Supplementary information for:

Examining the effect of ice dynamic changes on subglacial hydrology through modelling of a synthetic Antarctic glacier

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Introduction

This supplementary information contains additional figures that show:

- The discharge differences, sheet thickness differences, and percent overburden differences for the following sensitivity tests of GlaDS parameters:
  - Bedrock obstacle size
  - Channel conductivity
  - Distributed system conductivity
- Undifferenced values for channel discharge, sheet thickness, and percent overburden for the water input sensitivity test.
- Side-by-side comparison of slope change and baseline run showing higher pressure and lower channel discharges in the slope change run
- Quiver plot showing the direction of steepest hydraulic potential gradient for the slope change run under high volumes of water, indicating preferential flow towards the central channel described in the main text

Bedrock obstacle size:

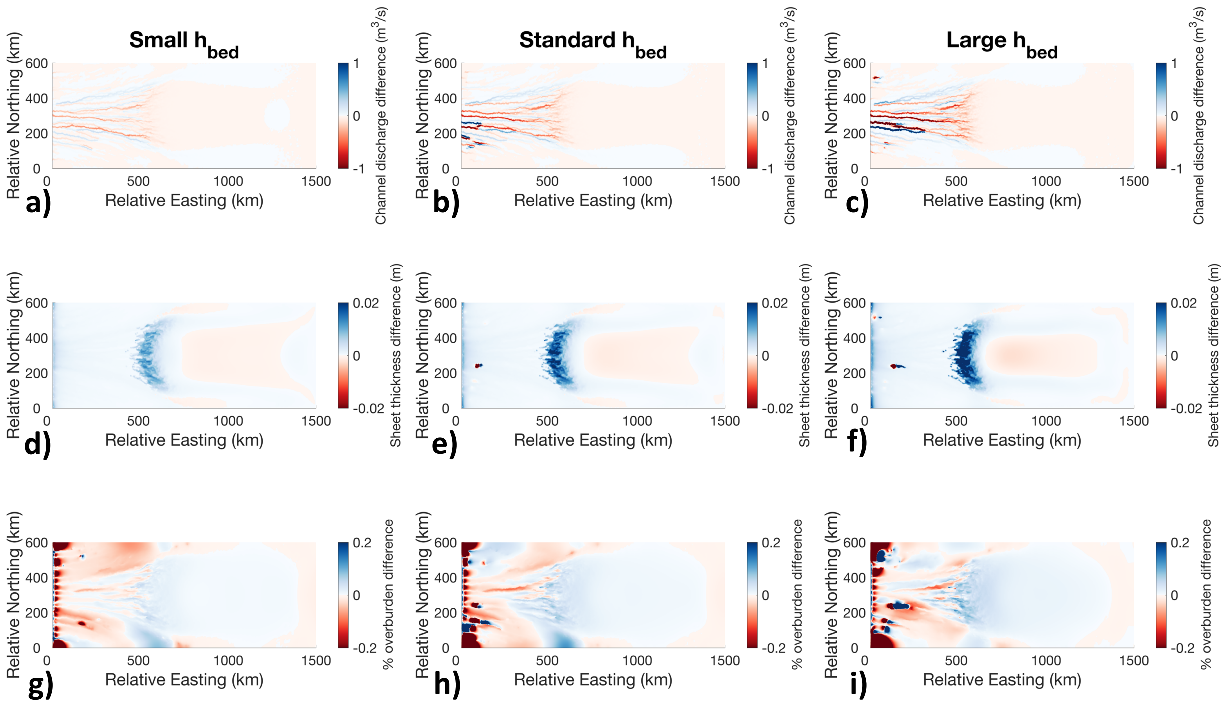

Figure S1. Channel discharge, water sheet thickness, and percent overburden differences between the linear velocity and baseline runs at the final timestep under different bedrock obstacle sizes. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the linear velocity run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

