



Does calving matter? Evidence for significant submarine melt



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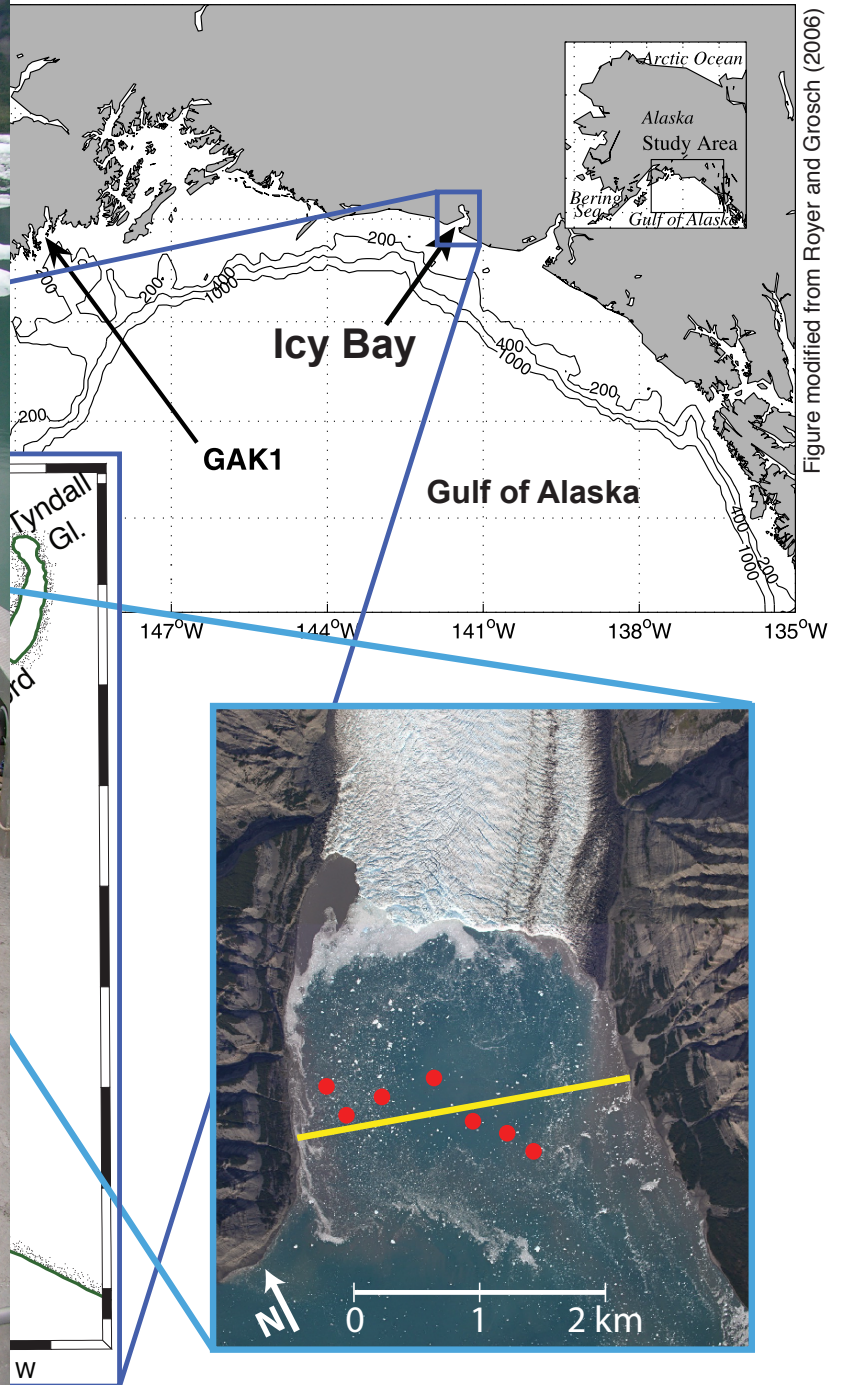
