

Correcting NetworkRTK, PPK and PositionNZ-PP coordinates for non-linear tectonic deformation



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Acknowledgement to :



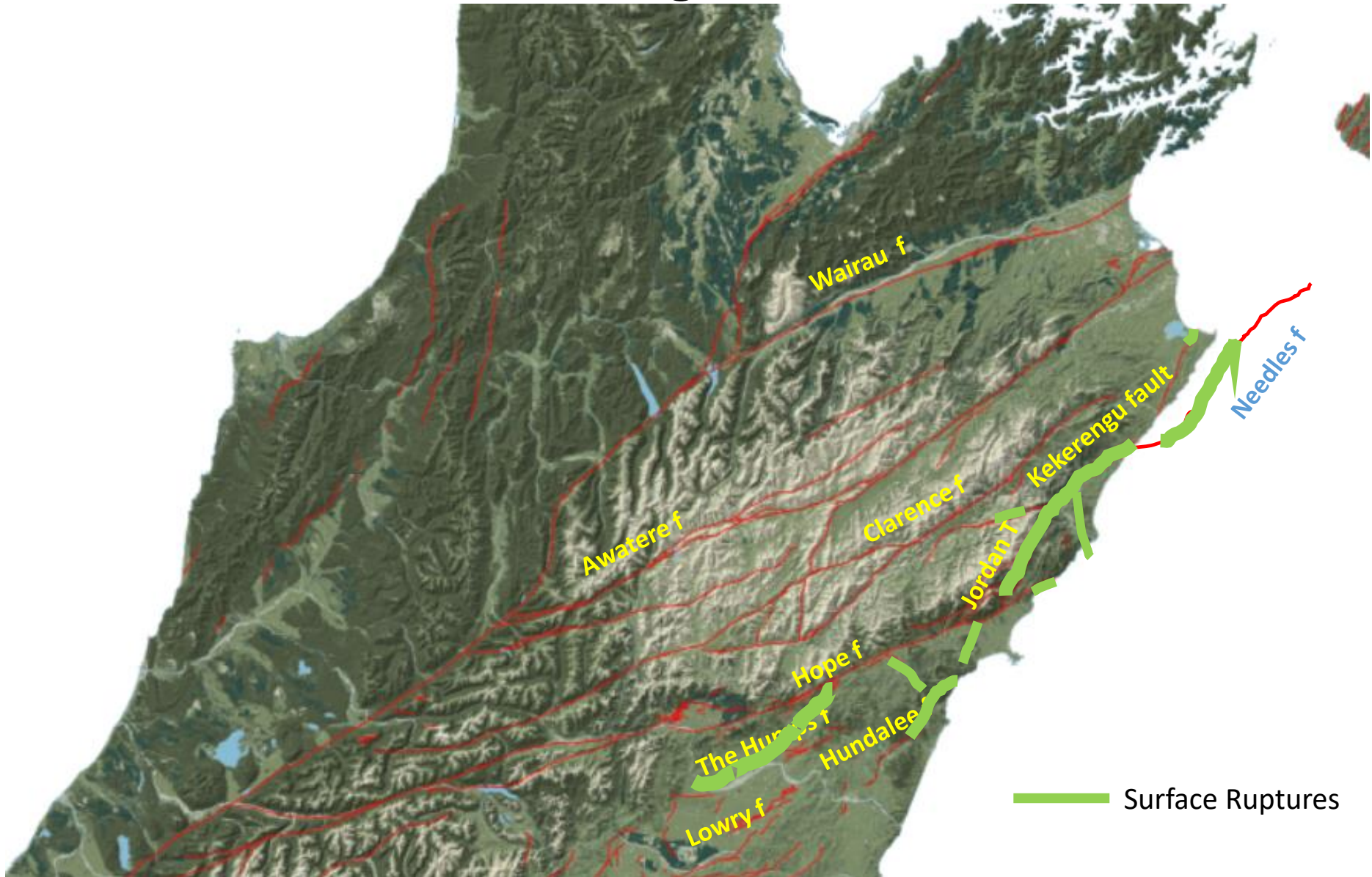
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Reece Gardner (3D World New Zealand)

