Will the Cascades soon be easier to climb?

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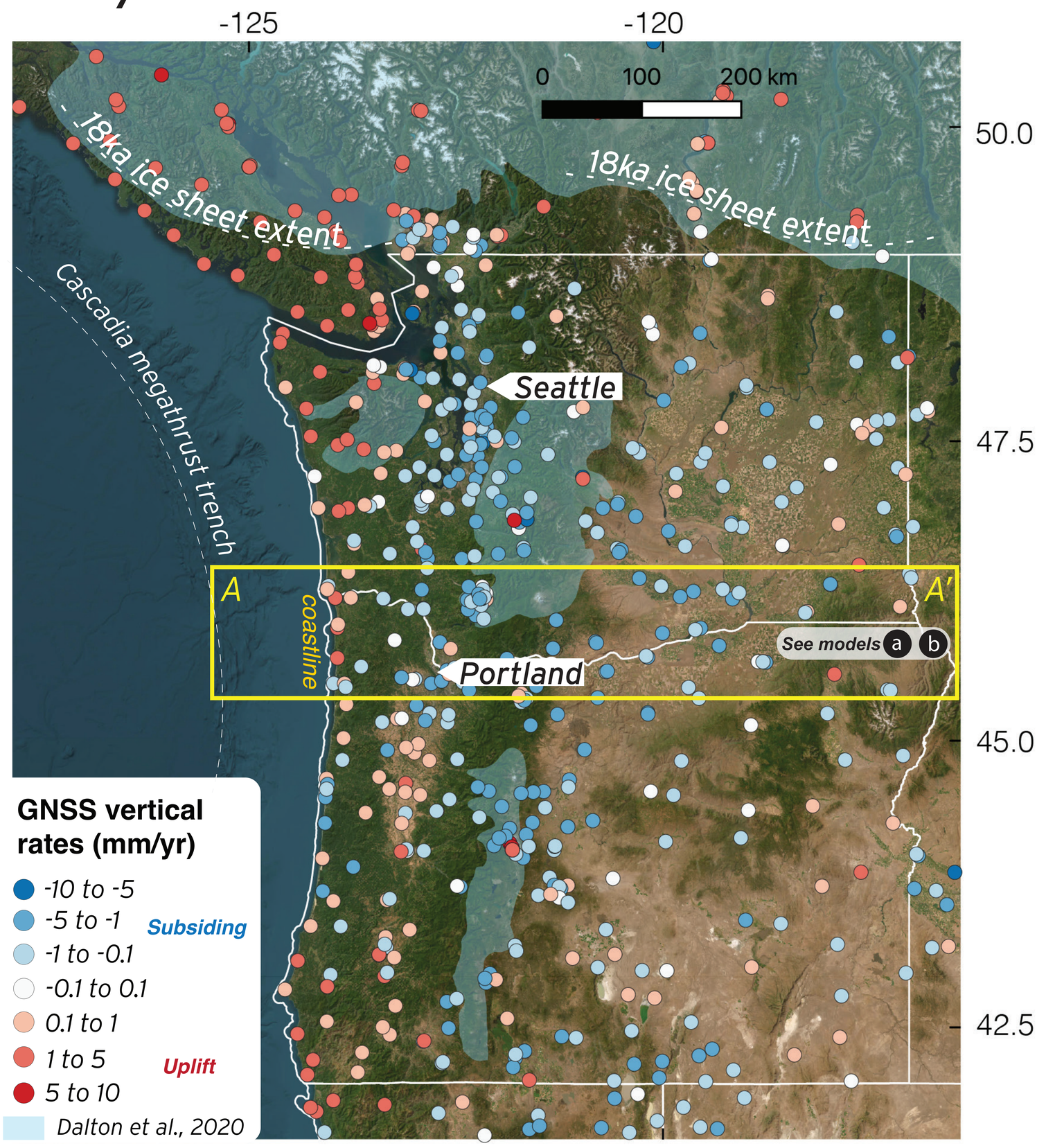
Summary

- Widespread subsidence is recorded 300-500 km from the coast throughout Cascadia (the Pacific Northwest).
- In this study, we examine several potential numerical models to explain this vertical signal in Cascadia.
- Our preliminary results show **subducting slab geometry can potentially explain the surface deformation.**

Study area



Background

- ***The Cascadia subduction zone*** *is where the Pacific Plate subducts beneath the North American Plate. It is* ***capable of hosting large earthquakes*** *in the contiguous United States (i.e., M8+ in 1700).*
- ***Vertical displacement*** *from GNSS across the Cascadia subduction zone* ***shows large scale subsidence*** *extending inland east of the Cascades.*

- *The 3 main ideas for the widespread subsidence :*
  - *A) Glacial Isostatic Adjustment (GIA) - has the wrong spatial pattern (Lau et al., 2020)*
  - *B) Subduction-driven mantle flow ← **this study***
  - *C) Post-earthquake influence*

Why do we care?

- *The ground stores elastic energy that is eventually released as earthquakes.*
- *We can measure these ground movements to* ***inform us about earthquake hazards*** *and* ***improve community resilience*** *to earthquakes.*
- *Dense GNSS coverage offers* ***a unique opportunity*** *for us to* ***study fault interactions*** *in the region.*

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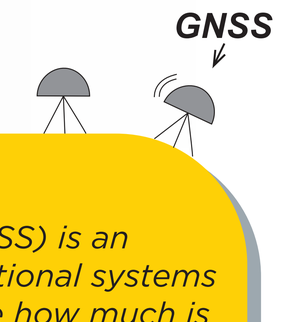
How?