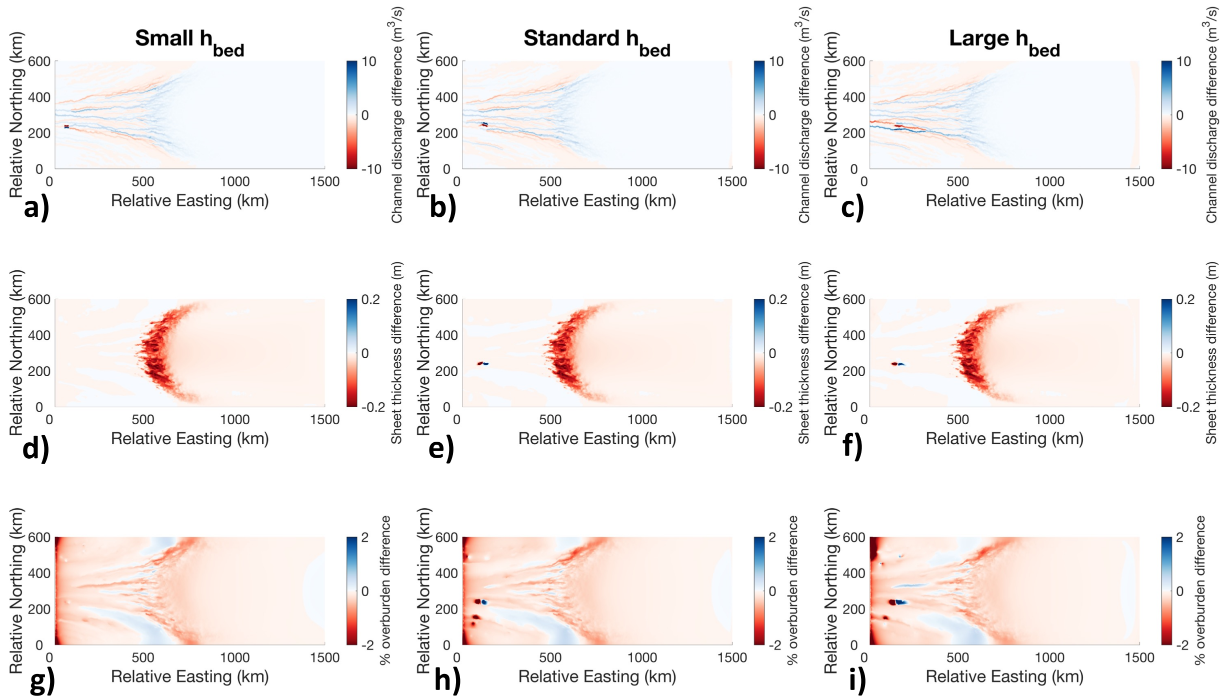

Figure S2. Channel discharge, water sheet thickness, and percent overburden differences between the slope change and baseline runs at the final timestep under different bedrock obstacle sizes. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the slope change run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

