GPS measurements on Pine Island Glacier

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WAIS, 2009

Pine Island Glacier

GPS Installation

Data Processing

Results

Conclusions

Outline

Pine Island Glacier

- One of the primary drainages into the Amundson Sea Embayment

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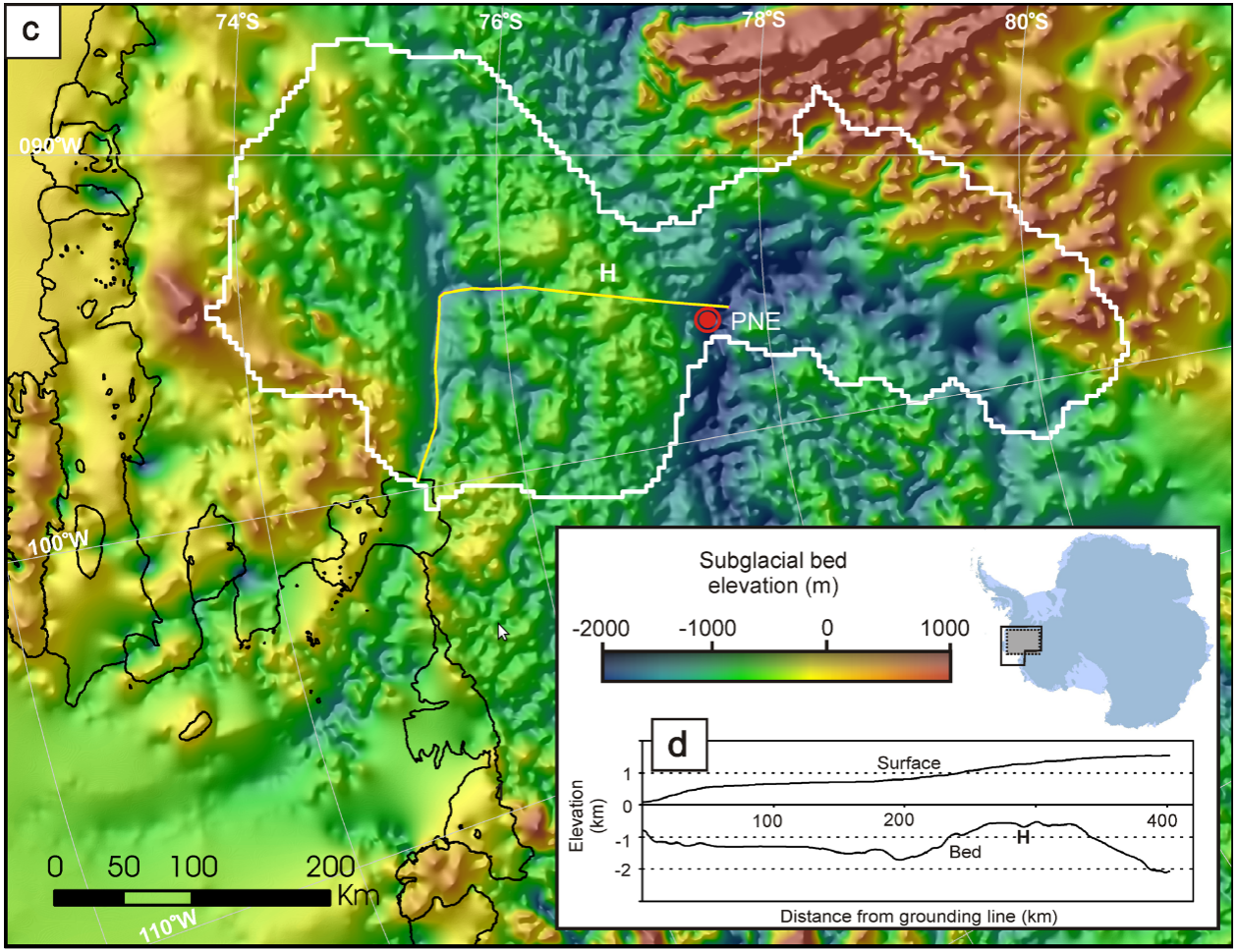
- Short floating tongue
- Continued retreat of grounding line, acceleration, and thinning
- Drains a marine ice sheet; potential for large changes