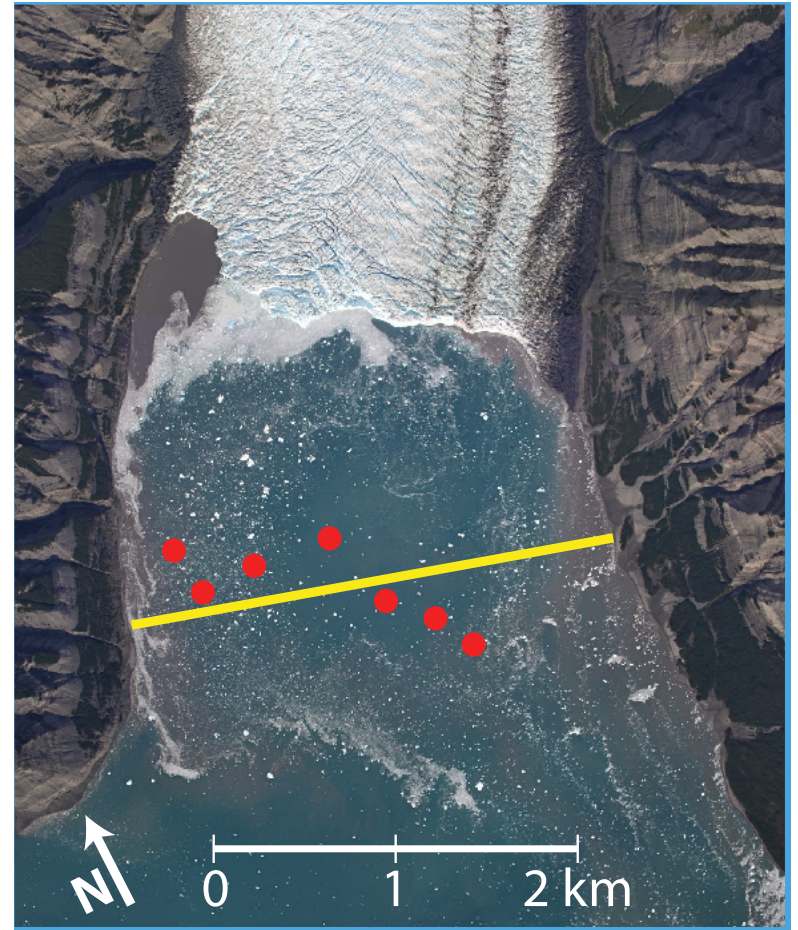
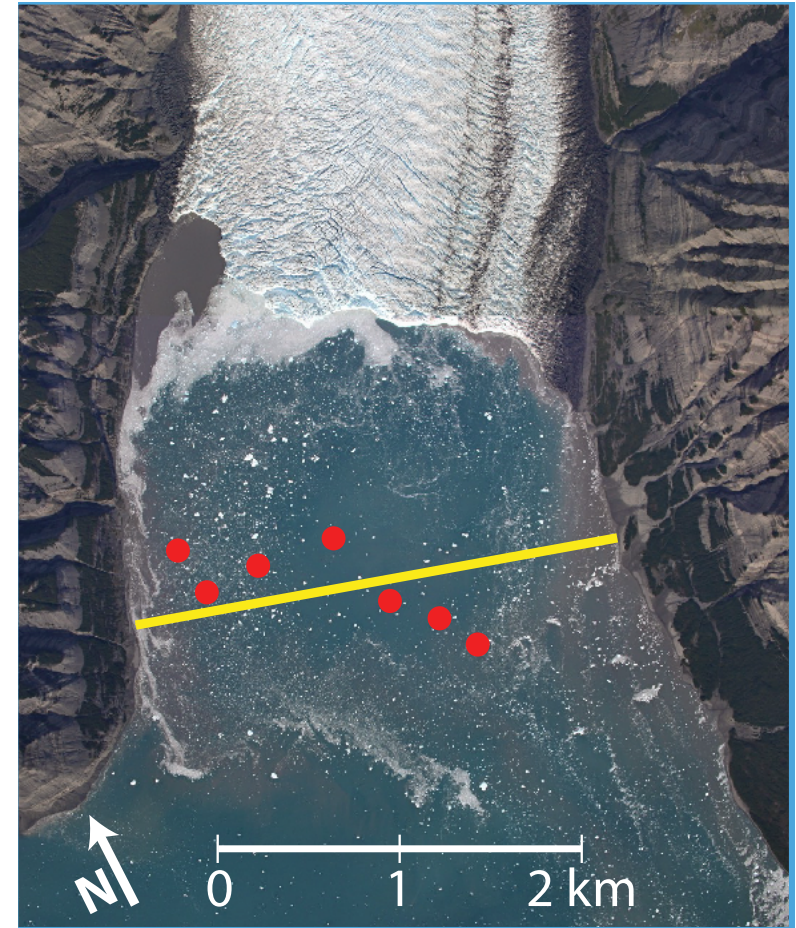
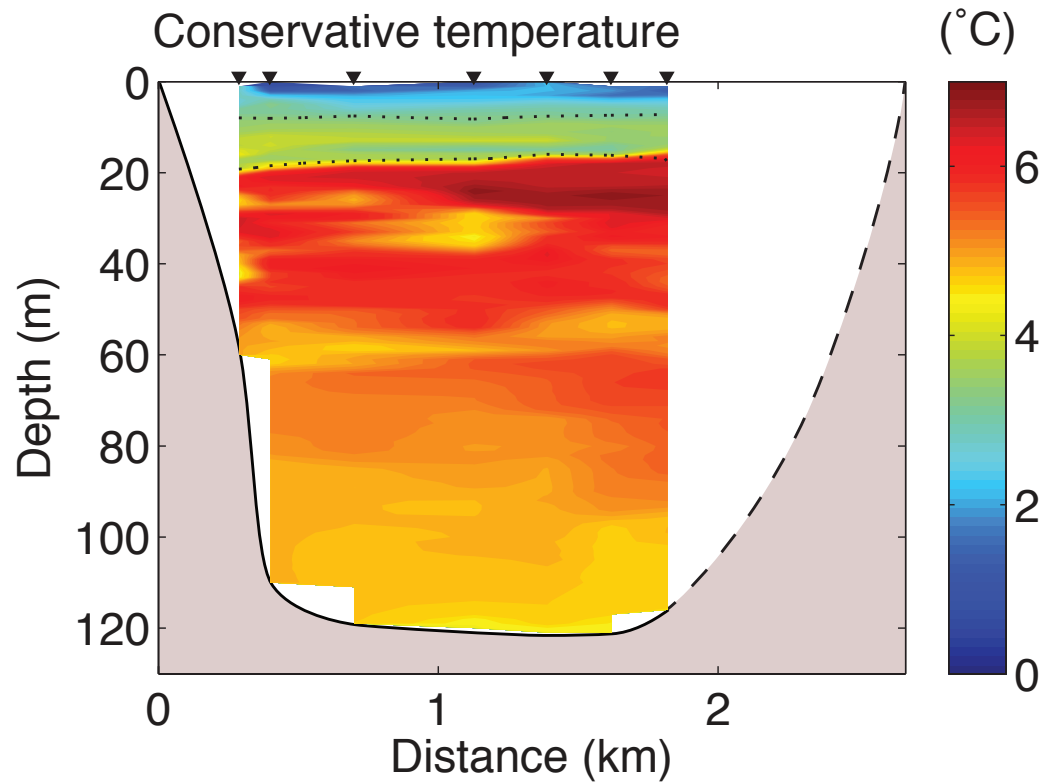