IAG-IASPEI 2017



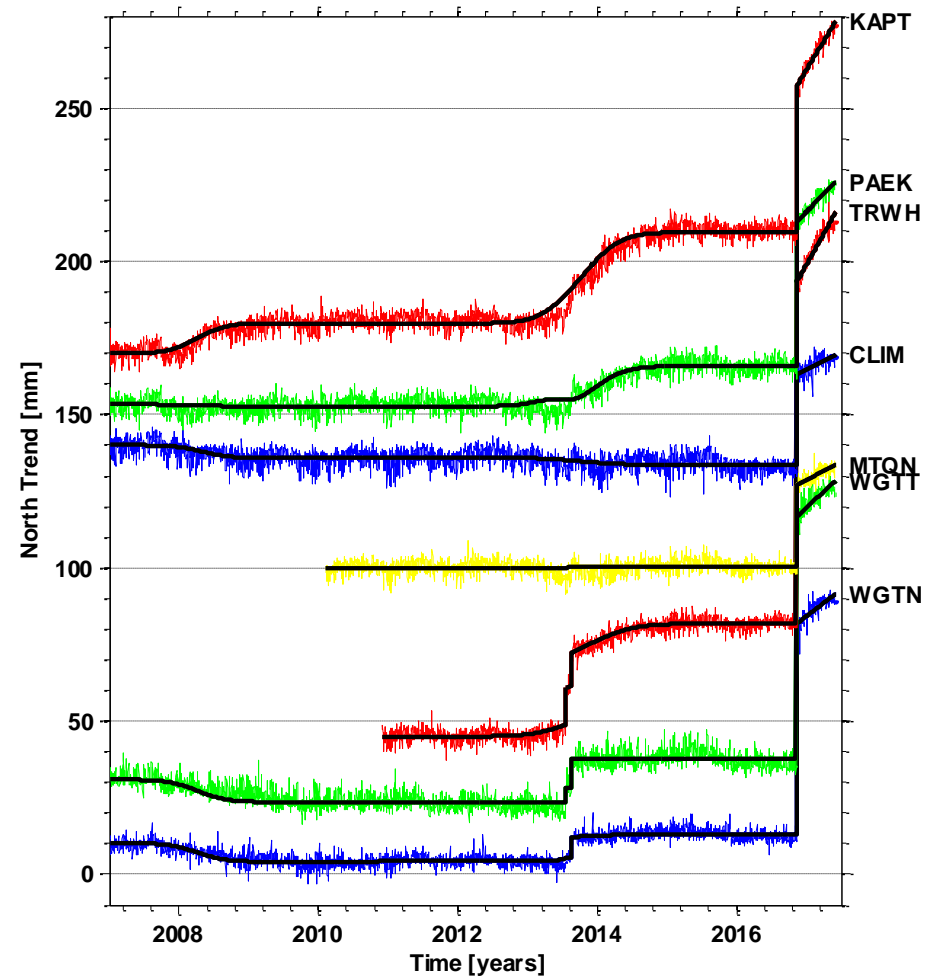
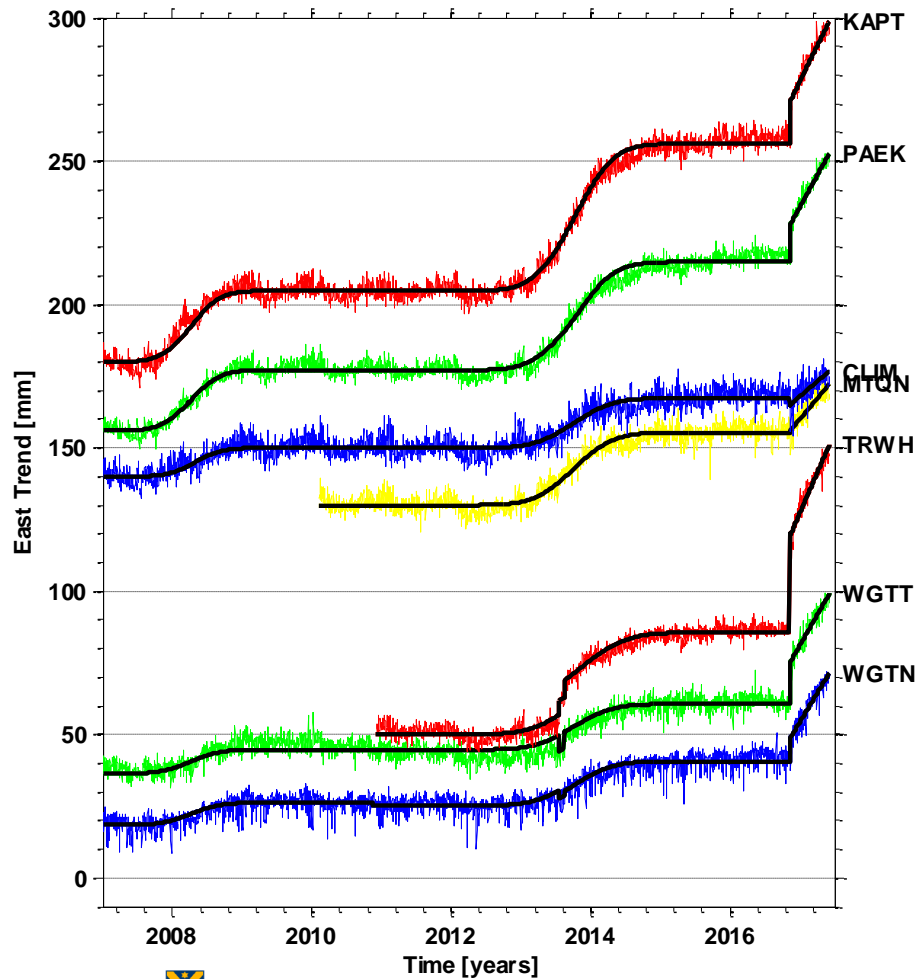
Active faults: Malborourgh Fault Zone