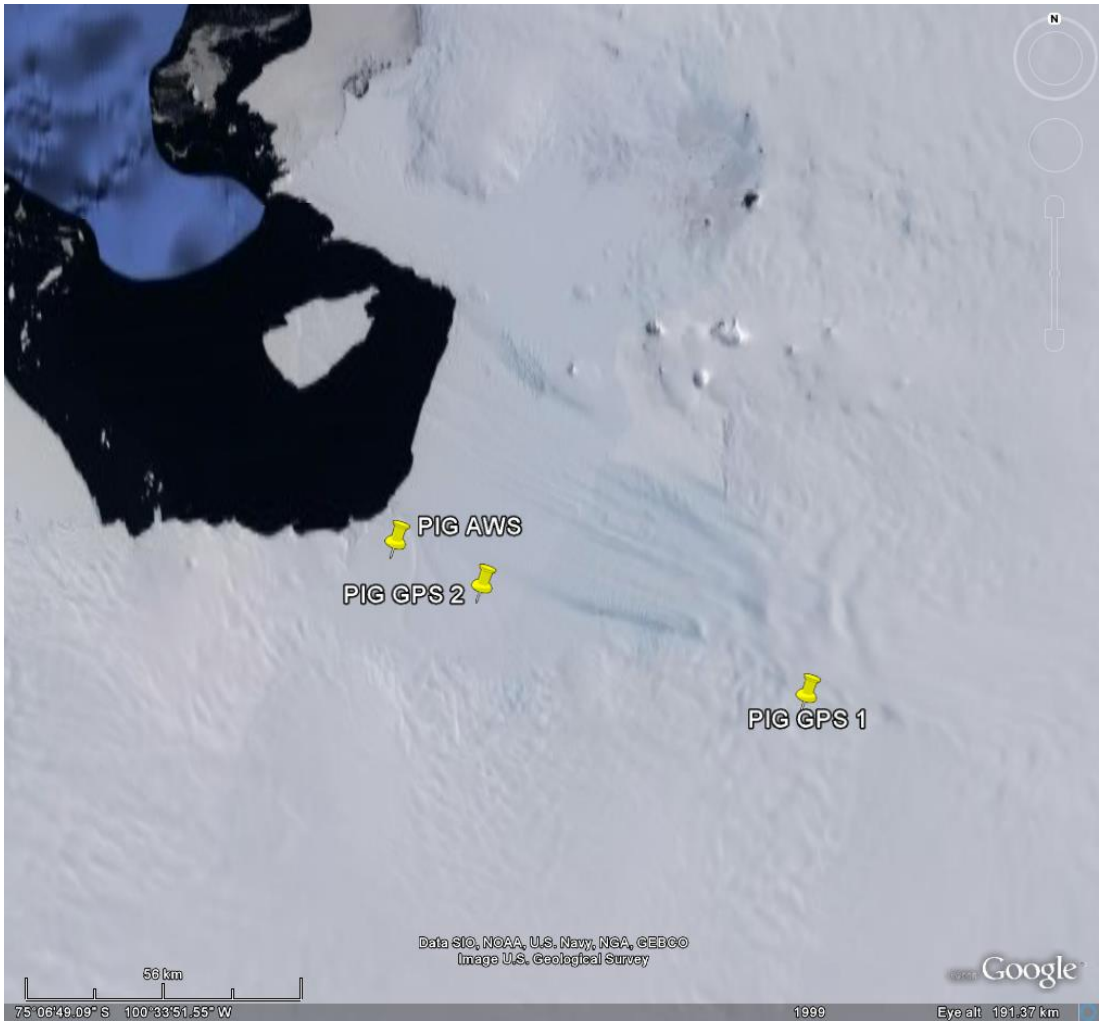
Bottom topography



Vaughn et al., 2006, GRL

Outline

GPS Location



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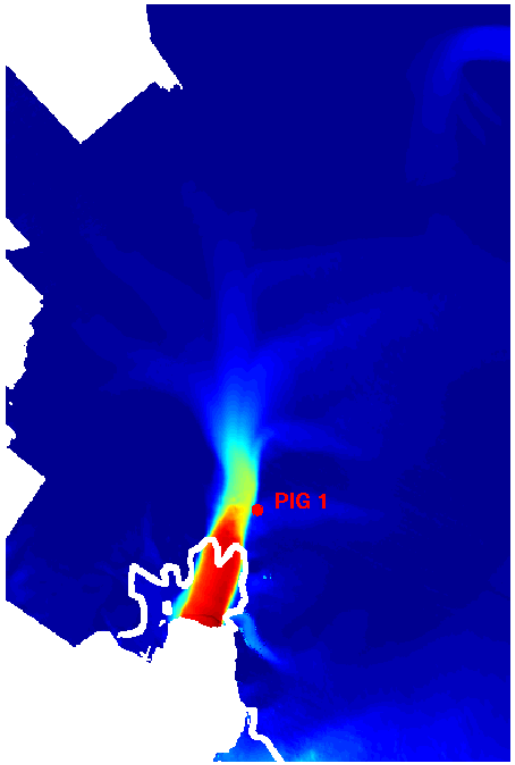
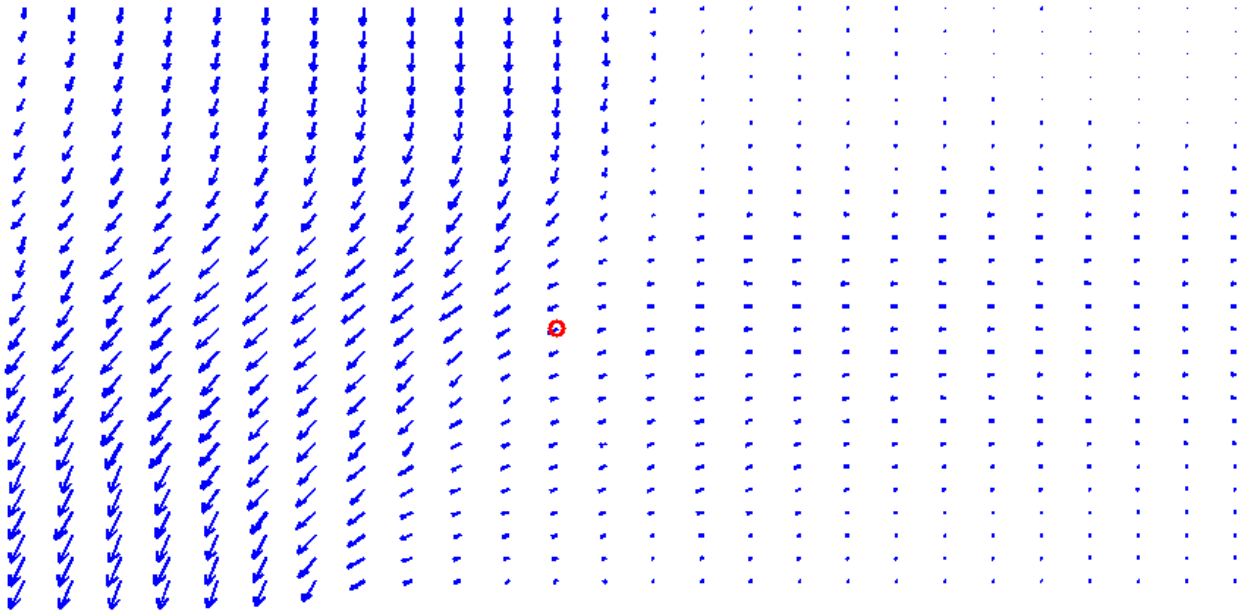