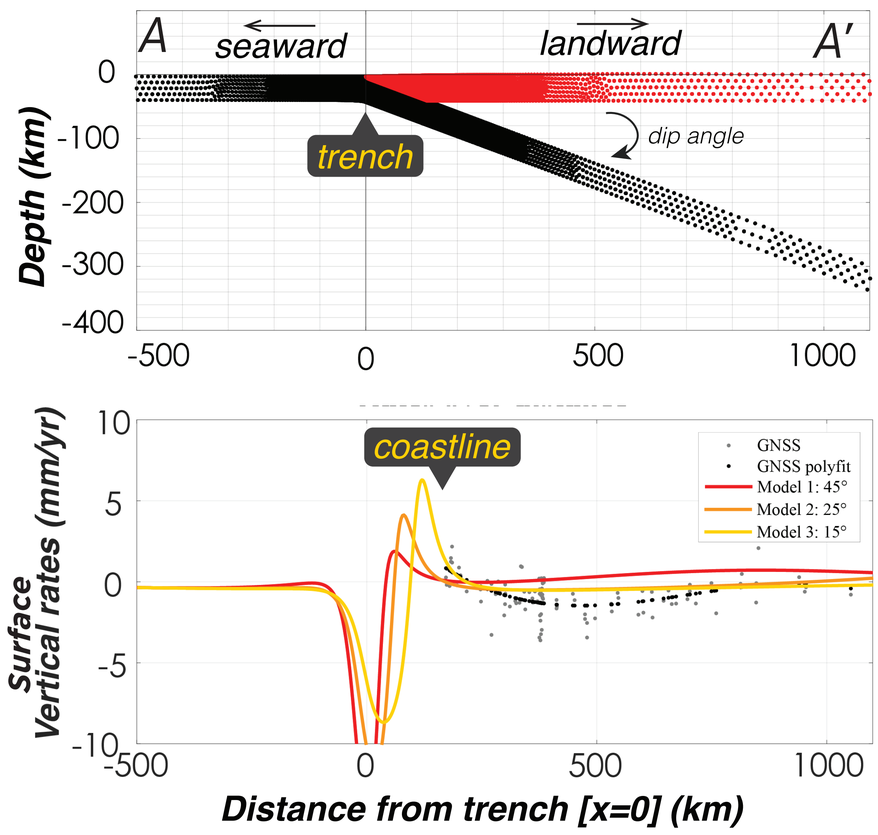


Global Navigation Satellite Systems *(GNSS) is an umbrella term for all the different navigational systems (e.g., GPS). We can use GNSS to measure how much is the ground moving.*

Numerical modeling *is a broad term for using complex simulations. We apply numerical models to simulate mantle processes and explore potential sources of vertical deformation on the surface.*

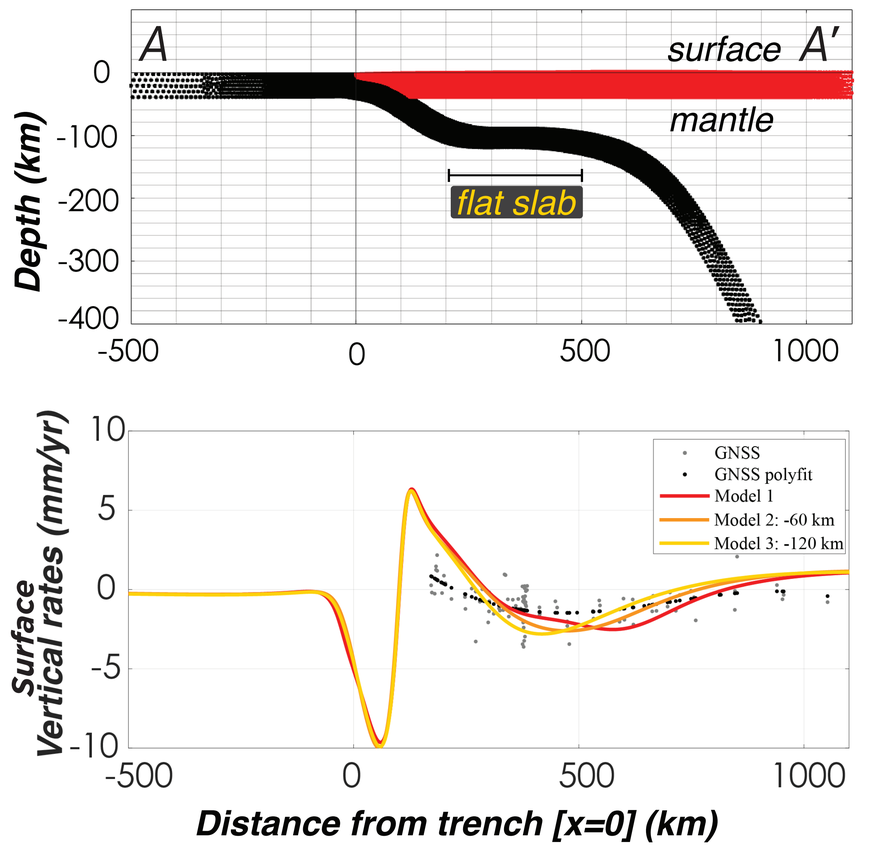
Model a: linear slab subduction

tested 15°, 25°, 45° degrees linear slab



Model b: flat slab subduction

tested 3 different flat slab length



Findings

The geometry of a subducting plate can potentially affect the surface deformation

- *We need more simulations of other parameters that can contribute to the signals we see on the surface.*