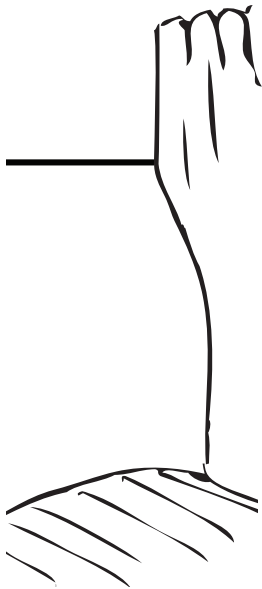
Figure modified from Royer and Grosch (2006)



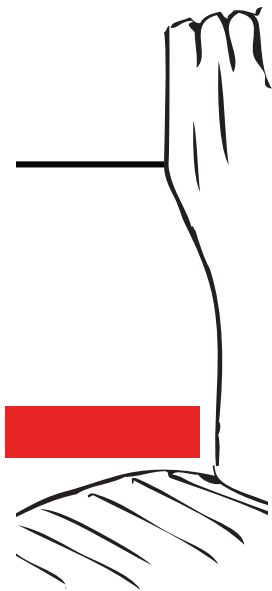
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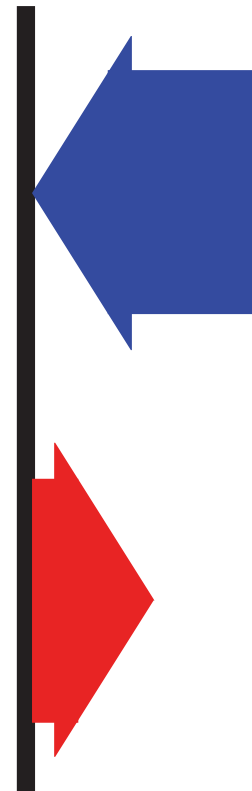
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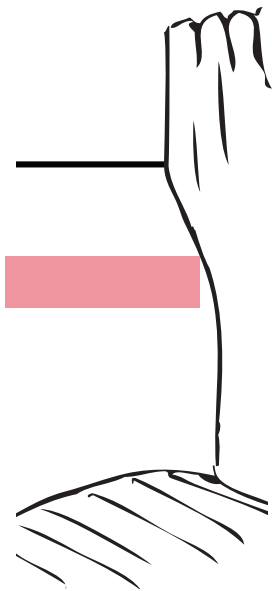