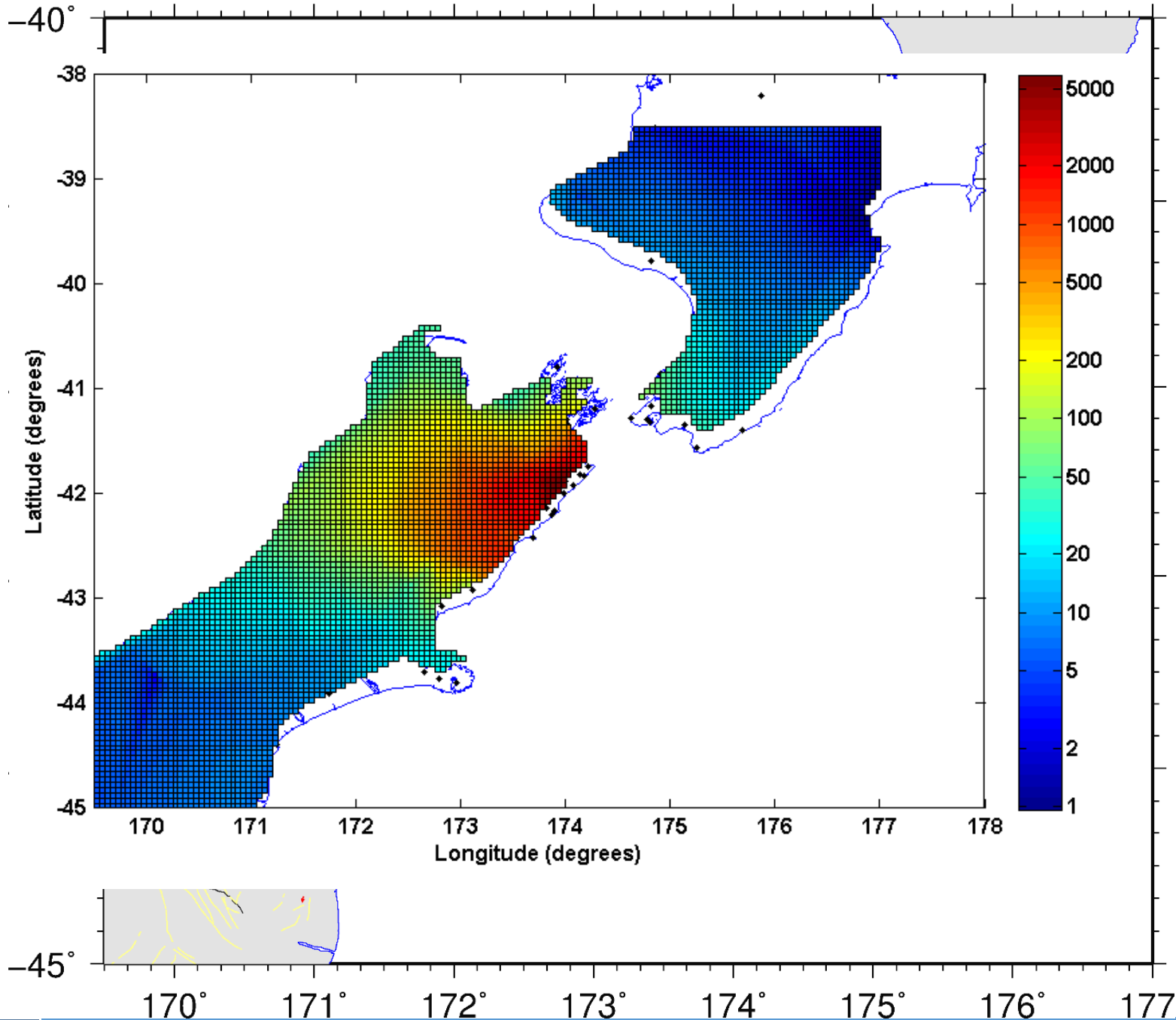
Kapiti Coast – Slow Slip Events + Kaikoura 2016

