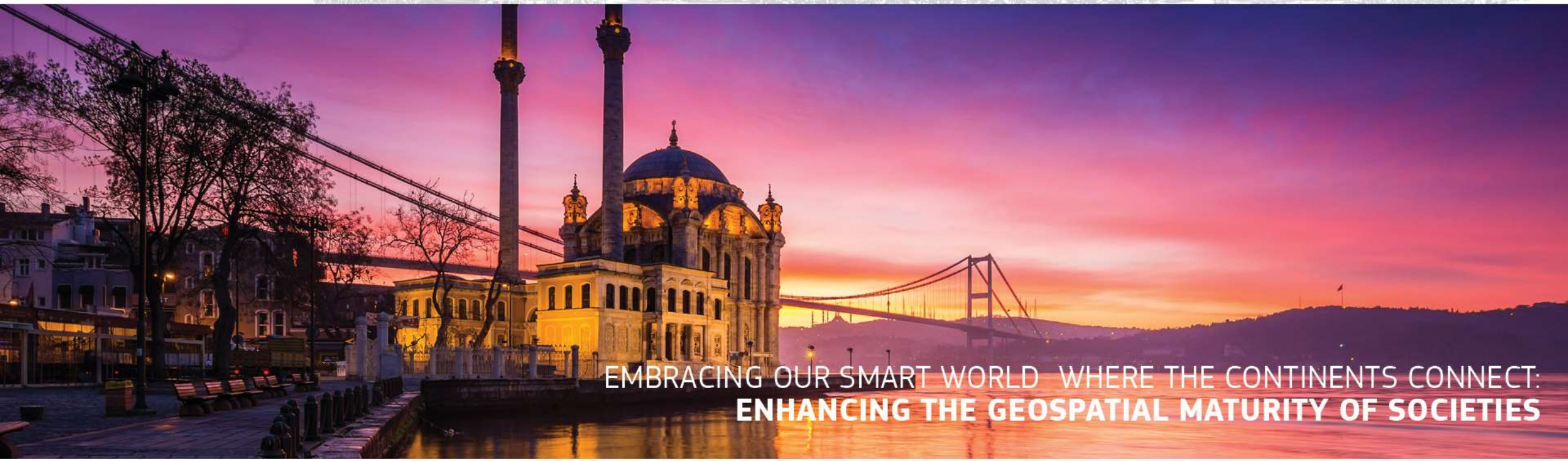
FIG 2018 ISTANBUL

XXVI FIG CONGRESS

6–11 May 2018, İstanbul

Feasibility of developing a regional deformation model for the South Pacific