1996 velocity field from I. Joughin

Local flow field



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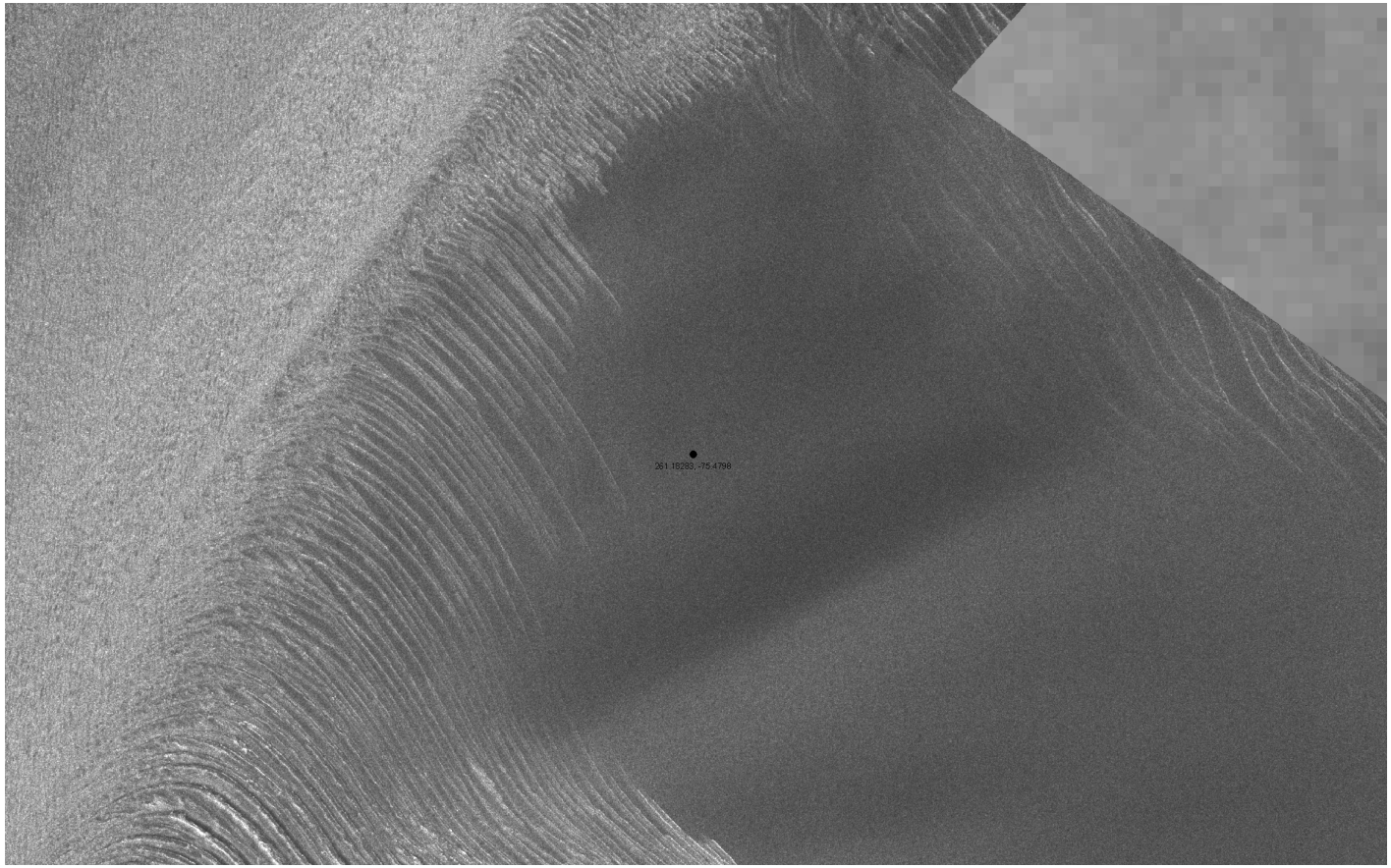
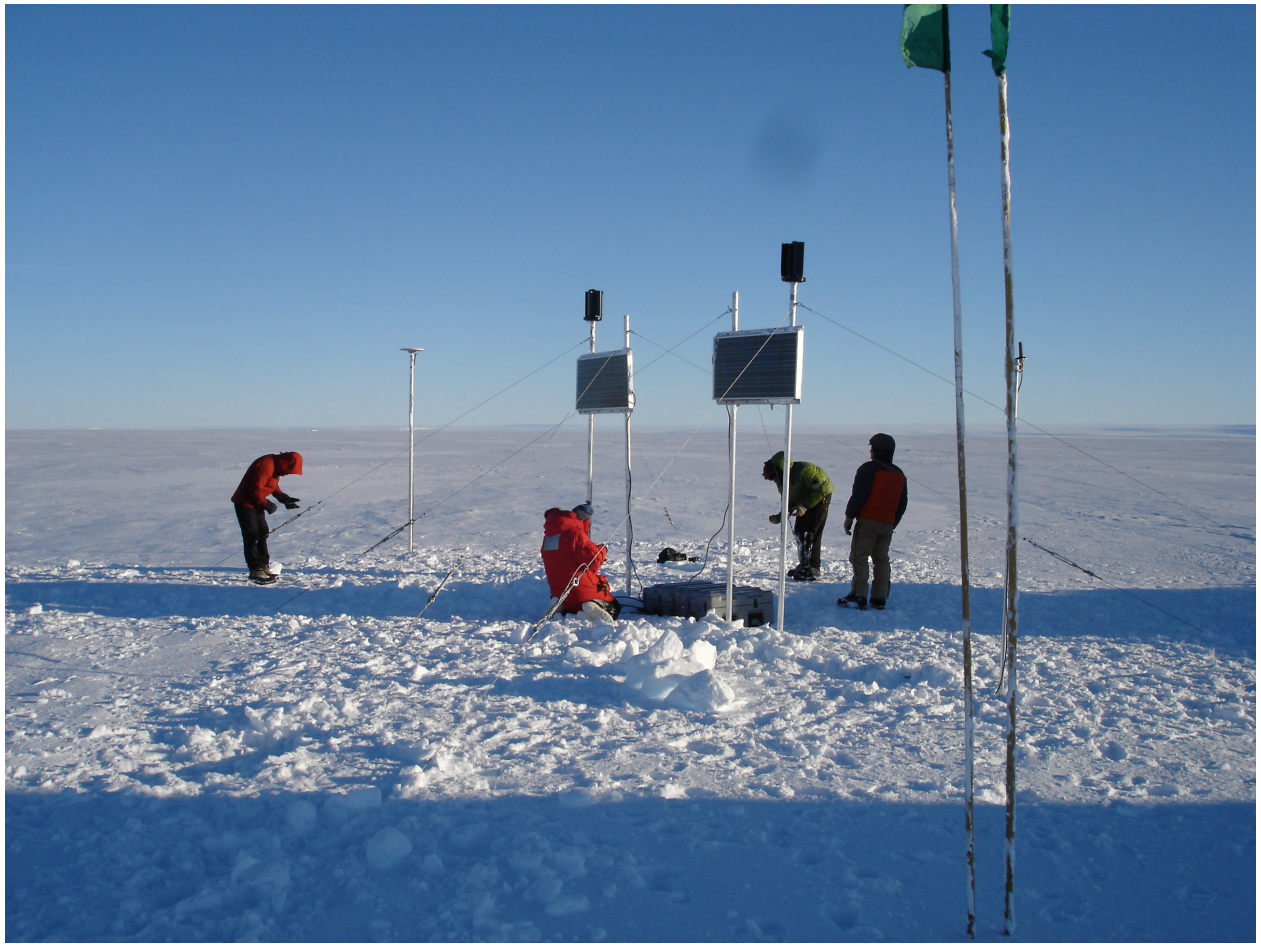


GPS on ALOS image, courtesy: I. Joughin

GPS station setup



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Data record

- PIG 1 recorded since 13 January 2008 with a few days missing

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- PIG 2 recorded 10 January - 24 March 2008

Data processing

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- Base station: Howard Nunatak
- 370 km base line; that's a lot
- Noise in processed data: ≈ 0.05 m

Data Analysis

- Calculate deviation from mean motion through a strain field by fitting displacement data to $x = x_0 + \frac{v}{\dot{\varepsilon}}\left(e^{\dot{\varepsilon}(t-t_0)} - 1\right)$

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- Analyze residuals for tidal and seasonal signals

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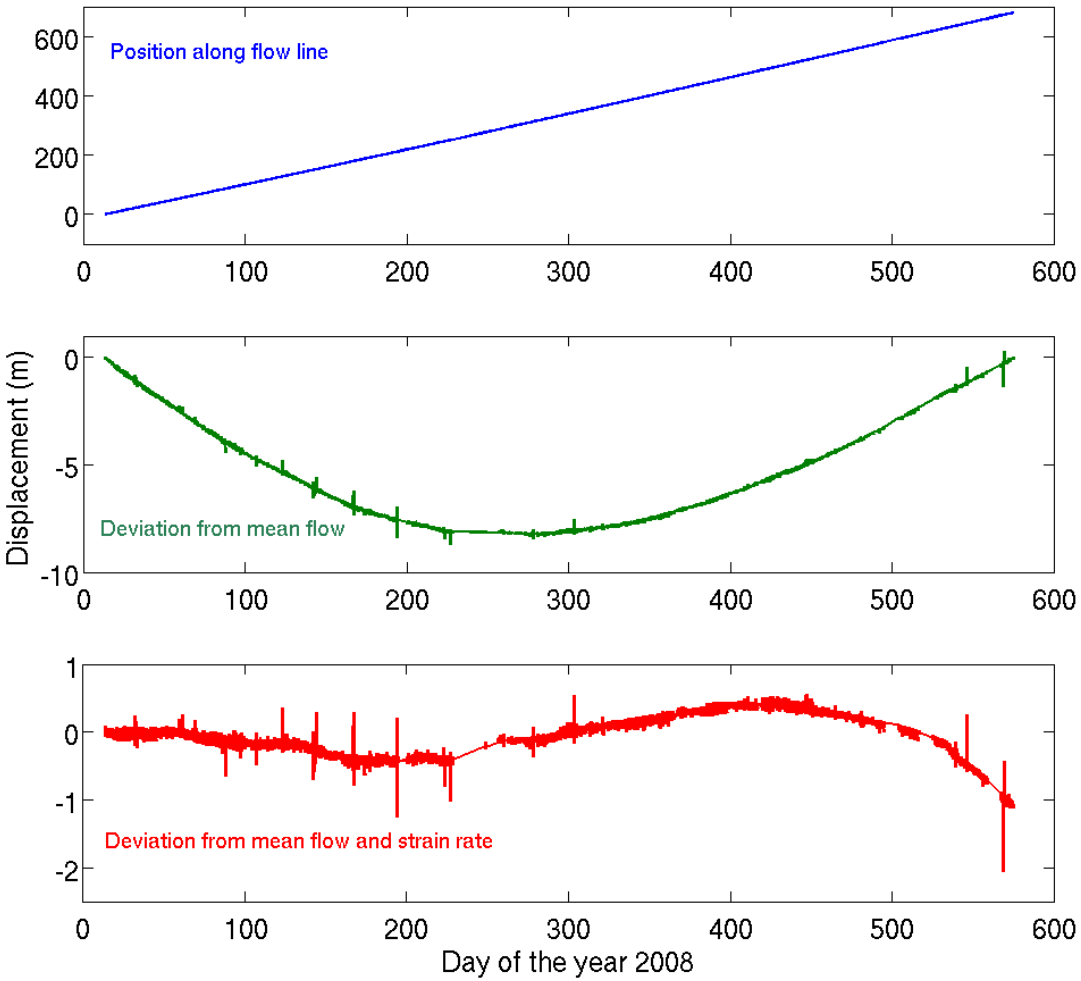