Channel conductivity

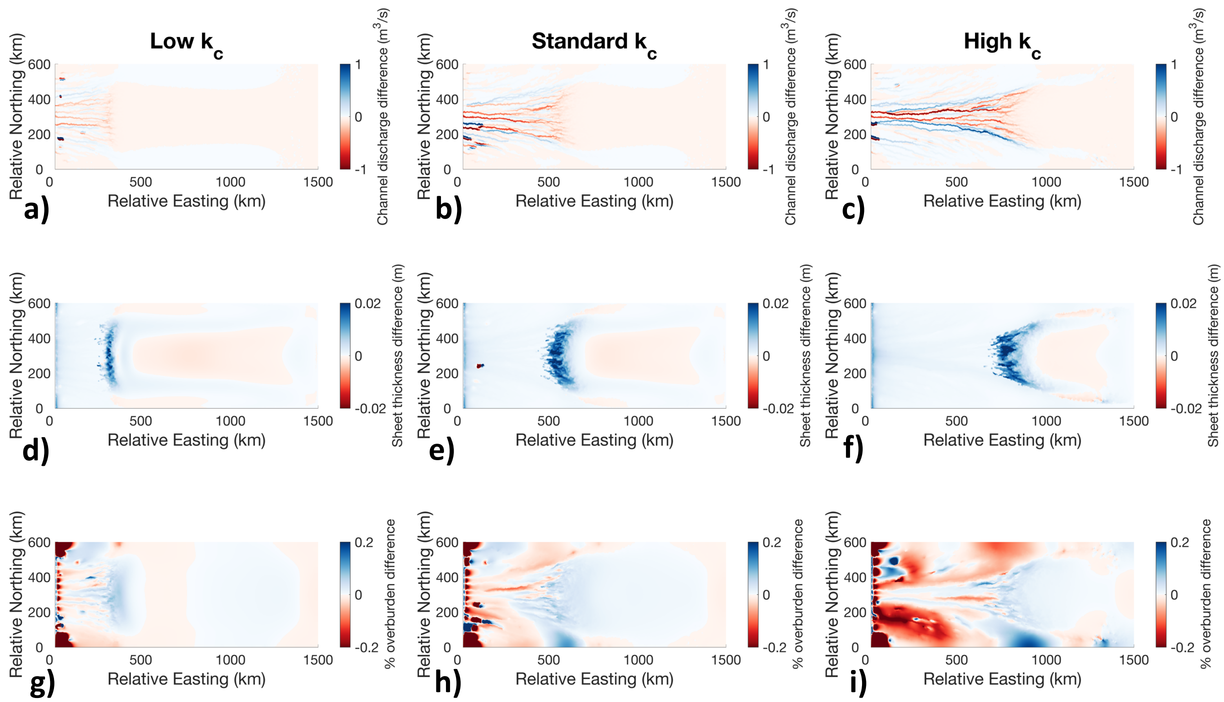

Figure S3. Channel discharge, water sheet thickness, and percent overburden differences between the linear velocity and baseline runs at the final timestep under different channel conductivities. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the linear velocity run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

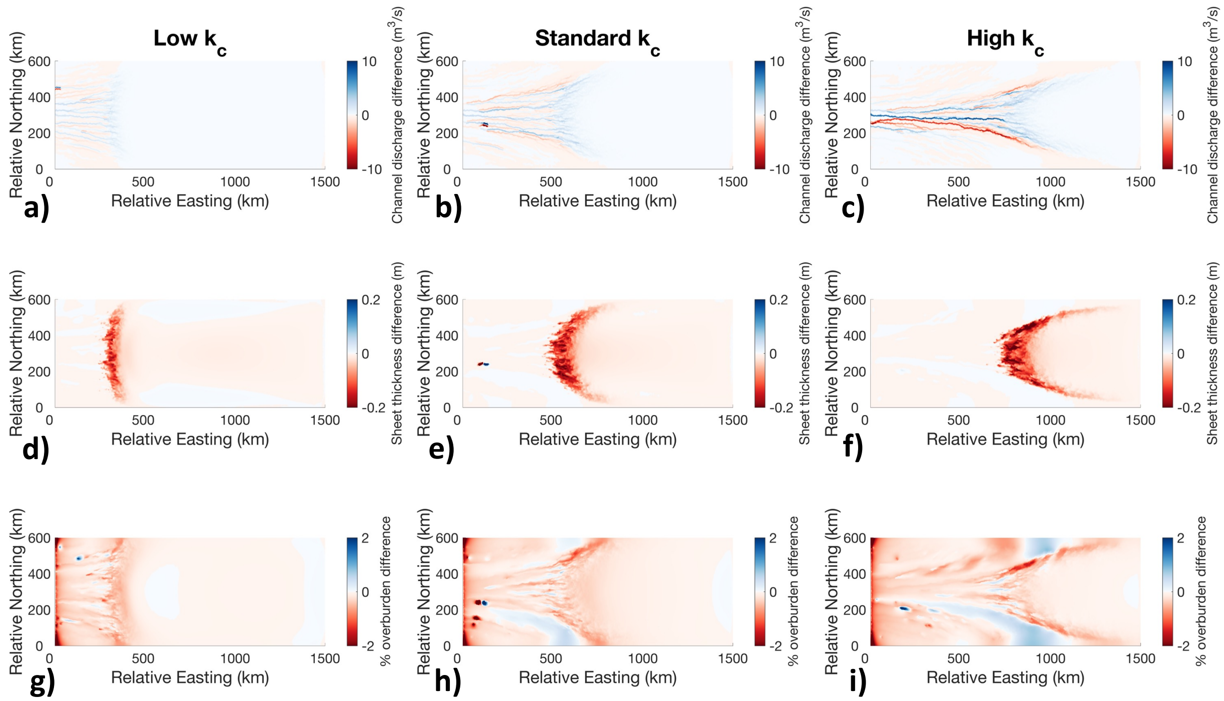

Figure S4. Channel discharge, water sheet thickness, and percent overburden differences between the slope change and baseline runs at the final timestep under different channel conductivities. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the slope change run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