Easting

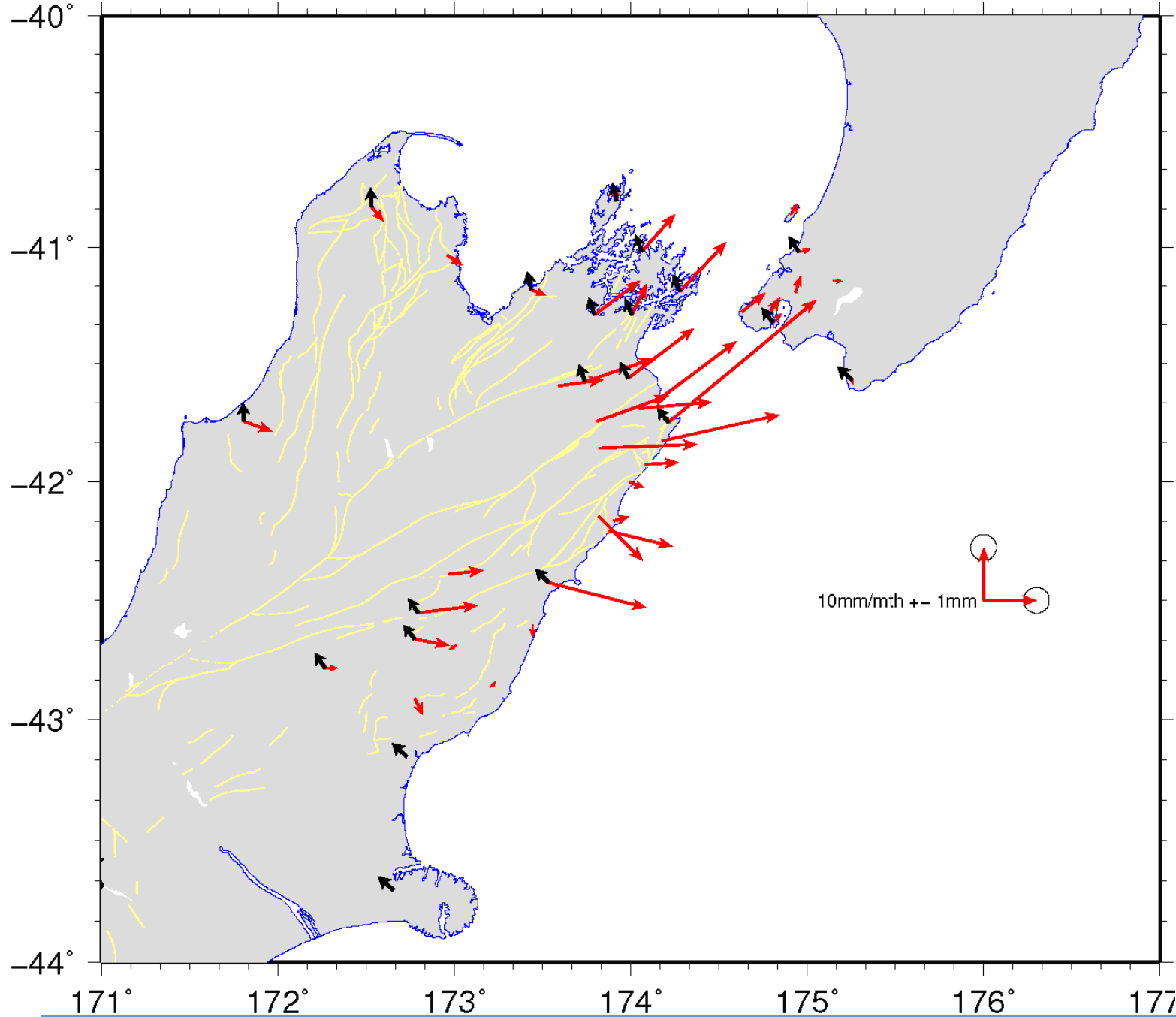
Northing



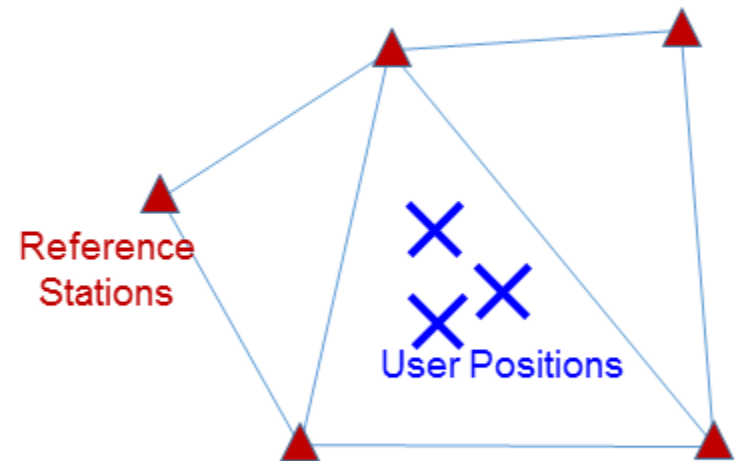