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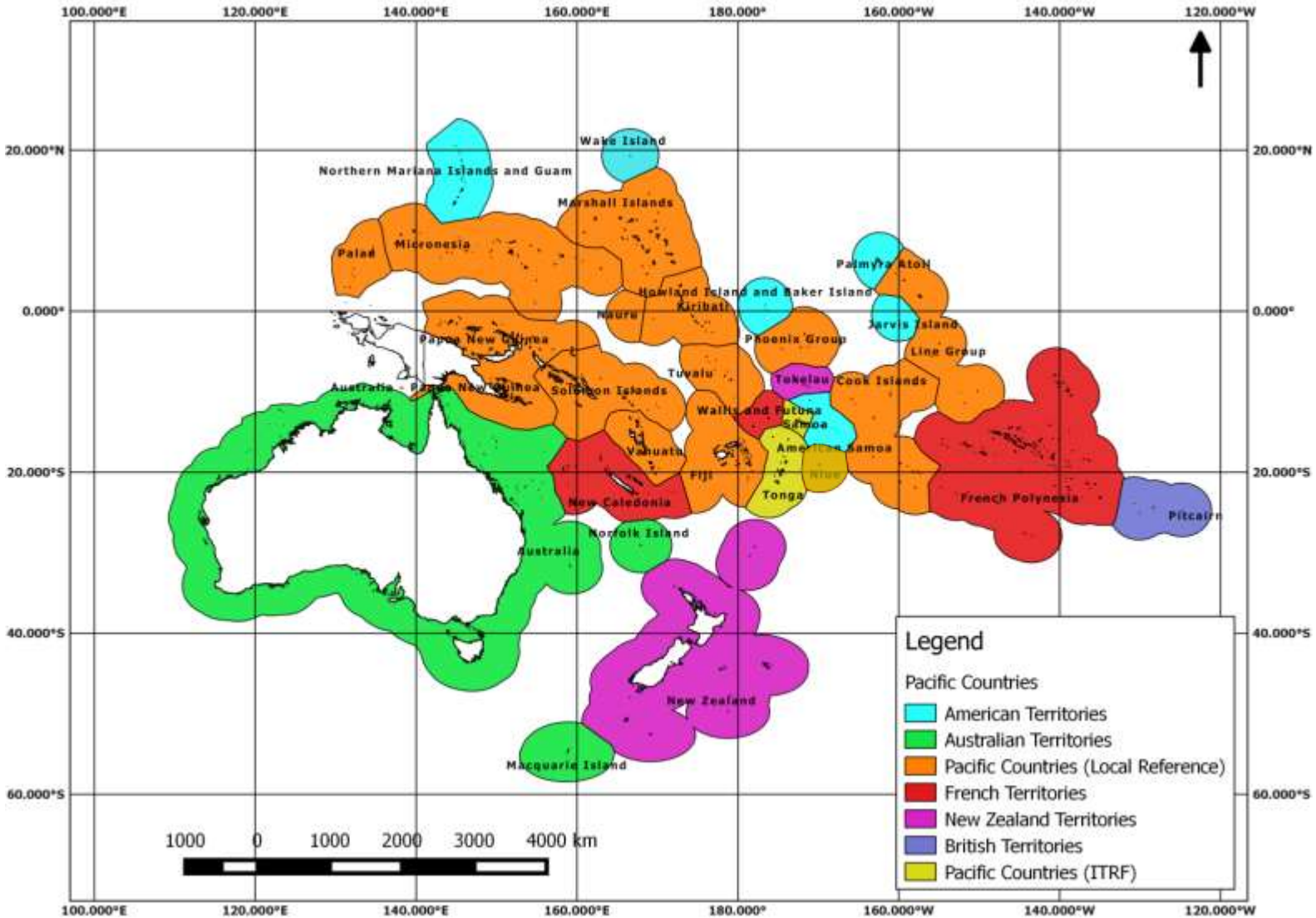
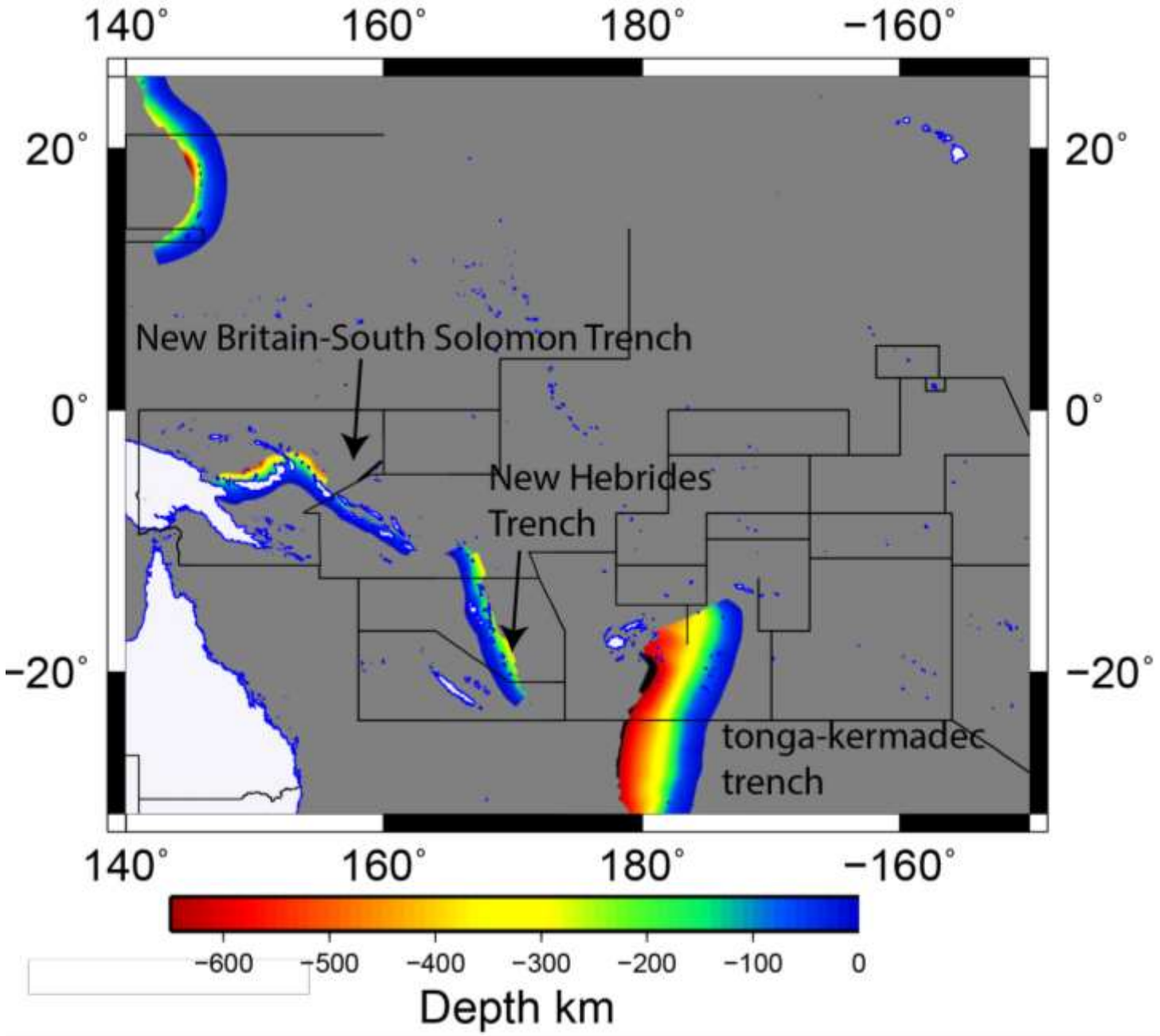
Chris Pearson Kevin Kelly Paul Denys Laura Wallace

