Investigating the Mechanics of Strain Partitioning at the Rakhine-Bangladesh Megathrust Using InSAR time-series

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Summary

• Dextral-oblique collisional strain is partitioned across several tectonically active structures including the Rakhine-Bangladesh megathrust, the Indoburman Ranges and the dextral Sagaing Fault.

• We seek to understand the strain partitioning in the region, using **L-band ALOS-2** wide-swath imagery to perform **InSAR time-series** in the **highly vegetated** central Indoburman Ranges (fold-and-thrust belt) and Eastern Bangladesh (near the megathrust trench).

• Our study will help **improve workflows for future L-band InSAR analysis in vegetated regions** and include vertical and horizontal displacement for subduction zone modeling.

Background

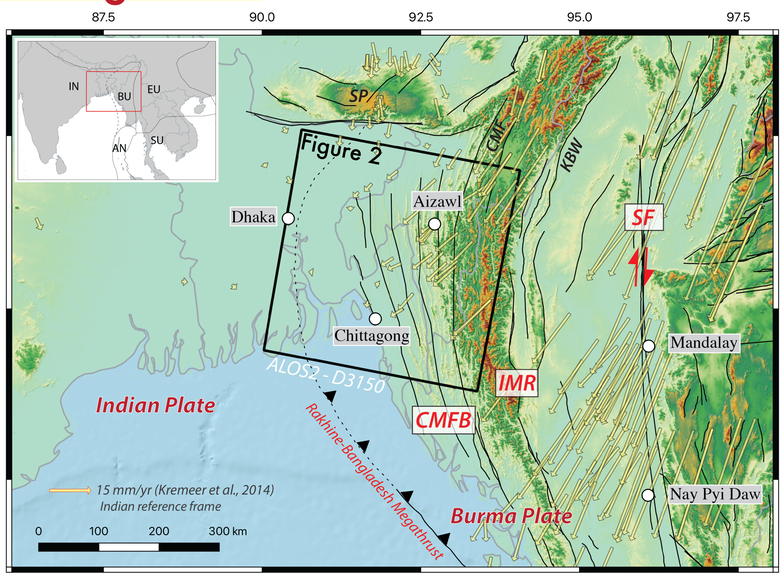


Figure 1: Map showing the region of interest. GNSS velocities are from Lindsey et al., (in prep) in the Indian reference frame. The black box outlines ALOS-2 Path 44, Frame 3150 from JAXA. IMR is the Indo-Myanmar ranges, SF is the Sagaing Fault, CMF is the Churachandpur-Mao Fault, KBW is the Kabaw Fault System, and SP is the Shillong Plateau. The dotted line shows the estimated trace of the northern section of the megathrust. Faults obtained from the Global Earthquake Model (GEM) by Styron and Pagani (2020).

Proposed workflow

1. **Measuring tectonic deformation**
   - ▶ InSAR + GNSS
     - Get geodetic horizontal & vertical velocities in the region
2. **Modeling observations**
   - ▷ ESPM (elastic subducting plate model) *(Kanda and Simons, 2010)*
     - Can accurately predict horizontal & vertical velocities near trench and fold-thrust-belt
3. **3D Block Modeling**
   - ▷ TVR (Total Variation Regularization)
     - Estimating most active crustal faults across the hanging wall
     - Estimating locking pattern on megathrust

