Deformation and Tsunami Inundation estimates from Inverted slip distribution: How reliable are they?

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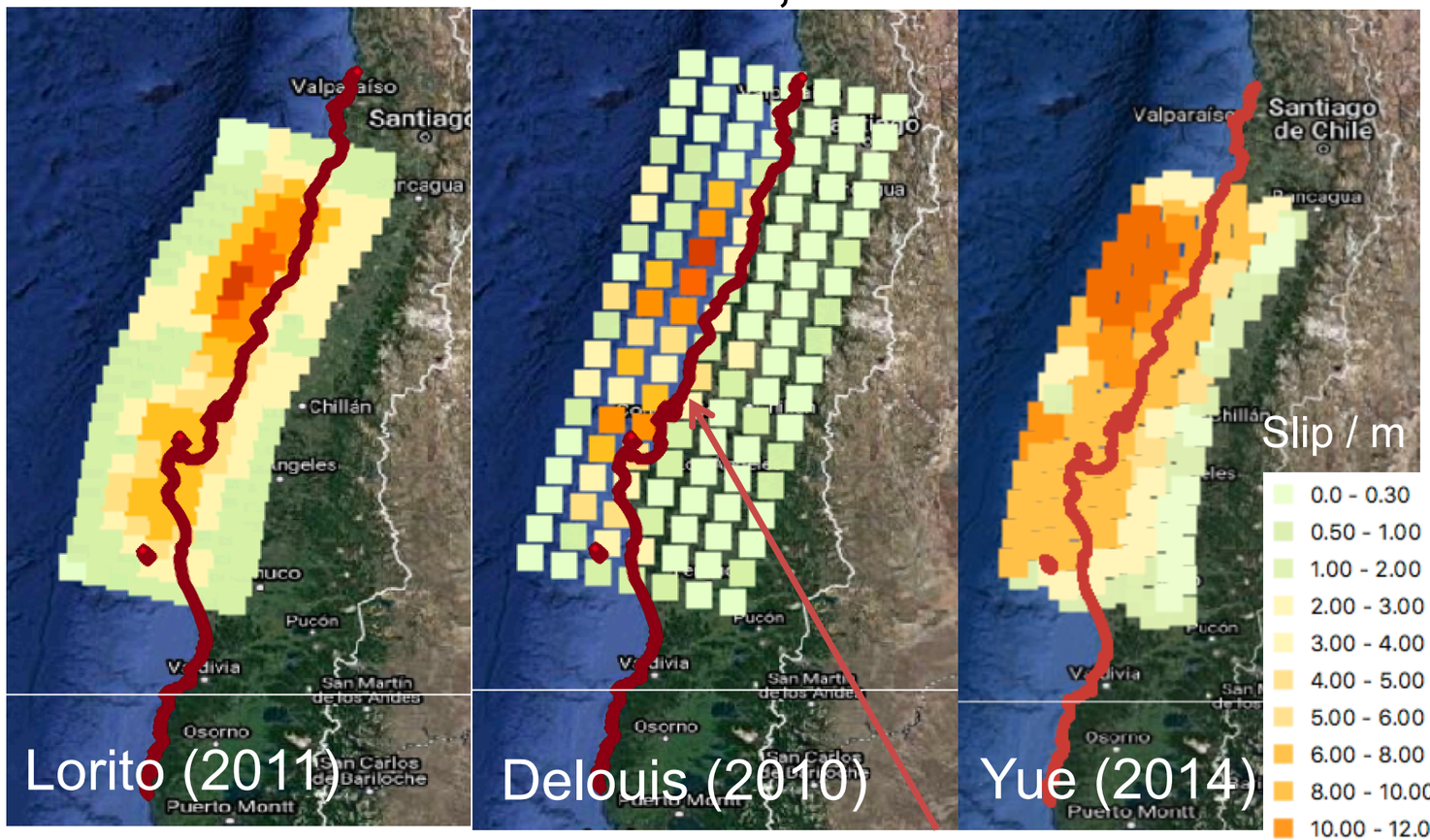
SUMMARY

- Framework:
  - Create a probabilistic earthquake and tsunami hazard and risk model
- Approach:
  - Use published slip distributions to understand uncertainties of elastic deformation of seafloor and landmass (coastline) with respect to observed/measured deformation
  - Use gained information from modeling insights to constrain and select simulated slip distributions following the approach by Melgar et al (2016)
- Validation:
  - Evaluate coastal vertical deformations of published slip distributions against measurement from post-event surveys
  - Use deformation based on published slip distributions for model comparison and validation