Geodetic Reference Frame - Pacific



Courtesy of SPC

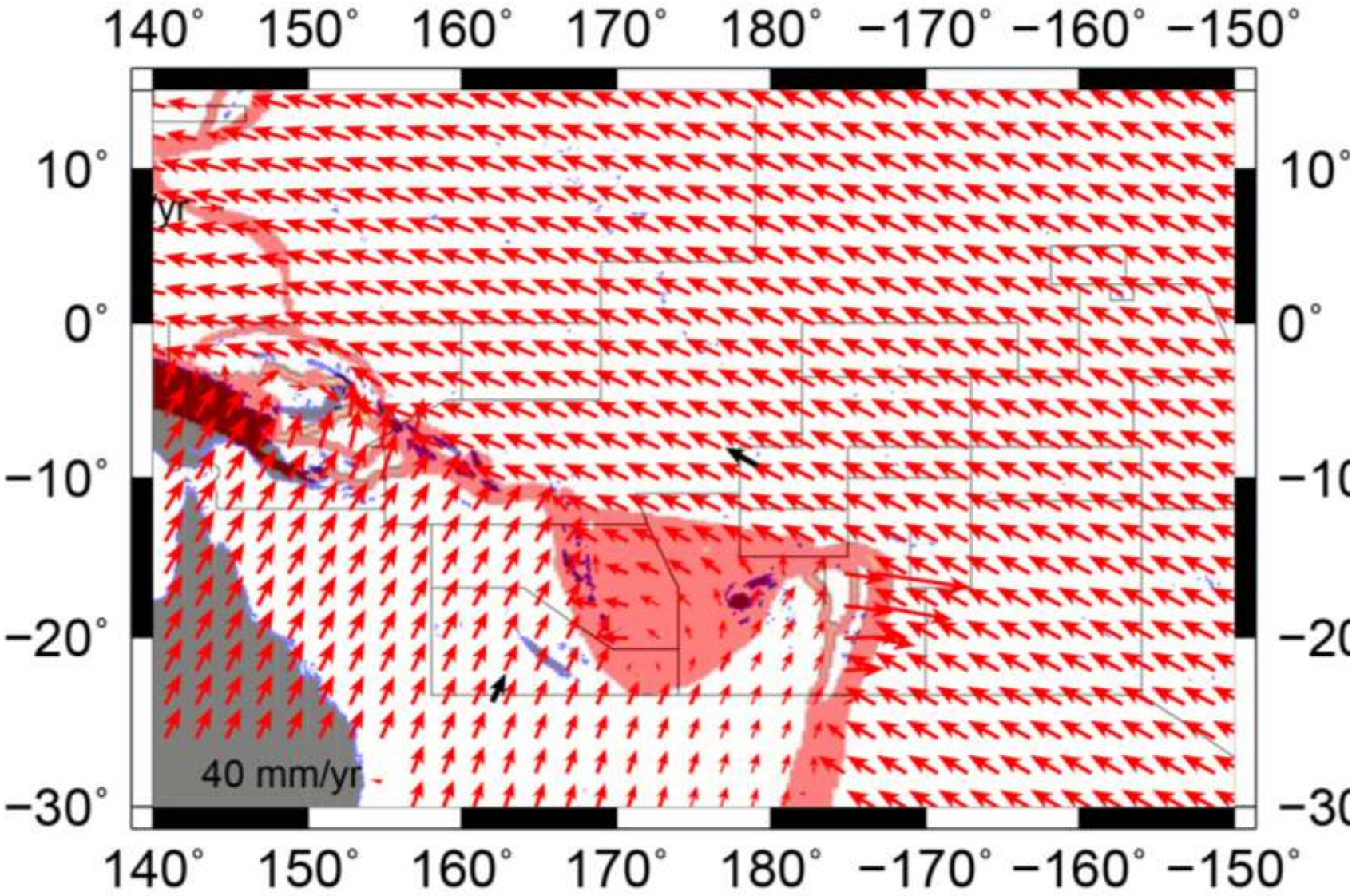


South Pacific tectonics

- Tonga, Samoa, Fiji, Vanuatu, The Solomon Islands and Papua New Guinea lie on a complex plate boundary zone
- Dominated by three active subduction zones
- Geodetic datums for these countries will require deformation models to be sustainable