Distributed system conductivity

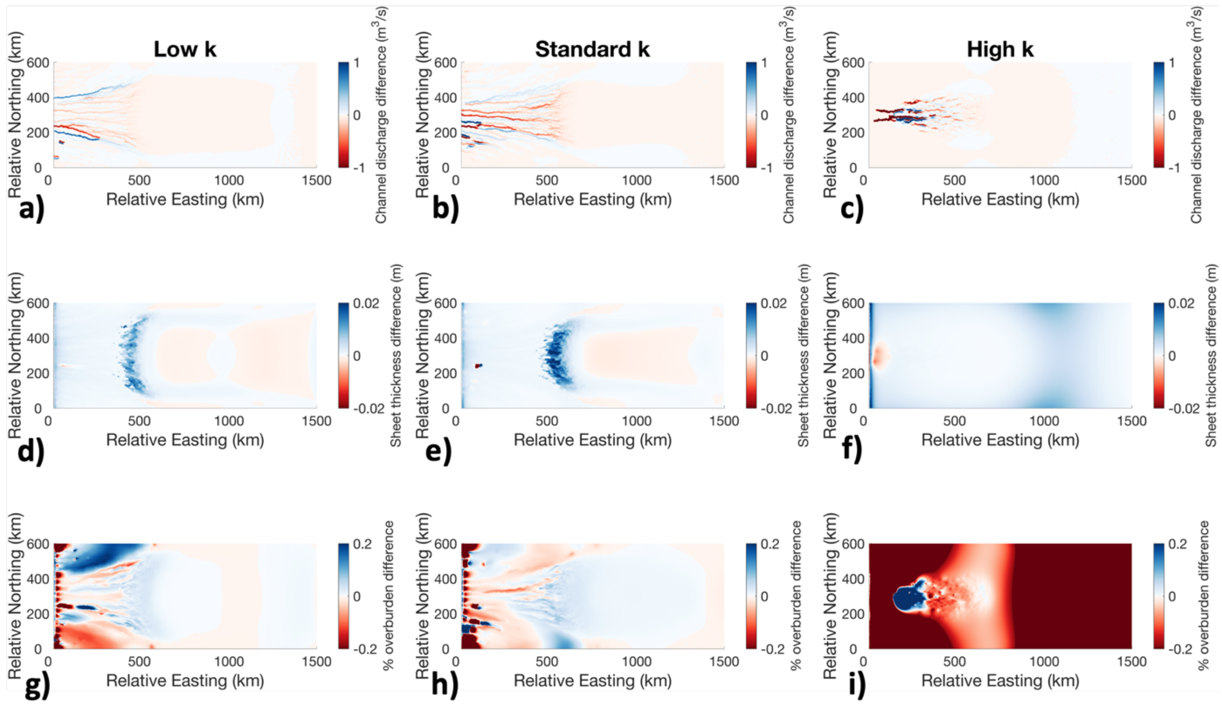

Figure S5. Channel discharge, water sheet thickness, and percent overburden differences between the linear velocity and baseline runs at the final timestep under different distributed system conductivities. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the linear velocity run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