9 m/d



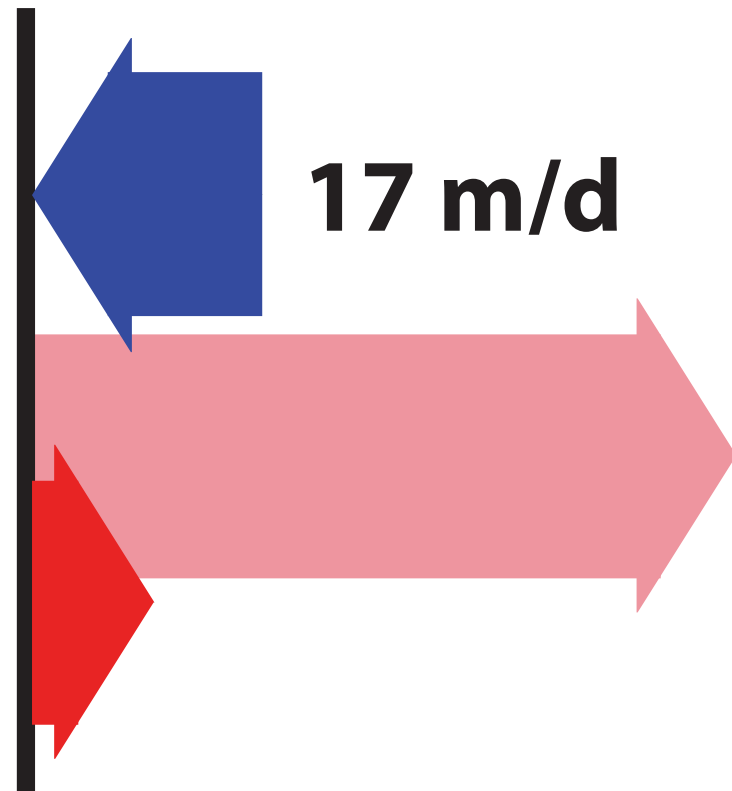
17 m/d

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52 m/d

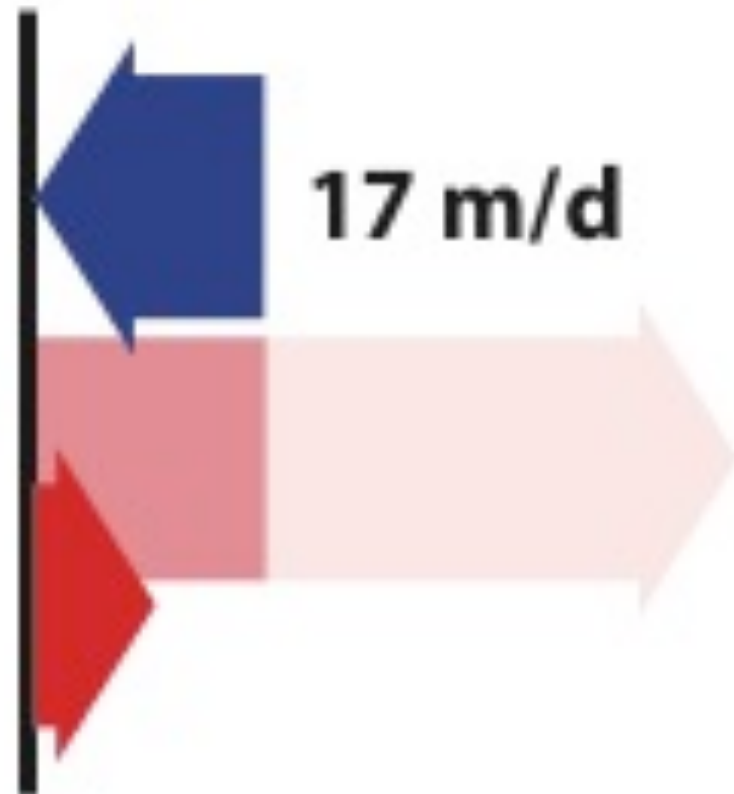