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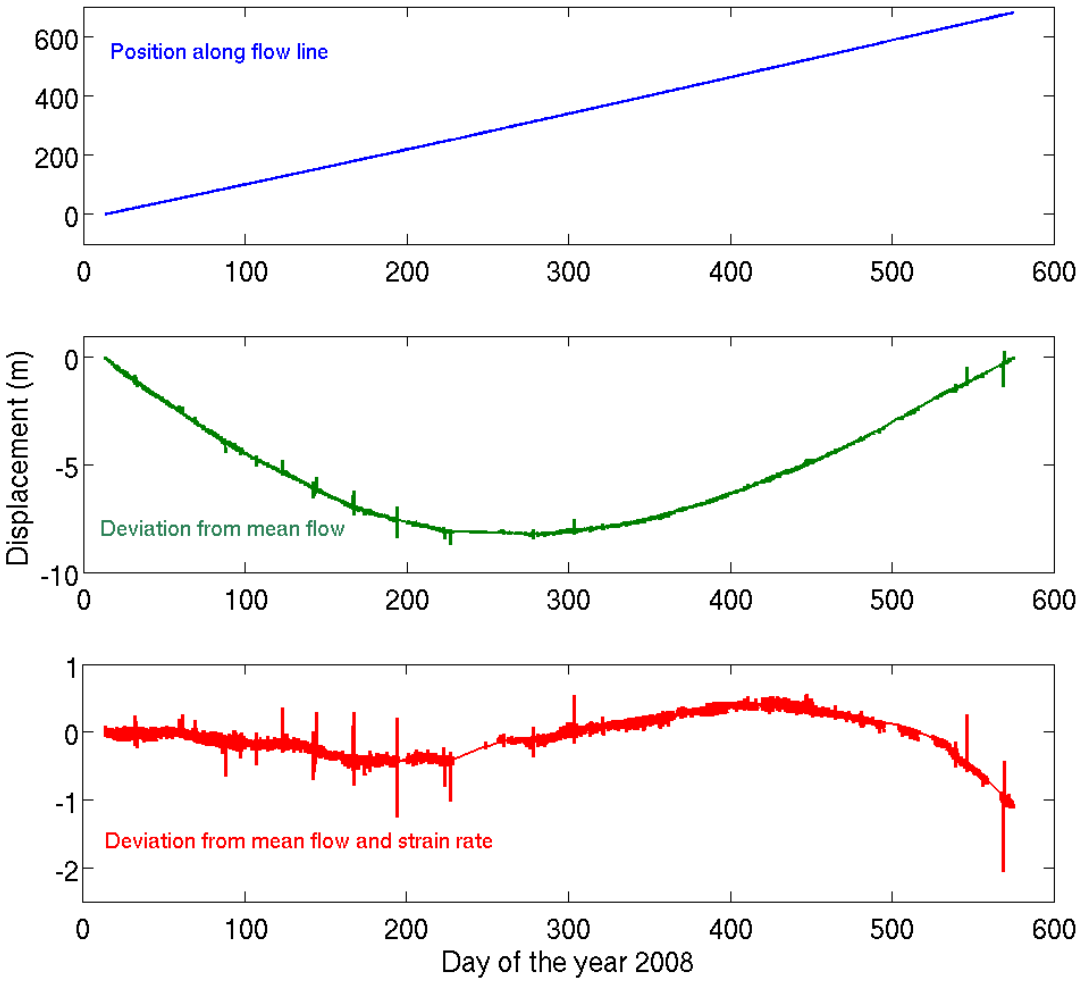

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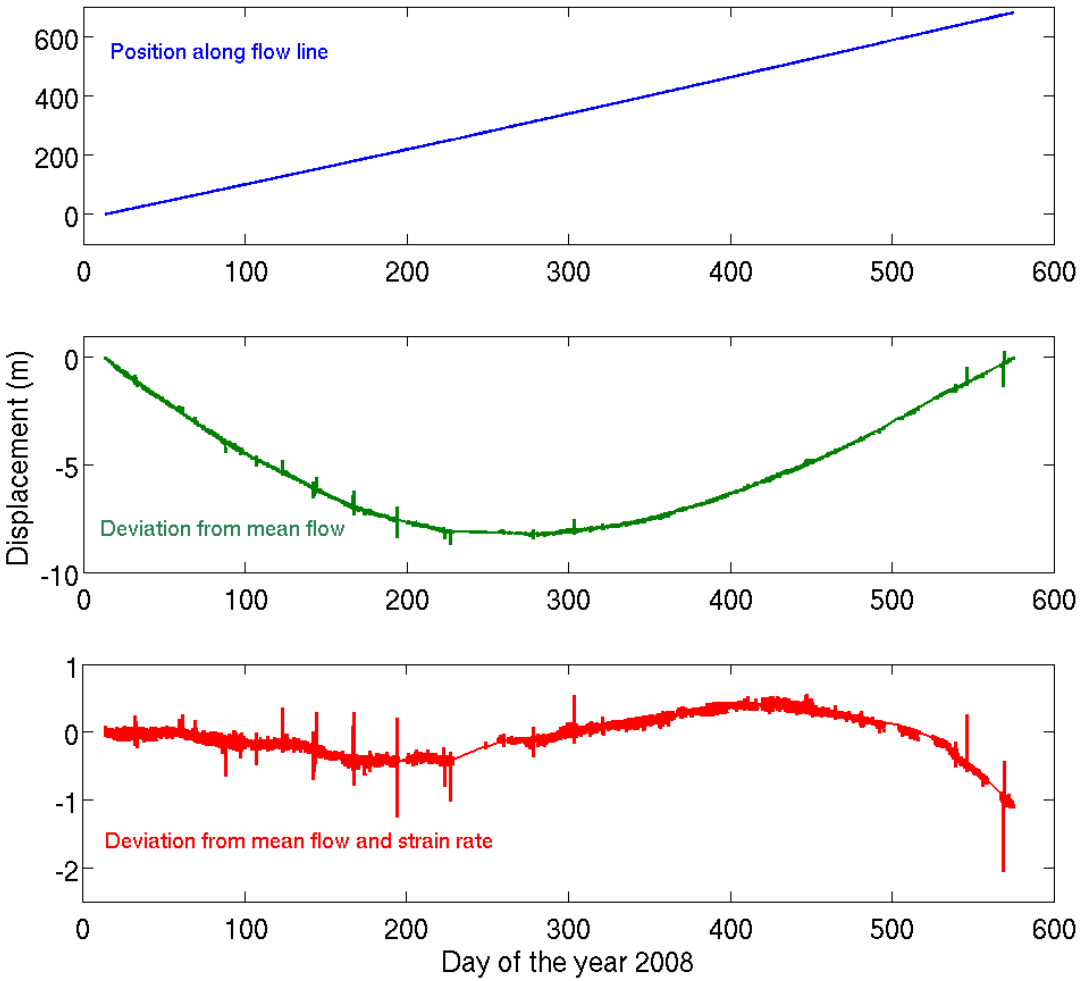