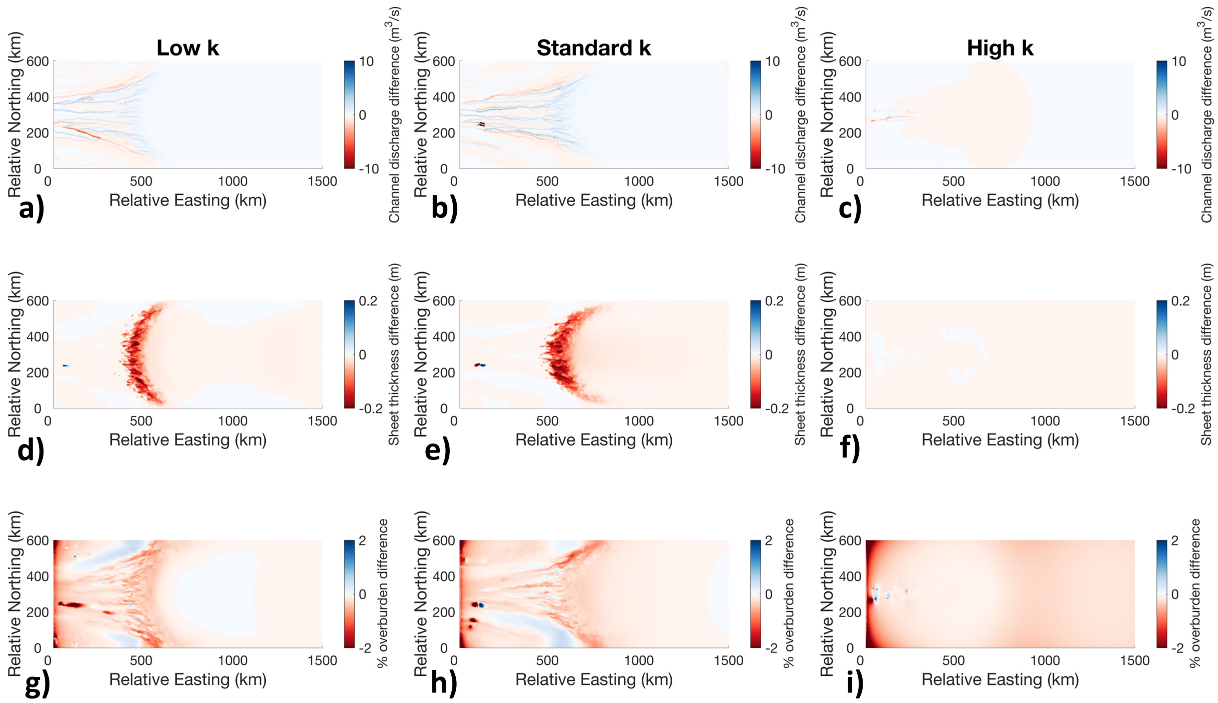

Figure S6. Channel discharge, water sheet thickness, and percent overburden differences between the slope change and baseline runs at the final timestep under different distributed system conductivities. The panels show a)-c) channel discharge difference; d)-f) water sheet thickness difference; g)-i) percent overburden difference. Positive differences in blue indicate where the value is larger in the slope change run, while negative differences are shown in red and indicate where the value is larger in the baseline run.