9 m/d



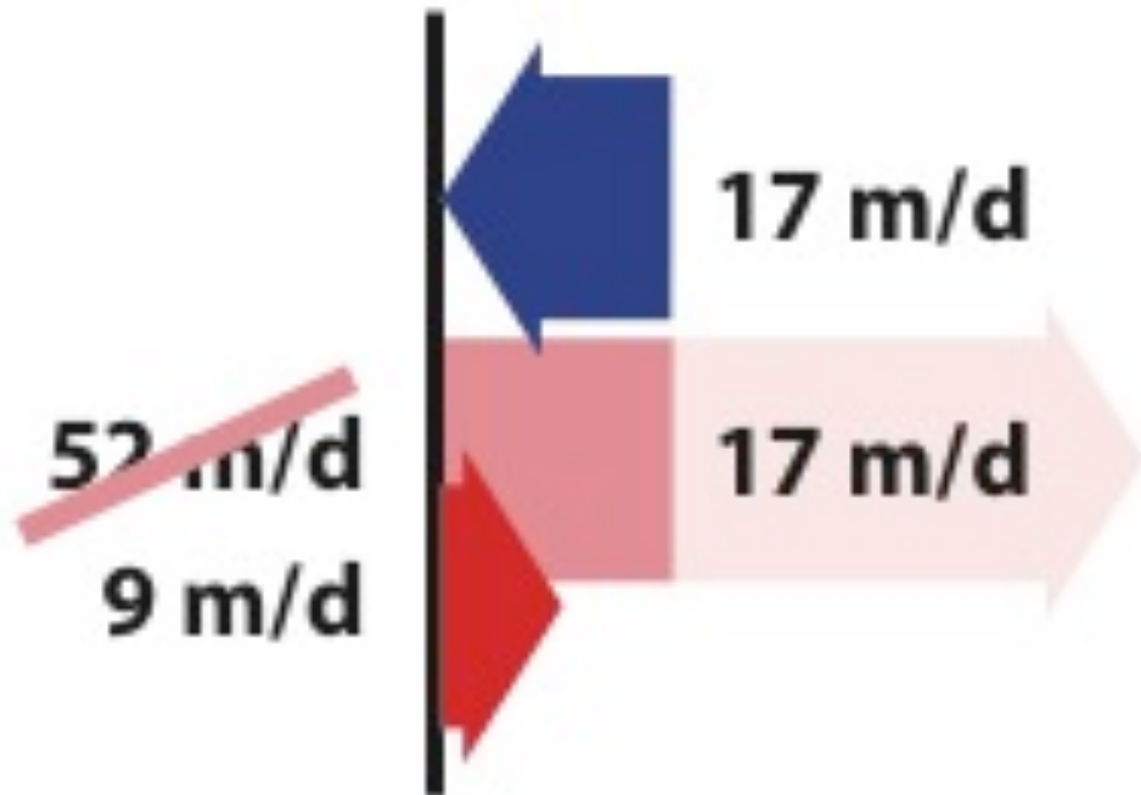
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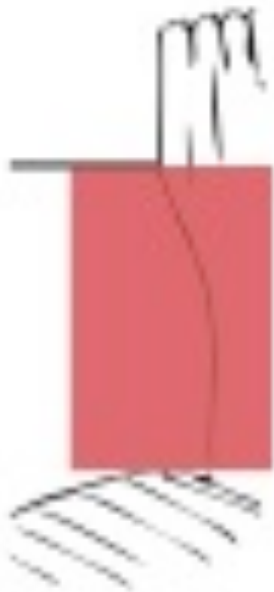
~~52 m/d~~
9 m/d