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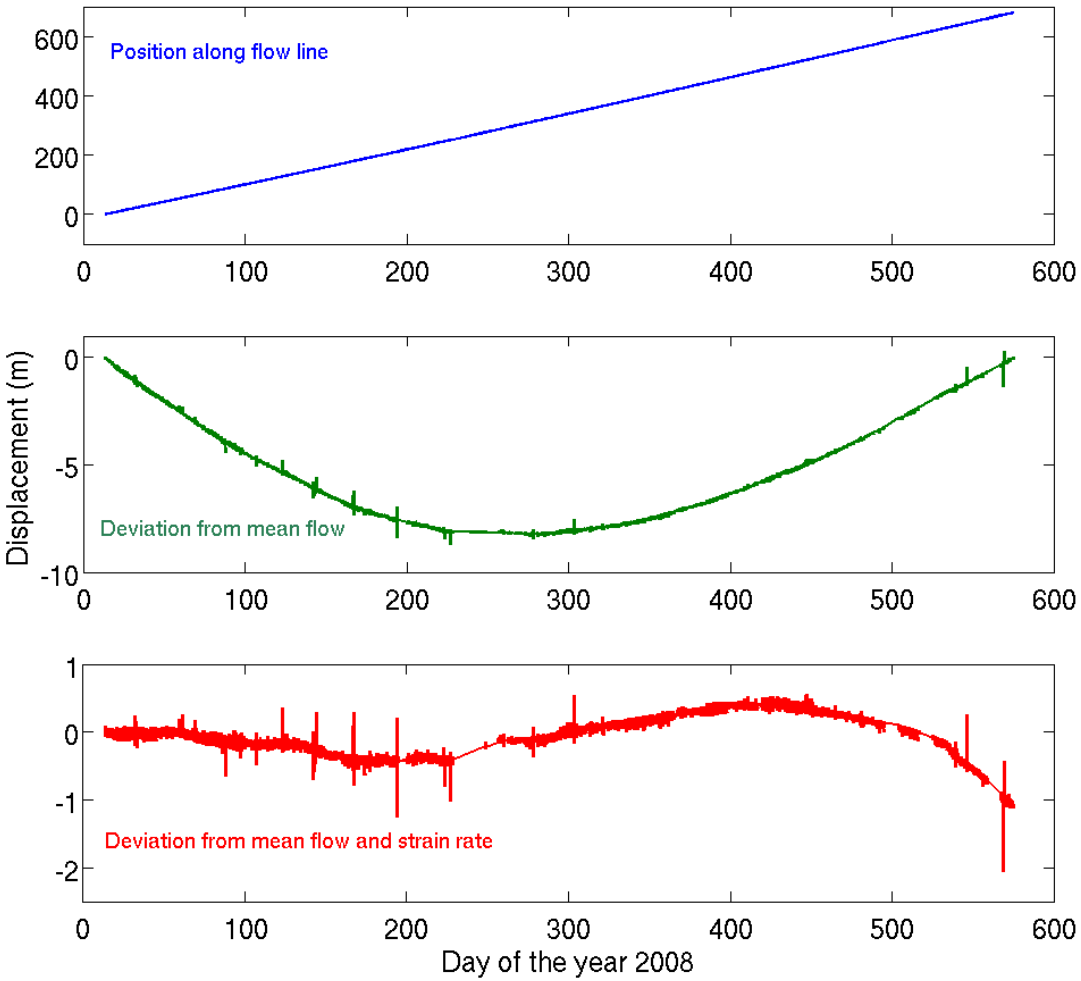

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- Best fit strain rate: 0.0659 a^{-1}

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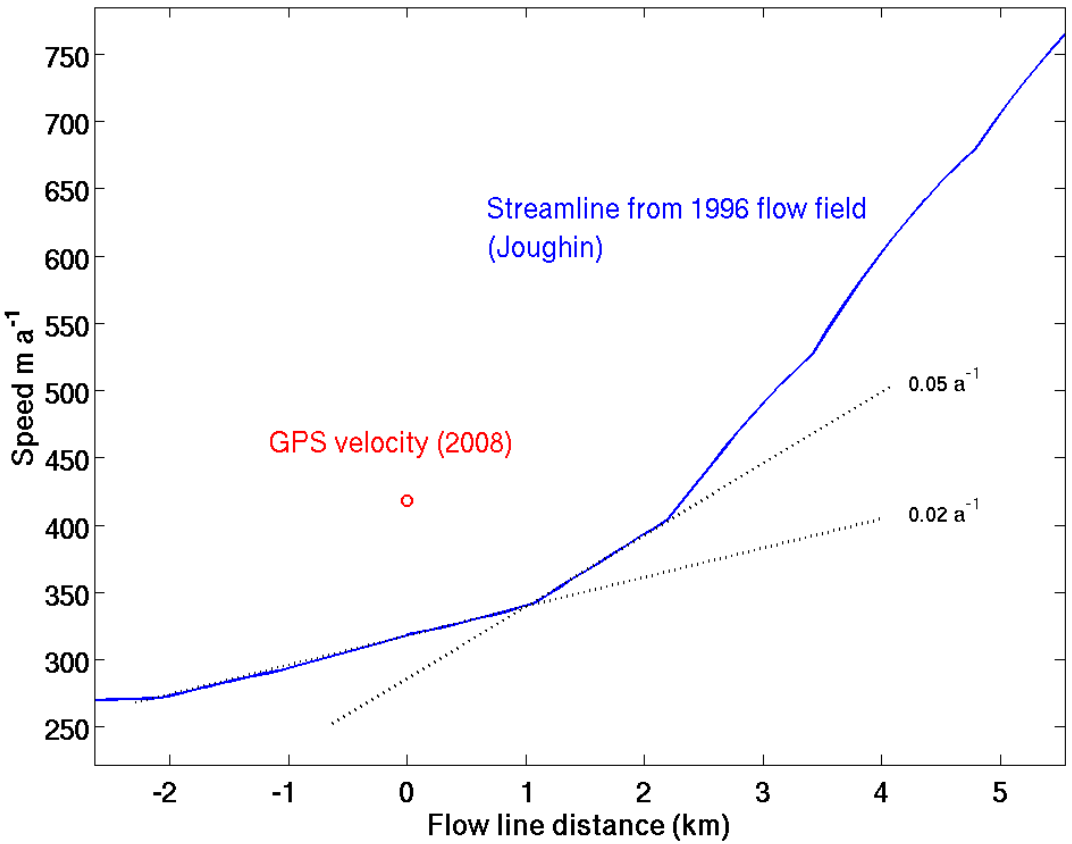