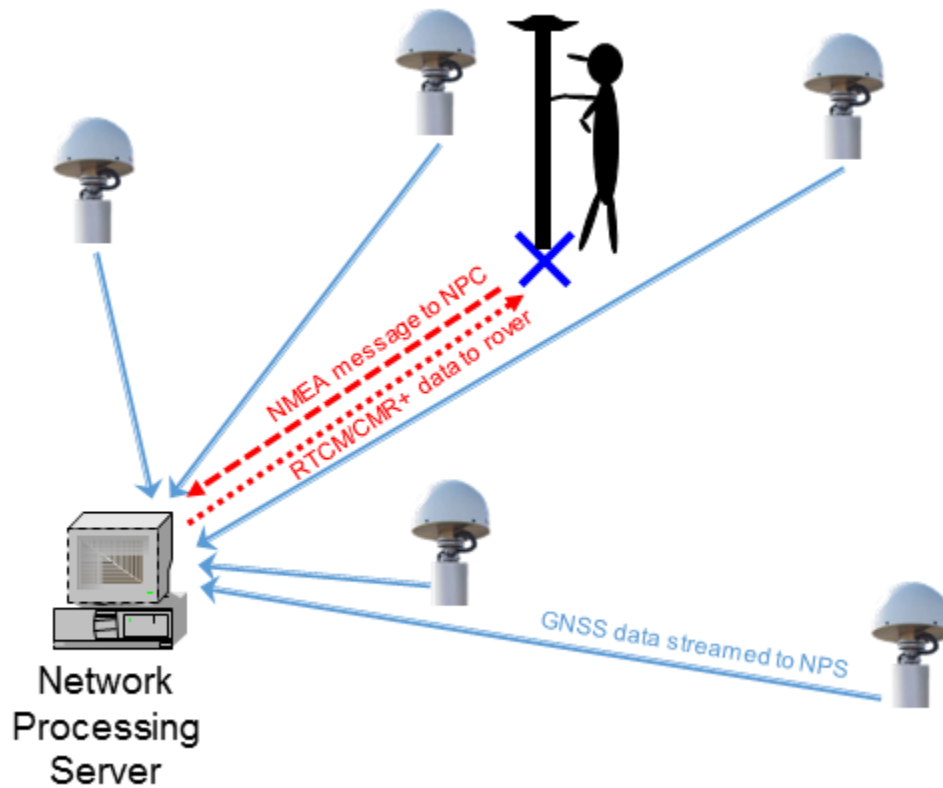
Coseismic Displacement