InSAR preliminary results

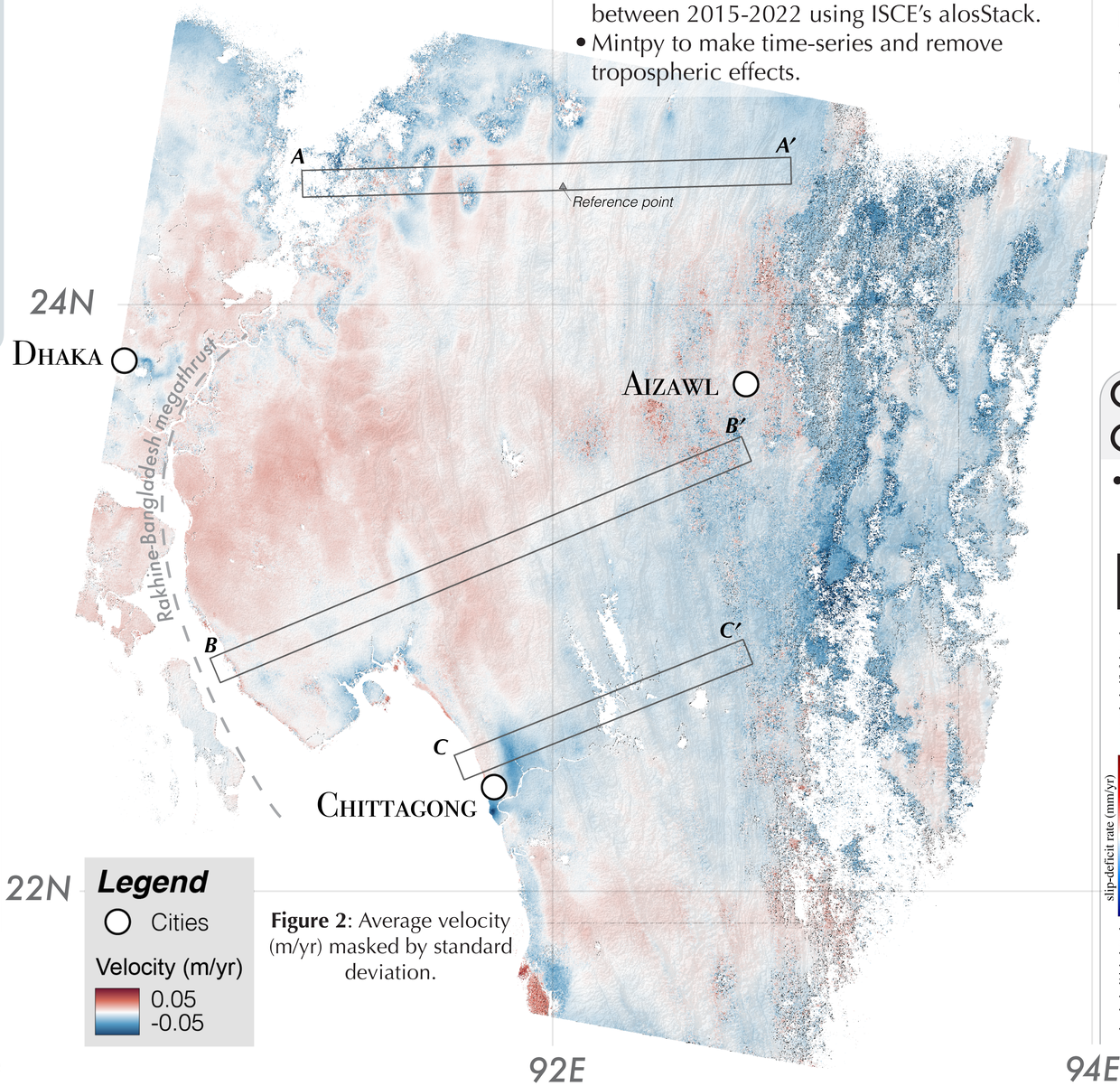
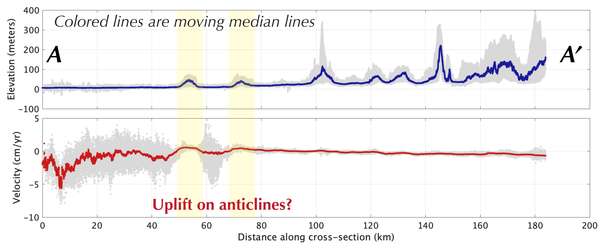
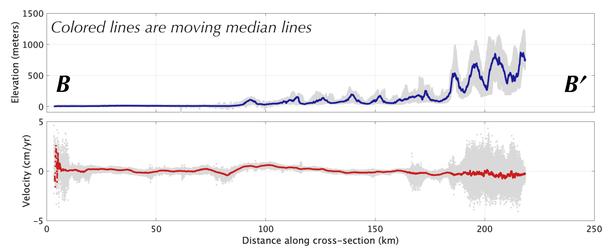