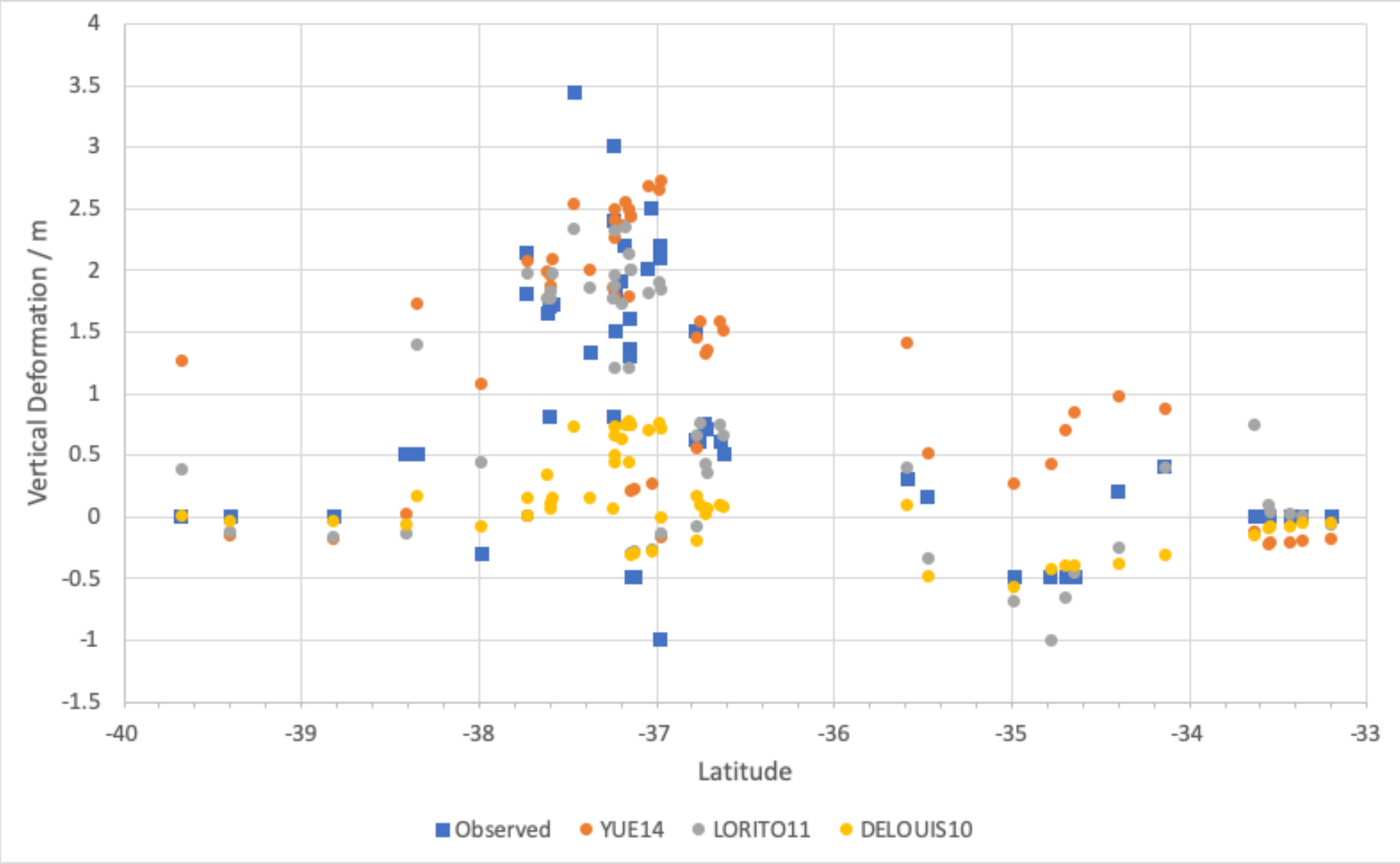
EXAMPLE SLIP DISTRIBUTIONS OF THE MAULE 2010, MW=8.8

- Multiple slip distributions in comparison (Lorito et al., 2011; Delouis et al., 2010; Yue et al. 2014)
  - At least 5 others exist as listed in Vigny et al (2011)
- Slip patterns are different depending on initial data used for inversion and inversion constraints
  - Resulting coastal deformation is highly variable
- Deformation accuracy along coast is of major importance to validate tsunami inundation results



COMPARISON OF VERTICAL DEFORMATION AND OBSERVED DATA

- GPS deformation data from Farias et al. (2010) and Fritz et al. (2010)
- Figure shows absolute differences between modeled and observed vertical deformation
- Deformation calculated using only elastic deformation equations (Meade, 2007)



RESIDUALS OF DEFORMATION FOR THE SELECTED SLIP DISTRIBUTIONS

- Vertical deformation differences along the coast strongly influence inundation depth results
- These differences impact damage and loss estimates
- **Improving accuracy of the slip / deformation models is paramount for tsunami loss and damage applications**