Post-seismic Displacement



Network RTK



Reference station coordinates

- Accurate
- Current epoch

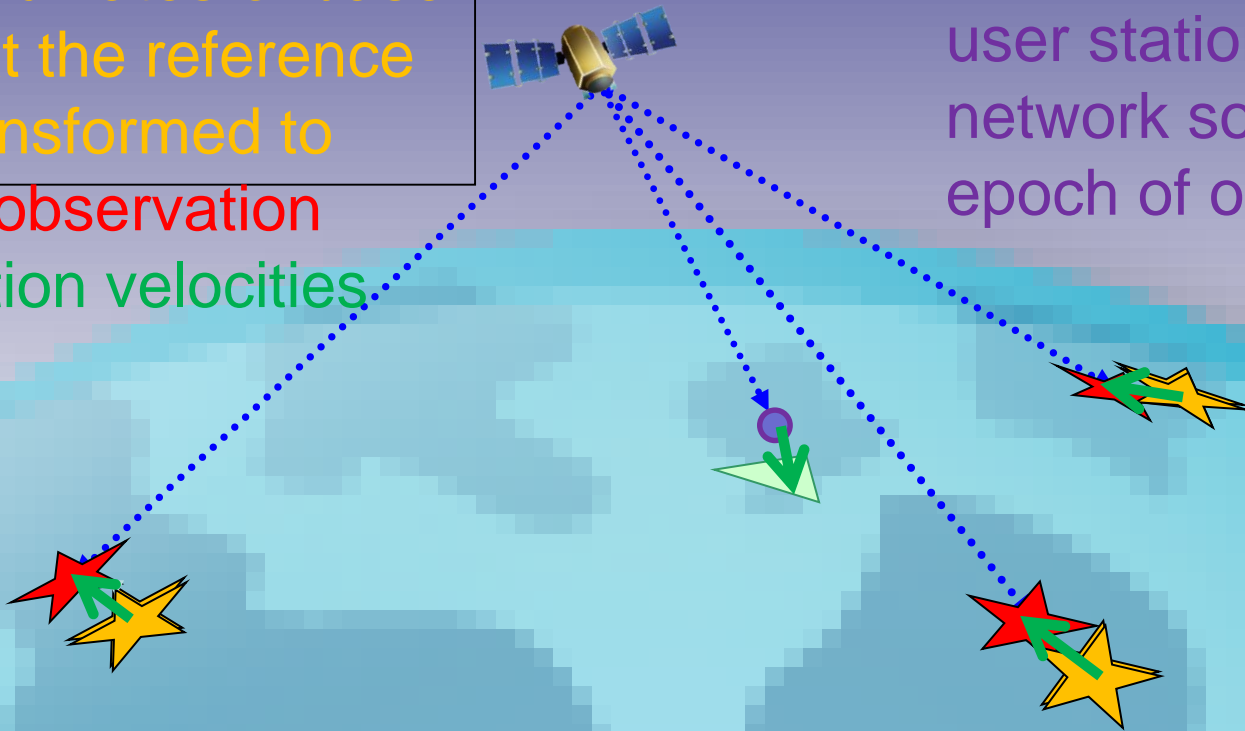


Summary of Network RTK Processing and OPUS

ITRF coordinates at reference epoch transformed to epoch of observation

ITRF coordinates of base stations at the reference epoch transformed to epoch of observation using station velocities

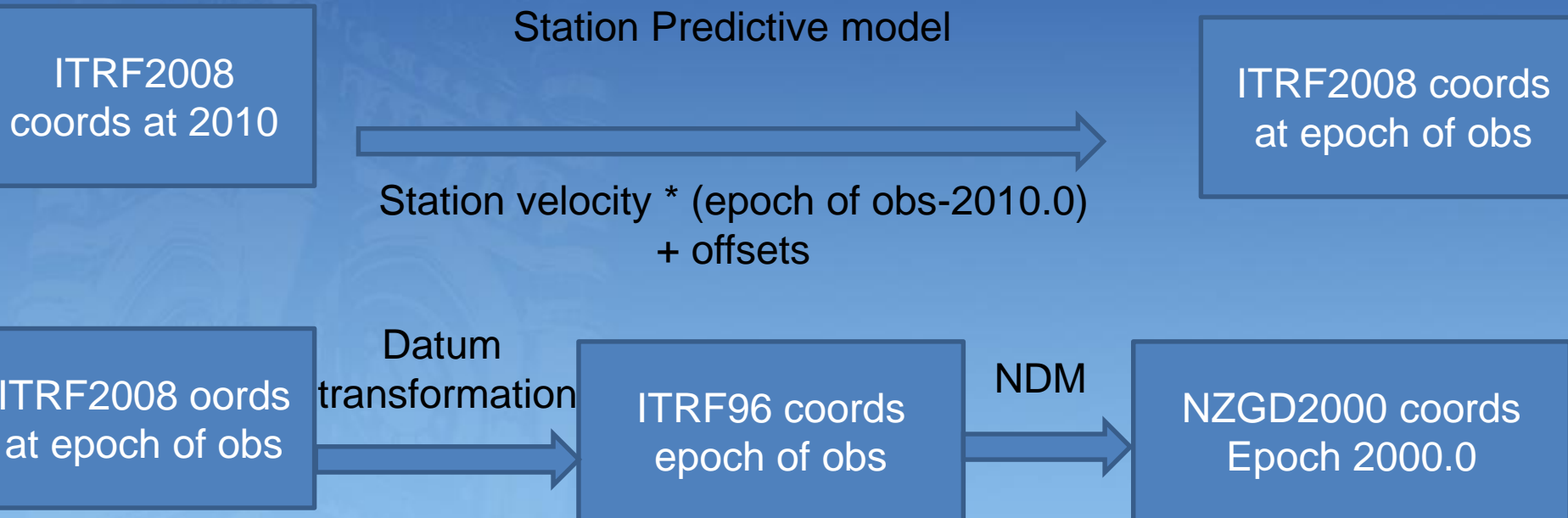
ITRF coordinates from user station from a network solution at epoch of observation