Undifferenced model outputs for water input tests

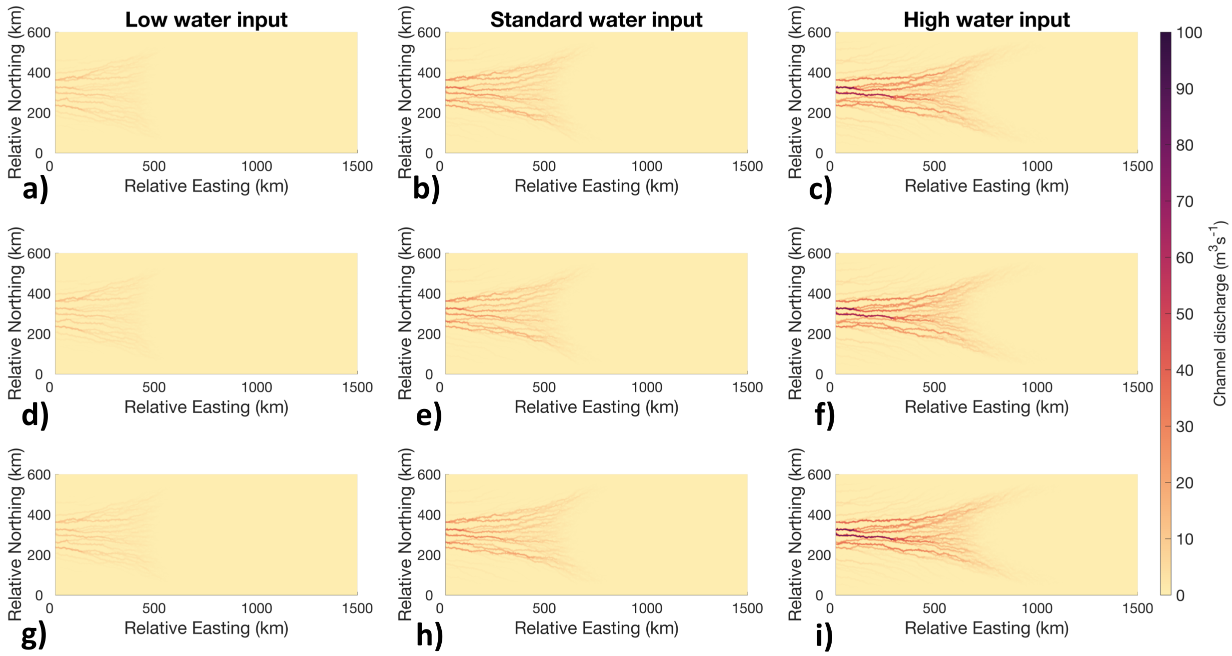

Figure S7. Channel discharges at the final timestep under different volumes of water input into the distributed system. a)-c) baseline run; d)-f) linear velocity run; g)-i) slope change run.

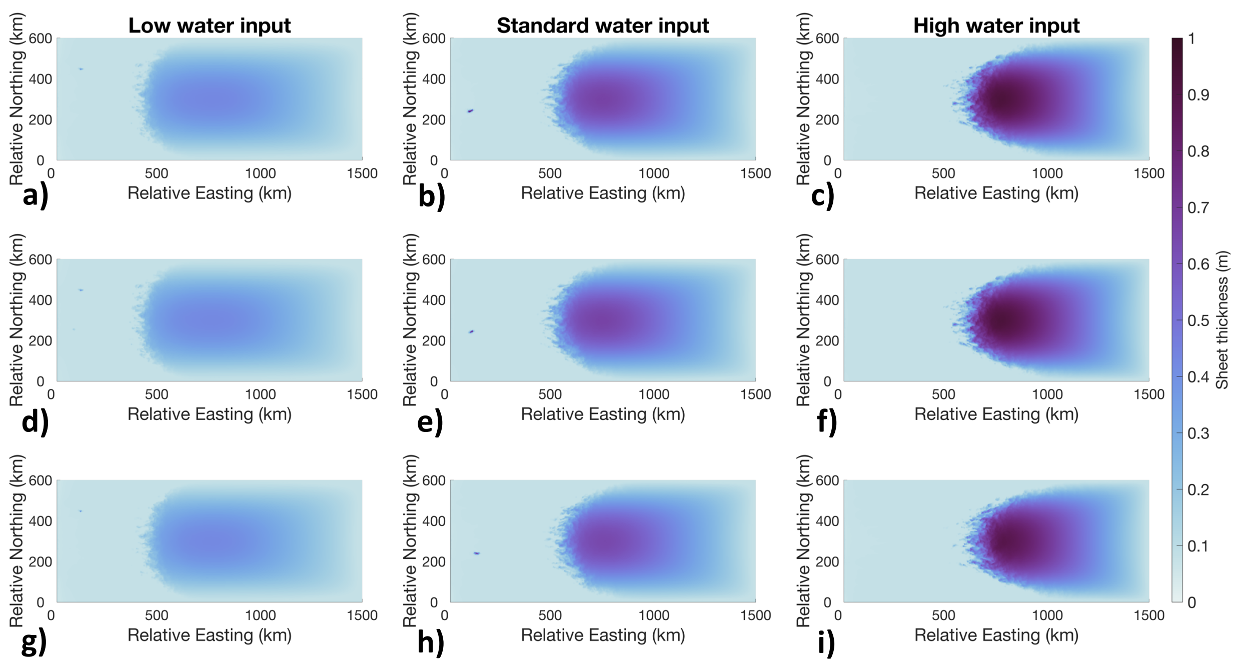

Figure S8. Distributed water sheet thicknesses at the final timestep under different volumes of water input into the distributed system. a)-c) baseline run; d)-f) linear velocity run; g)-i) slope change run.