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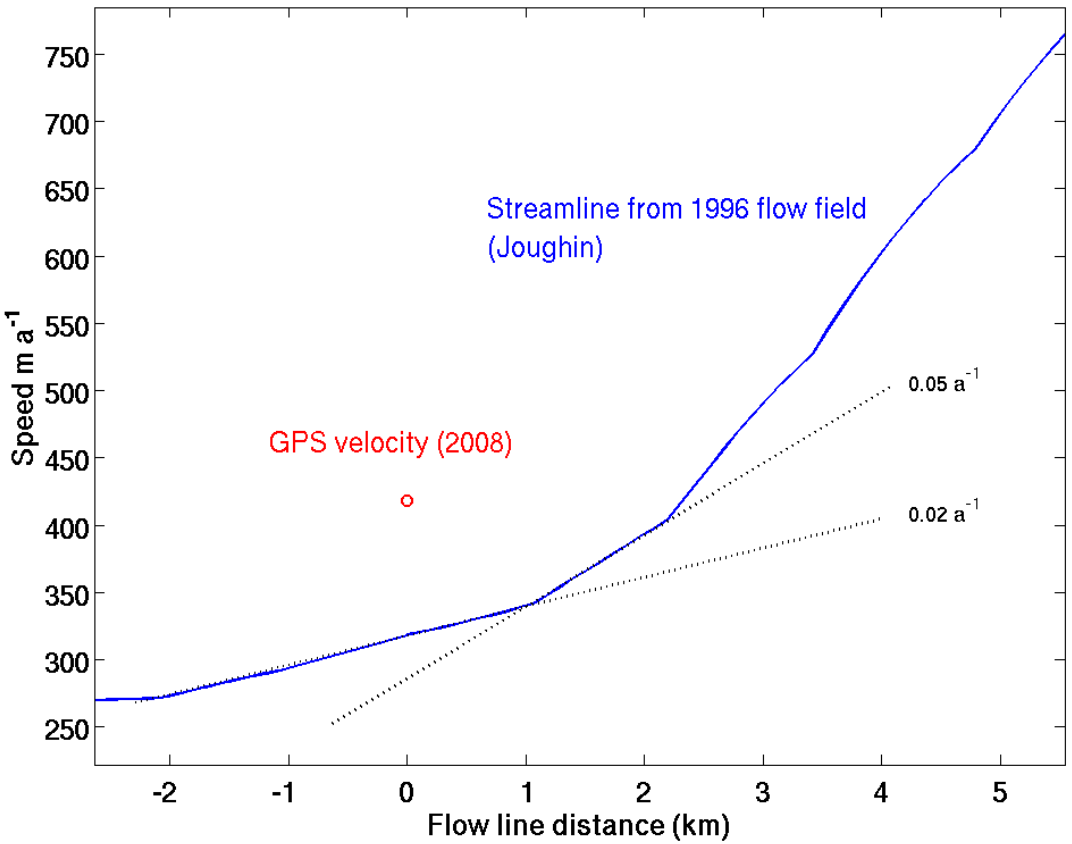

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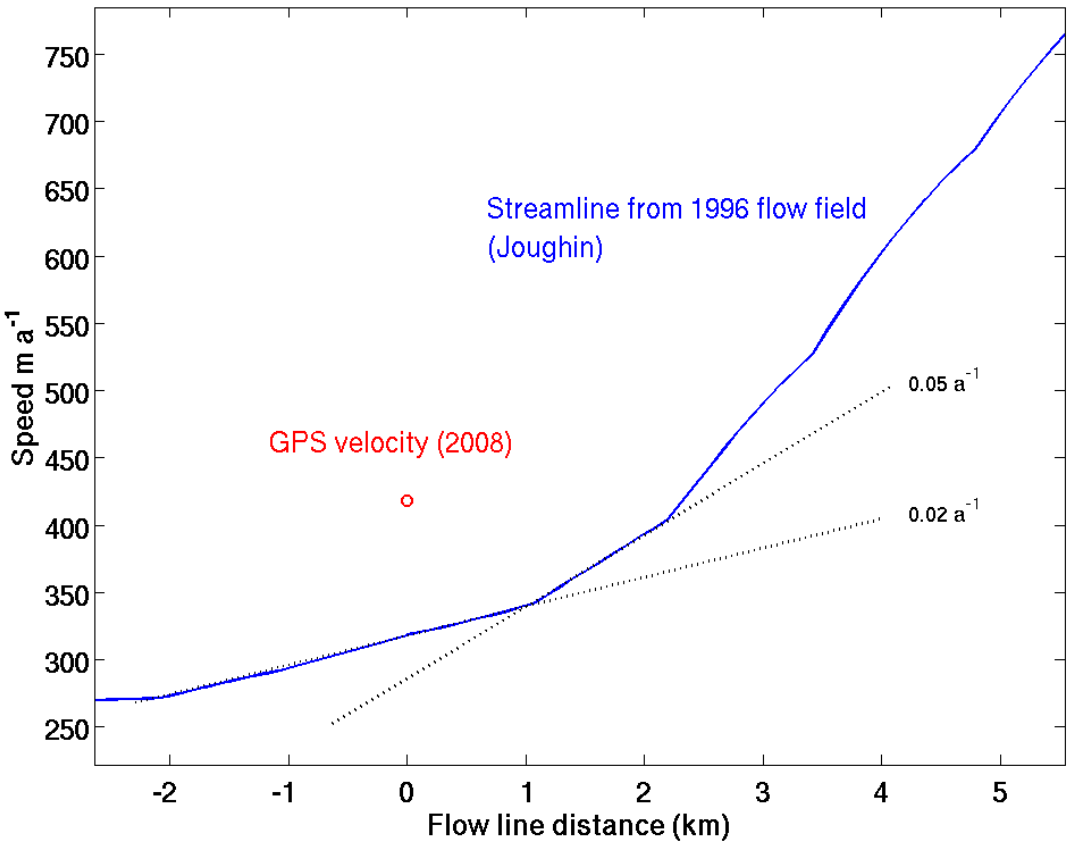

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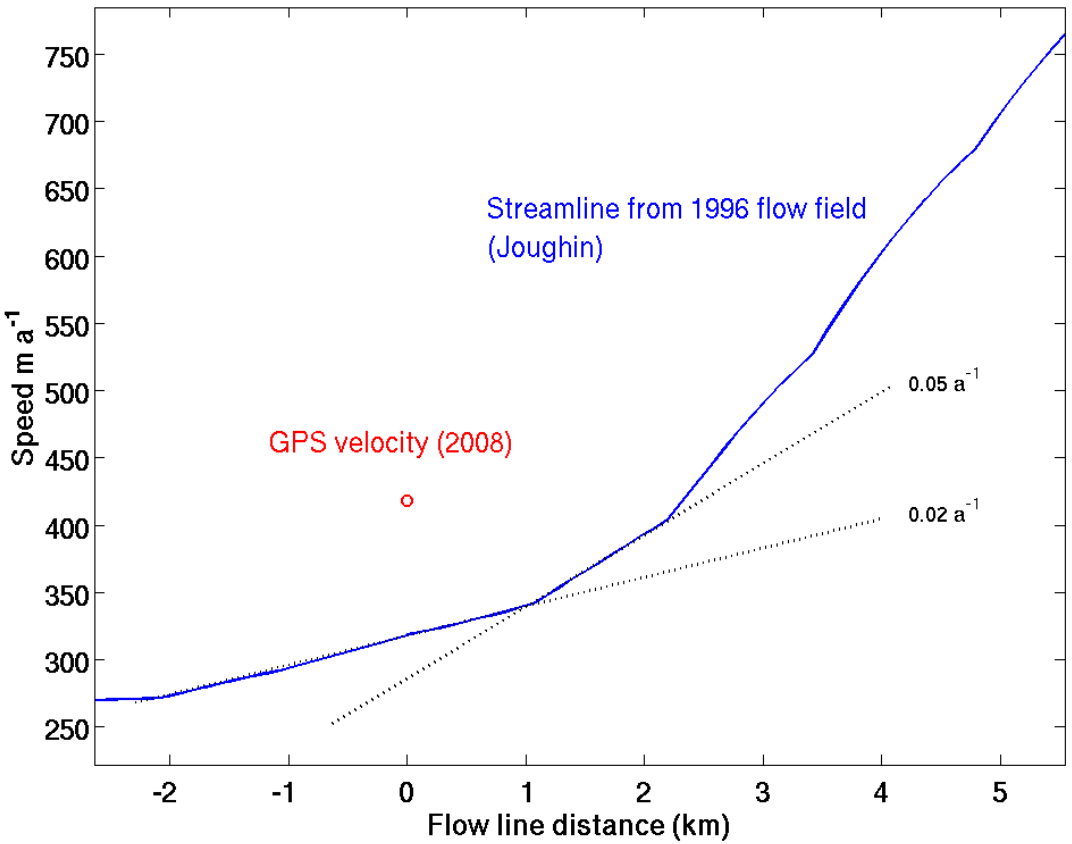