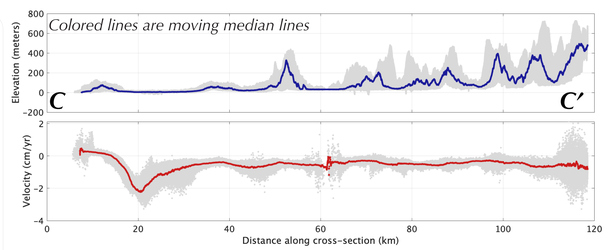
Figure 2: Average velocity (m/yr) masked by standard deviation.

InSAR time-series

- Processed 49 ALOS-2 scenes (185 pairs) between 2015-2022 using ISCE's alosStack.
- Mintpy to make time-series and remove tropospheric effects.

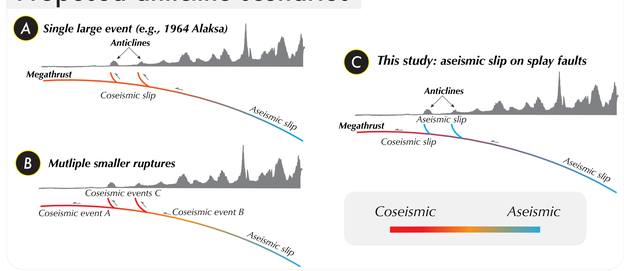






Profiles: Uplift and subsidence correlated with anticlines/synclines in the western Indo-Myanmar wedge.

Proposed anticline scenarios

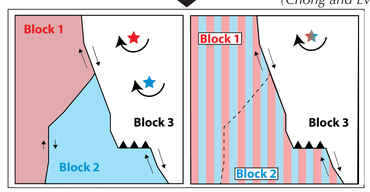


Proposed block modeling

- We plan to use Total Variation Regularization (TVR) (Evans et al., 2015) with our InSAR and existing GNSS velocities to estimate strain partitioning between crustal faults and megathrust.

TVR can estimate fault slip rates of known and proposed faults/contacts

(Chong and Evans, in prep).



Case Study: Cascadia Subduction Zone

- Different subducting motion affects the strain partitioning between the megathrust and crustal faults (Chong and Evans, in prep).

Fewer active crustal faults if megathrust is obliquely subducting

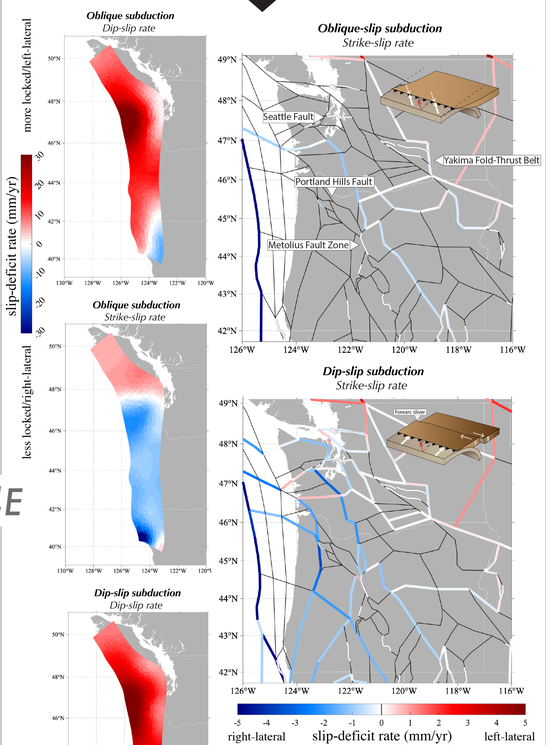


Figure 3: Example of TVR on Cascadia. DSS represents dip-slip subduction only; OSS represents oblique subduction. Colors represent active faults with different sense of slip. Inactive faults are dark colored.

Acknowledgments

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