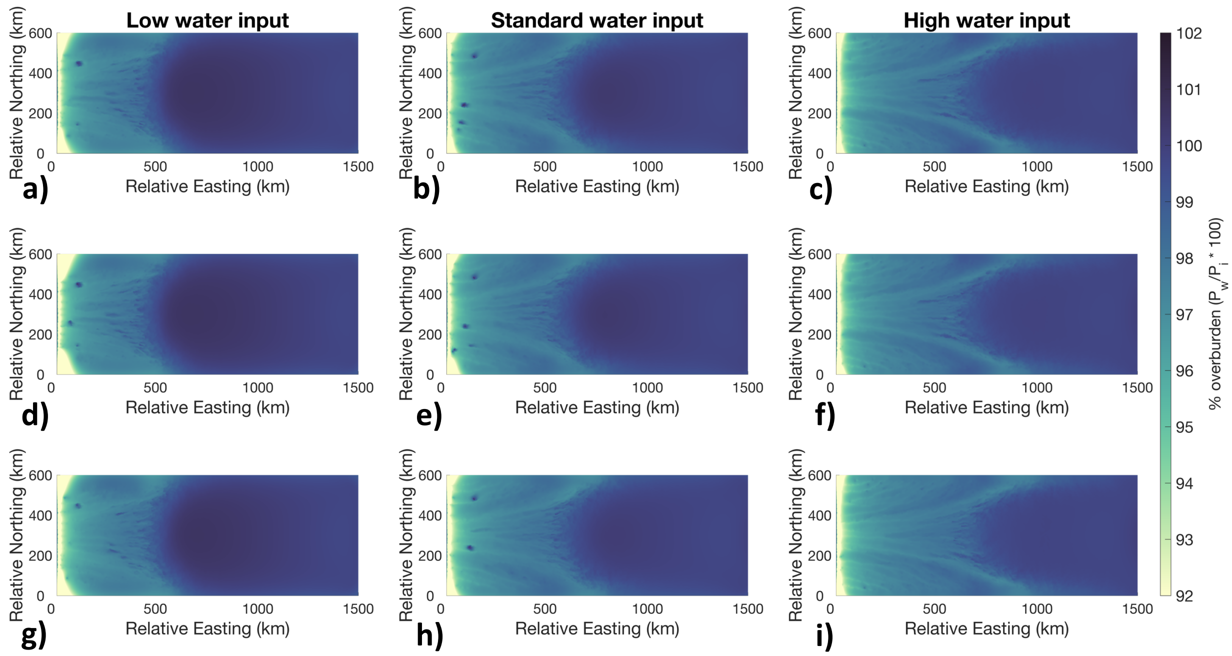

Figure S9. Percent overburden at the final timestep under different volumes of water input into the distributed system. a)-c) baseline run; d)-f) linear velocity run; g)-i) slope change run.