ITRF coordinates are projected from epoch of observation to 2000.0 using NDM

Coordinate transformations required by Network RTK

- ITRF coordinates converted to epoch of observation by applying station velocities plus any offsets

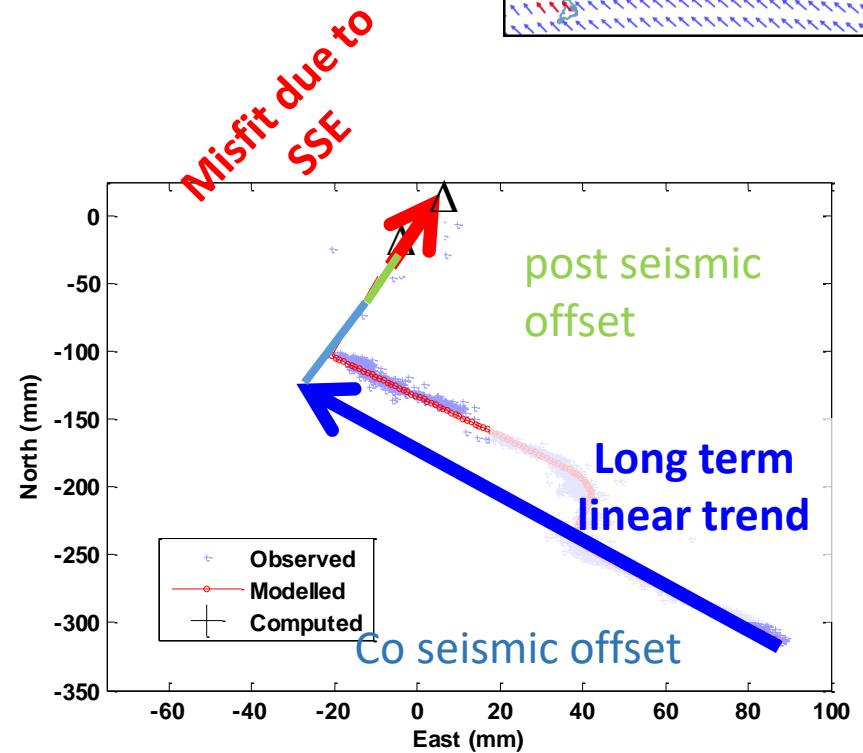
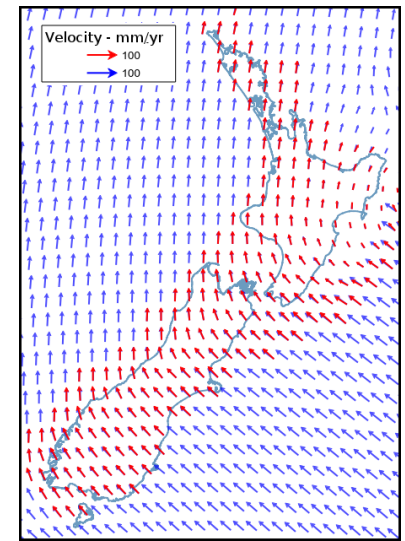


