRnet
M
2010
2012


AWS U– Yearly average
W/m^2
40
20
0
-20
-40
-60
SSH
LHF
LRnet
SHF
SRnet
M
2010
2012