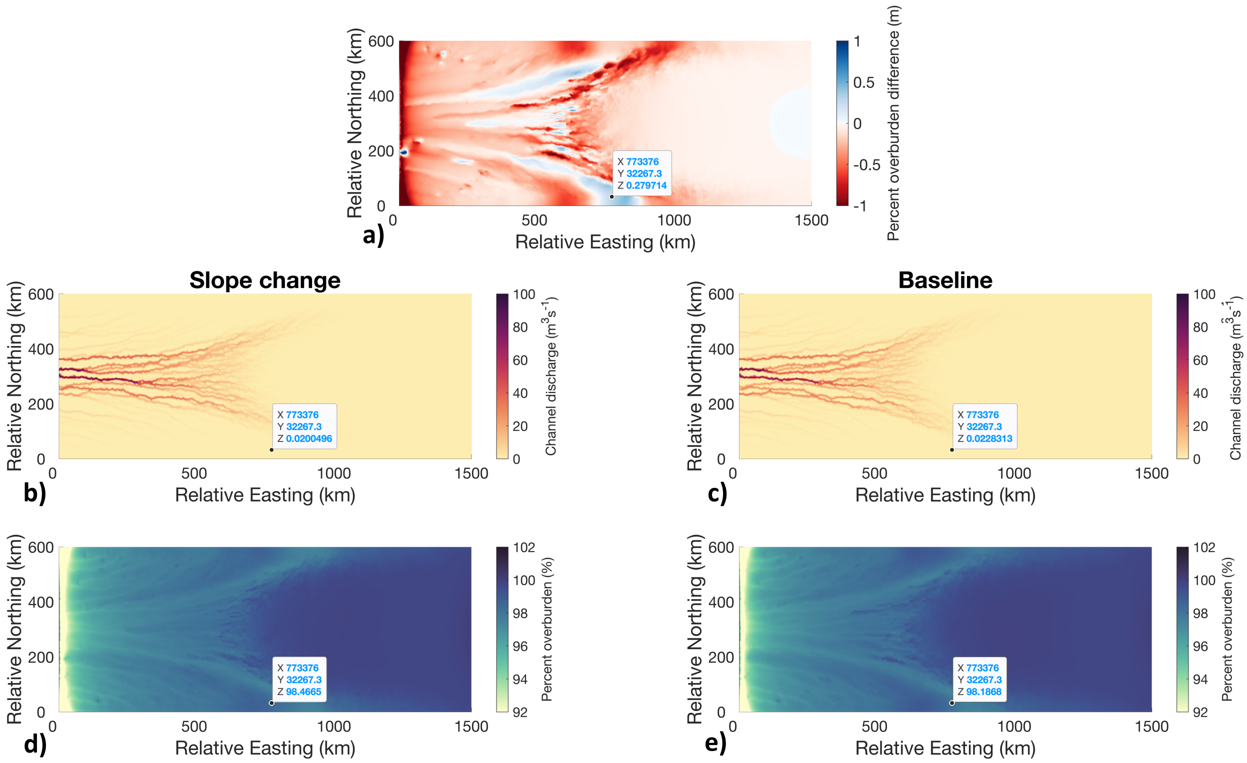

Figure S10. Comparison of channel discharges and percent overburden in the slope change and baseline runs under high water input. Panel a) shows the percent overburden difference between the slope change run and the baseline run. Positive values are in blue are indicate that the value in the slope change run is larger, while negative values are shown in red and indicate that the value is larger in the baseline run. Panels b) and d) show the undifferenced channel discharge and percent overburden for the slope change run. Panels c) and d) show the undifferenced channel discharge and percent overburden for the baseline run.

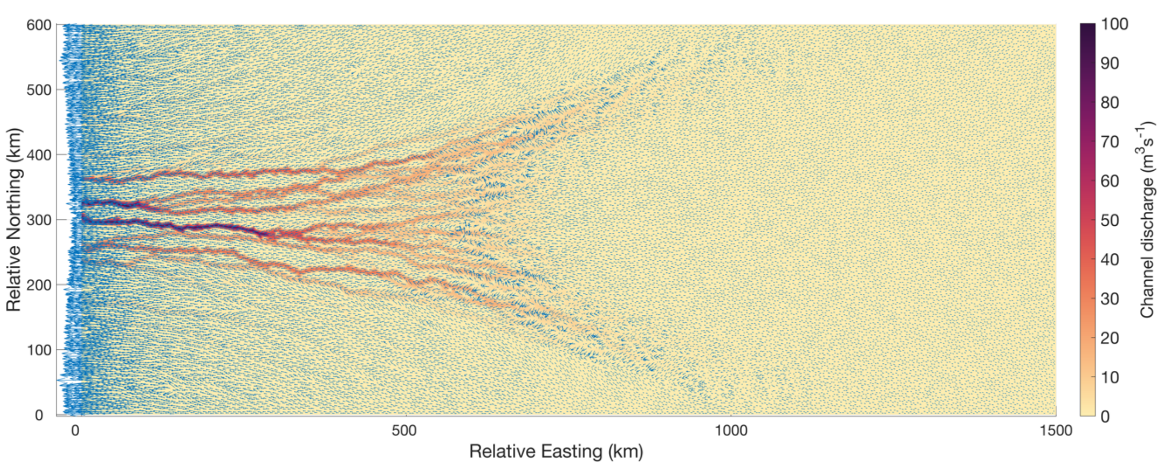

Figure S11. Quiver plot showing the direction of steepest hydraulic potential gradient for the slope change run under high volumes of water input, indicating preferential flow towards the central channel described in the main text.