Kapiti Coast – Slow Slip Event and Earthquake

Reference stations

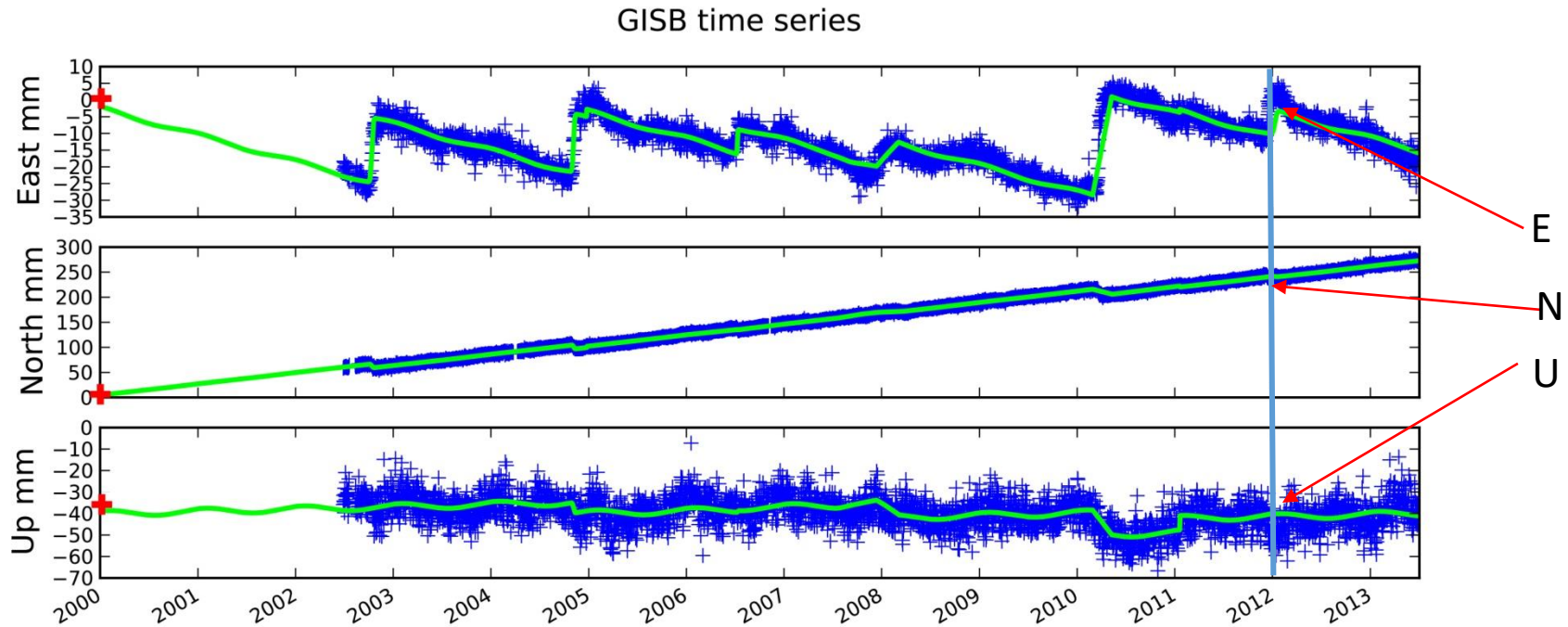
- Coseismic offset : $\sim 40\text{mm}$ (NE)
- Post-seismic velocity : 45 mm/yr @ $30^\circ\text{--}35^\circ$

Network RTK
NZGD2000
coordinate



Station coordinate predictive model

SSE

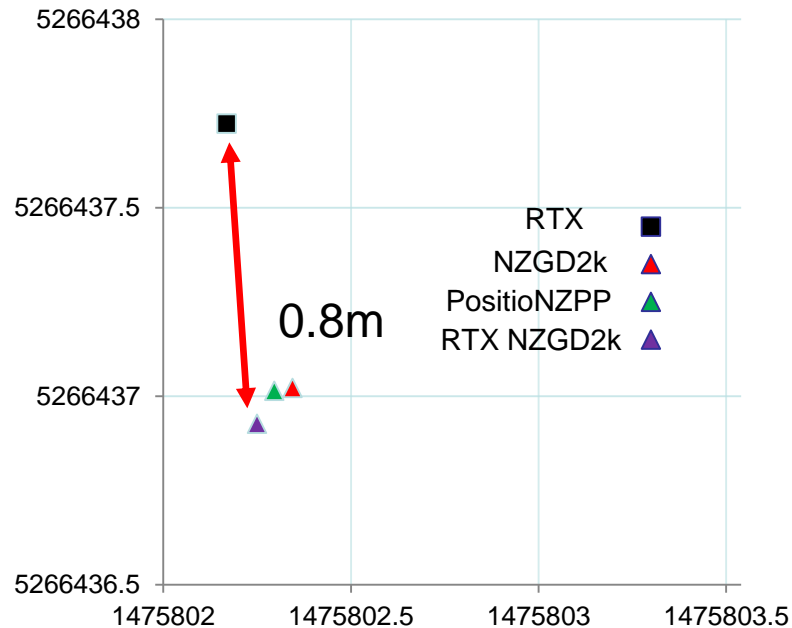


Example of Station Predictive model for slow slip events (saw tooth pattern on East trace)

SPM ENU
coordinate



Coordinate comparison



- All PPP and most Network RTK coordinates are actually in the ITRF datum at the epoch of observation
- Occurs because none of the commercial codes presently apply the deformation model
 - Produces nearly 1 m shift in vs NZGD2000 in New Zealand
 - On line position services like PositionNZ-PP do apply their national deformation model
 - Currently PPP and PPk users have to manually apply the deformation models