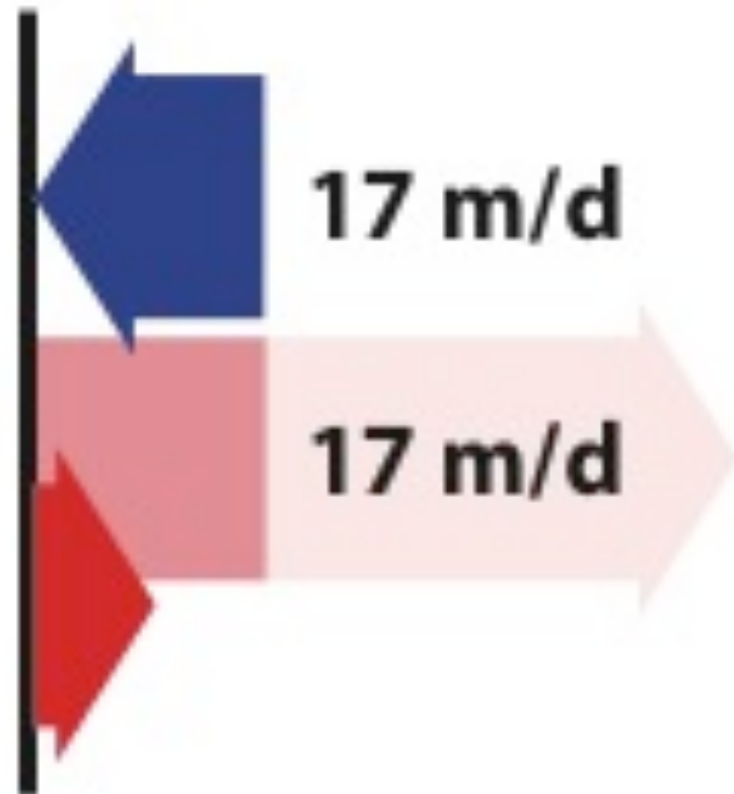
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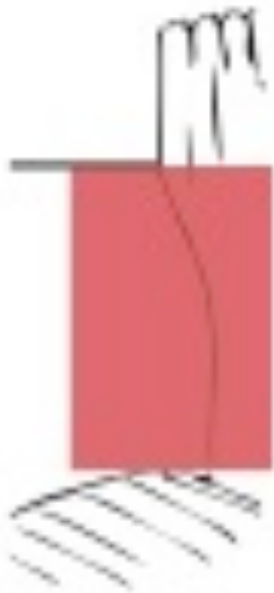
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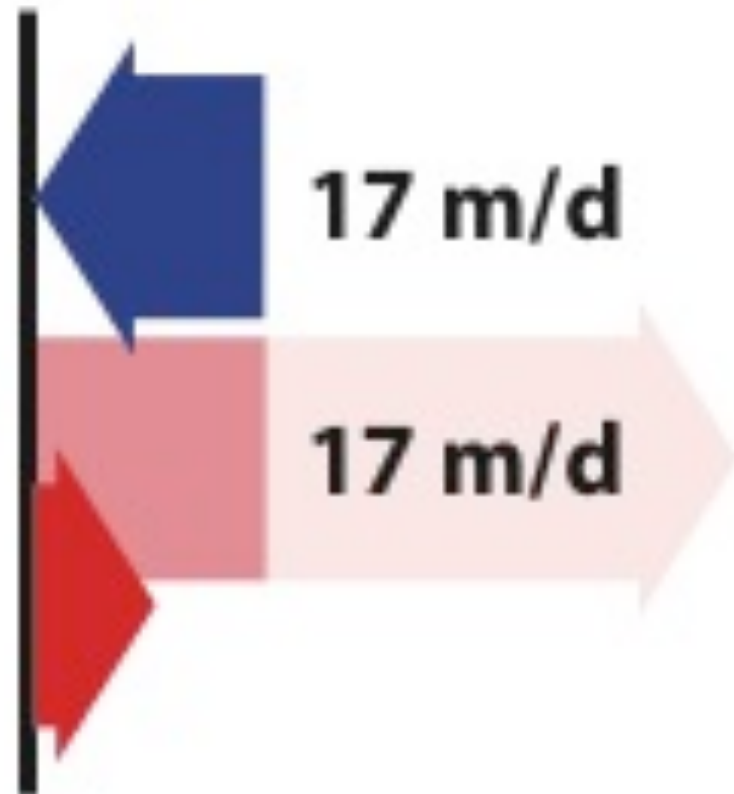
5 Sufficient heat exists
9 to melt all the
submarine ice
flowing into the
terminus