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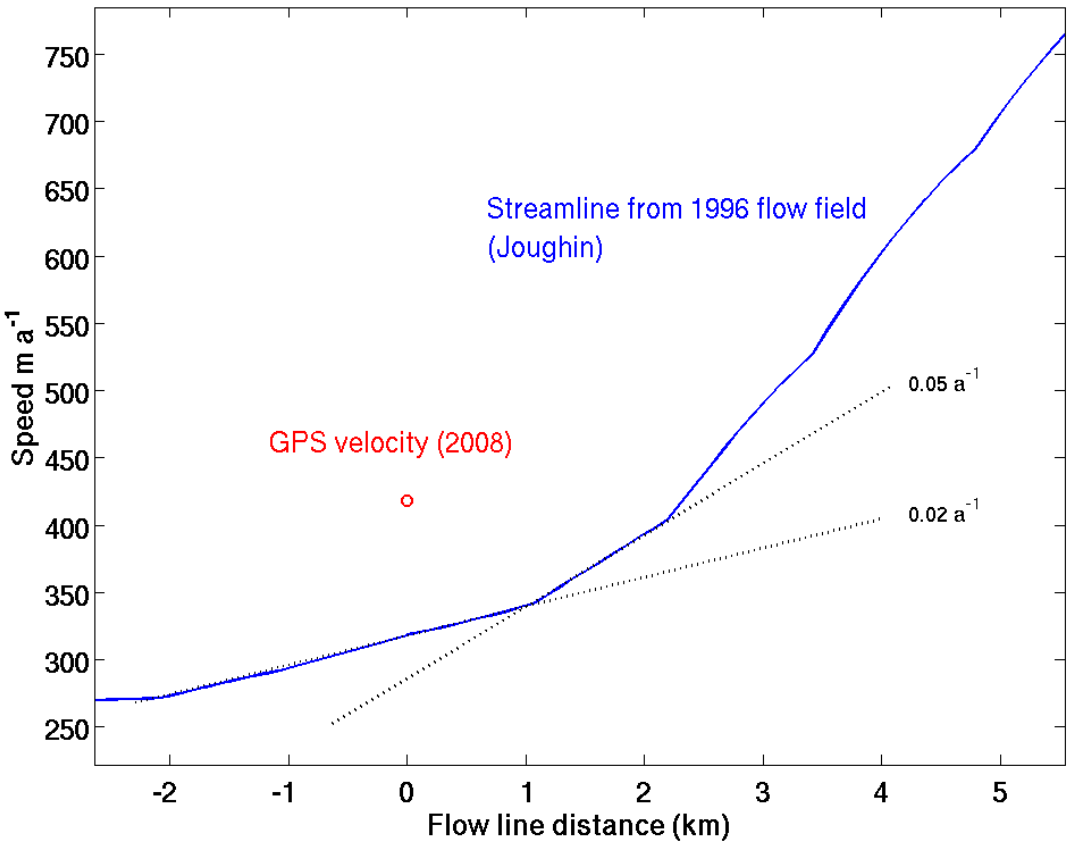

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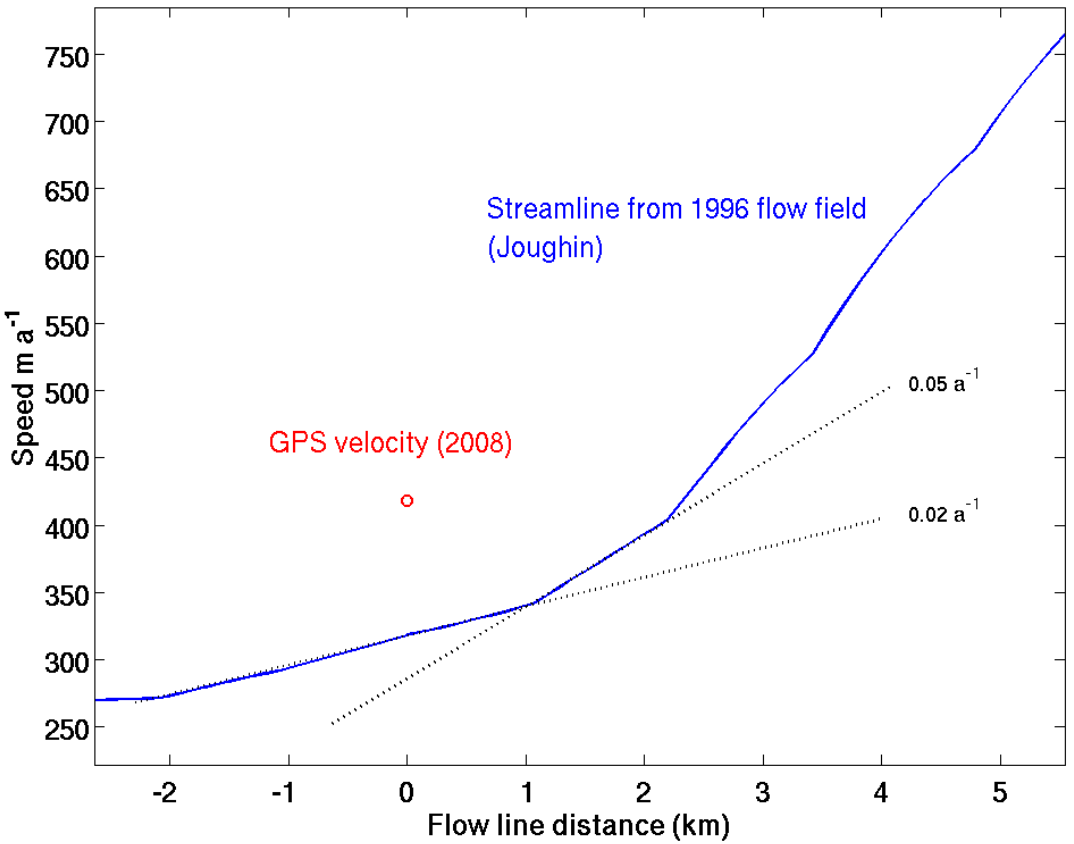