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Calving is 1/3 of frontal ablation,
but paced by submarine melt



~~52 m/d~~
9 m/d



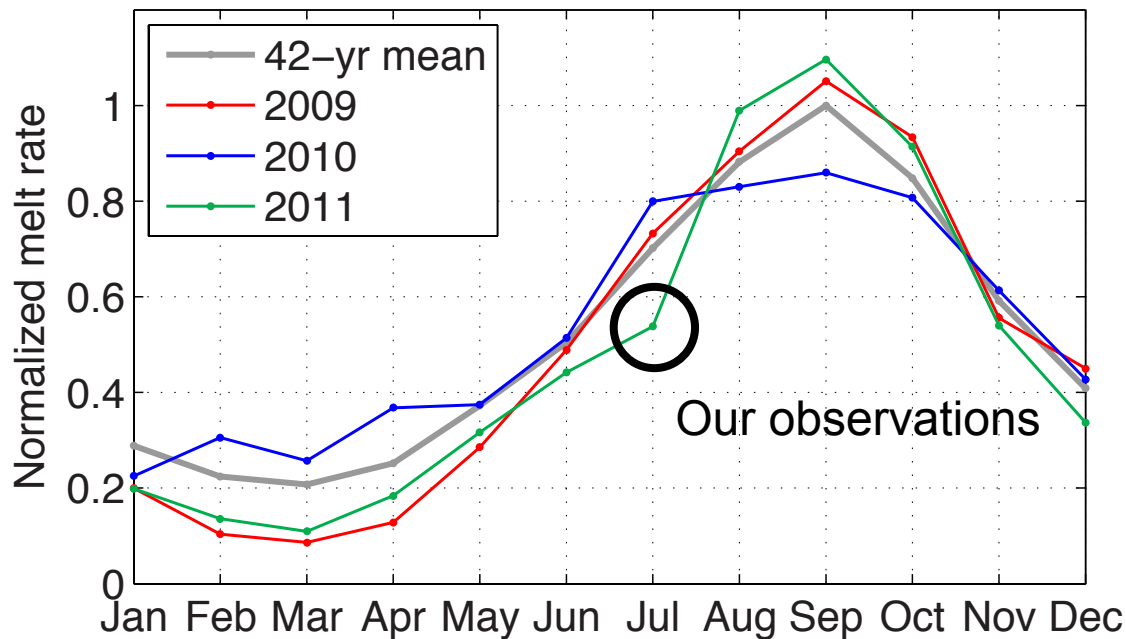
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Seasonal variability of
submarine melt

$$\dot{m} \propto q^p T$$

$$p \sim 1/3 \text{ or } 1/2$$

(Jenkins, 2011; Xu
2012;
Sciascia, 2013)



Significant melt
expected between
June and November,
peaked in September

Does calving matter?

Evidence for significant submarine melt

- **Submarine melt can equal the near-terminus ice speed.**
 - *Who needs calving laws? We need a submarine melt law...*
- **>10 m/d melt rates are not sufficient on their own to drive retreat.**
 - **Yahtse Glacier advances while coastal water warms.**
- **Alaska's fjords are an excellent natural laboratory for submarine melt.**

(want more