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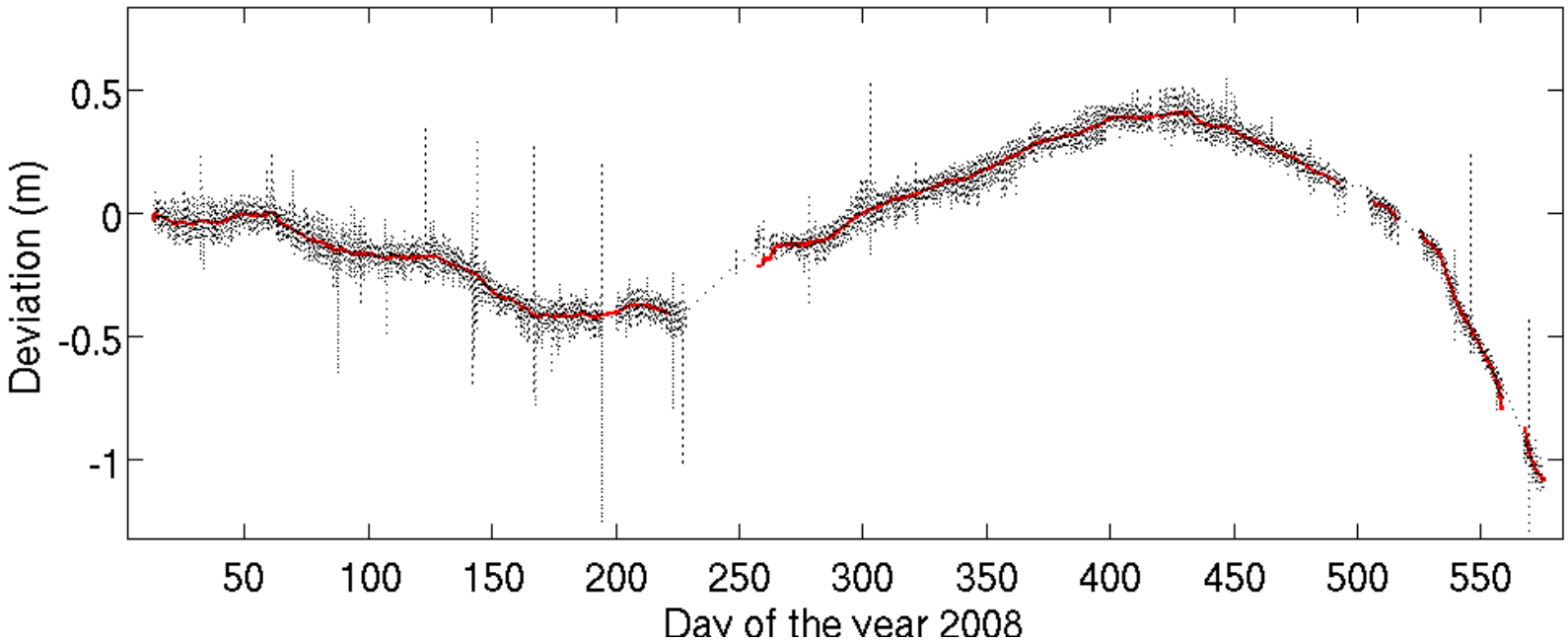
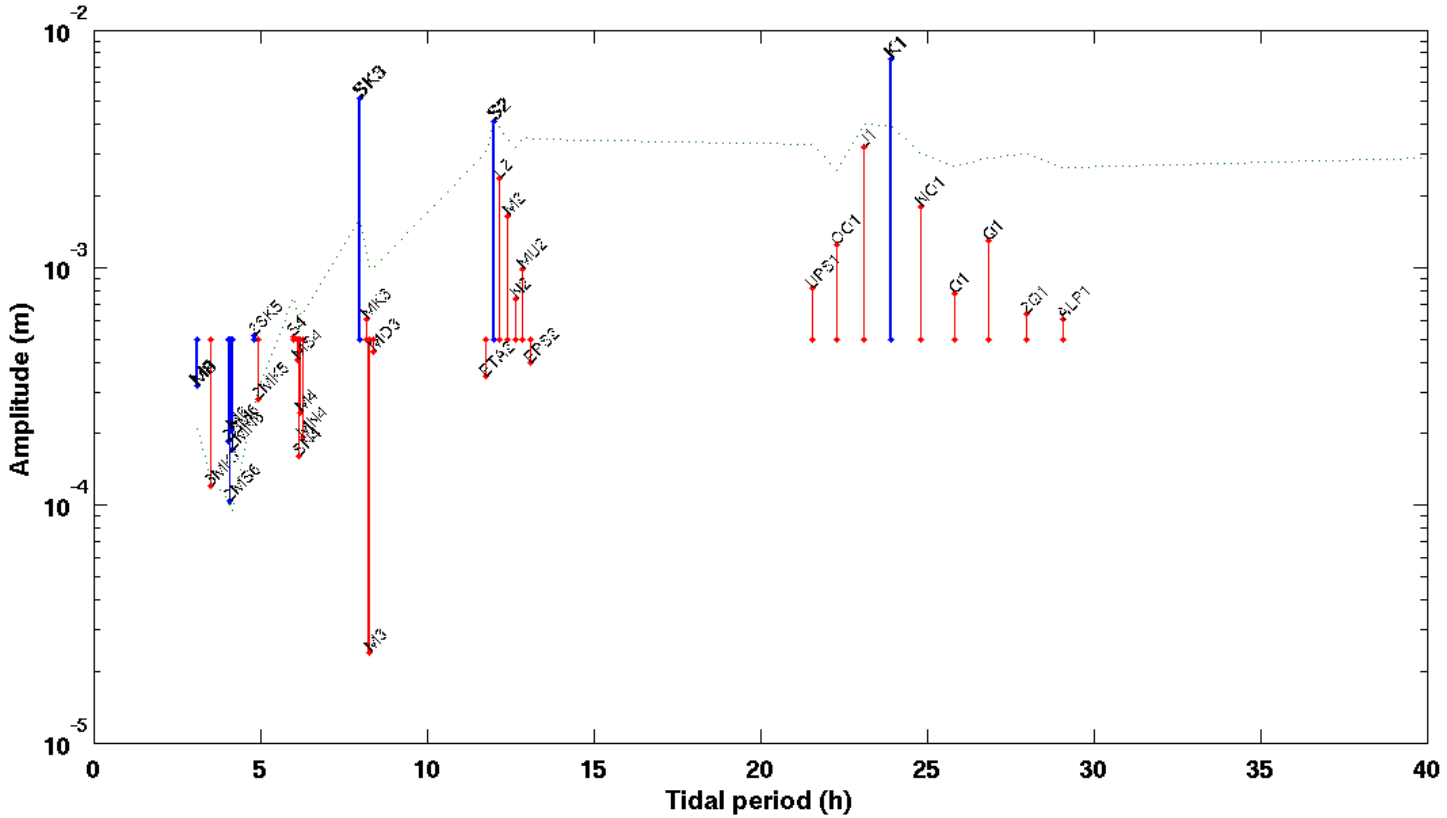
- Best fit *strain rate*: 0.0659 a^{-1}
- Strain rate from velocity field: 0.02 - 0.04 a^{-1}
- Acceleration: 2-4% a^{-1}

Velocity variations



Seasonal and shorter period variations

Tidal signals



Tidal harmonic analysis

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- Shorter term variations, causes?

THANKS