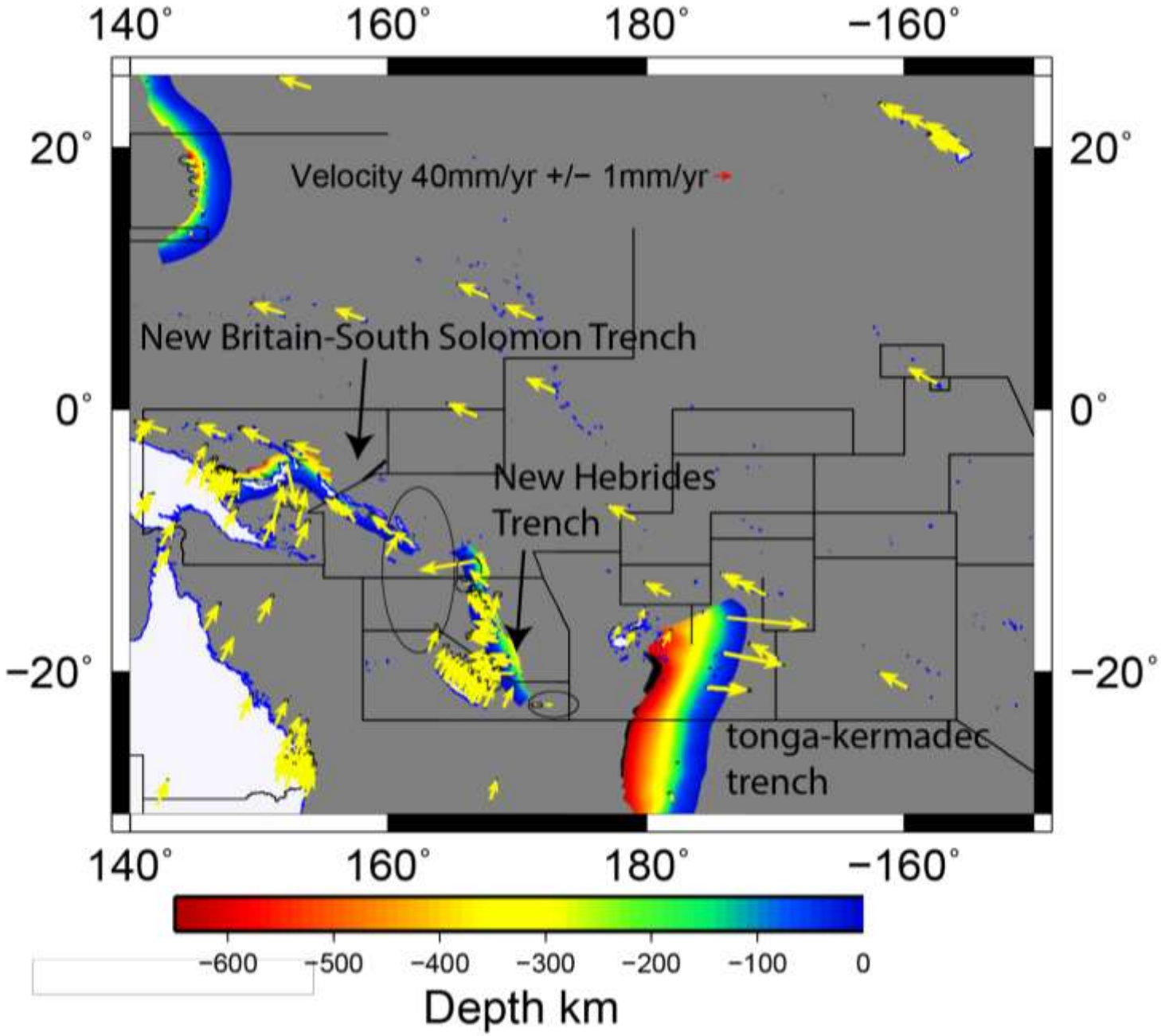
Velocity grid

- velocity grid produced by Kreemer et al's 2014 global strain project makes a good starting point.
- Quality will be variable depending on the velocity measurements available
- Plan to incorporate other measurements and utilize results of recent elastic block modelling studies.



Black vectors show the PA and AU plate velocities.
Pink shading show high strain rate zones

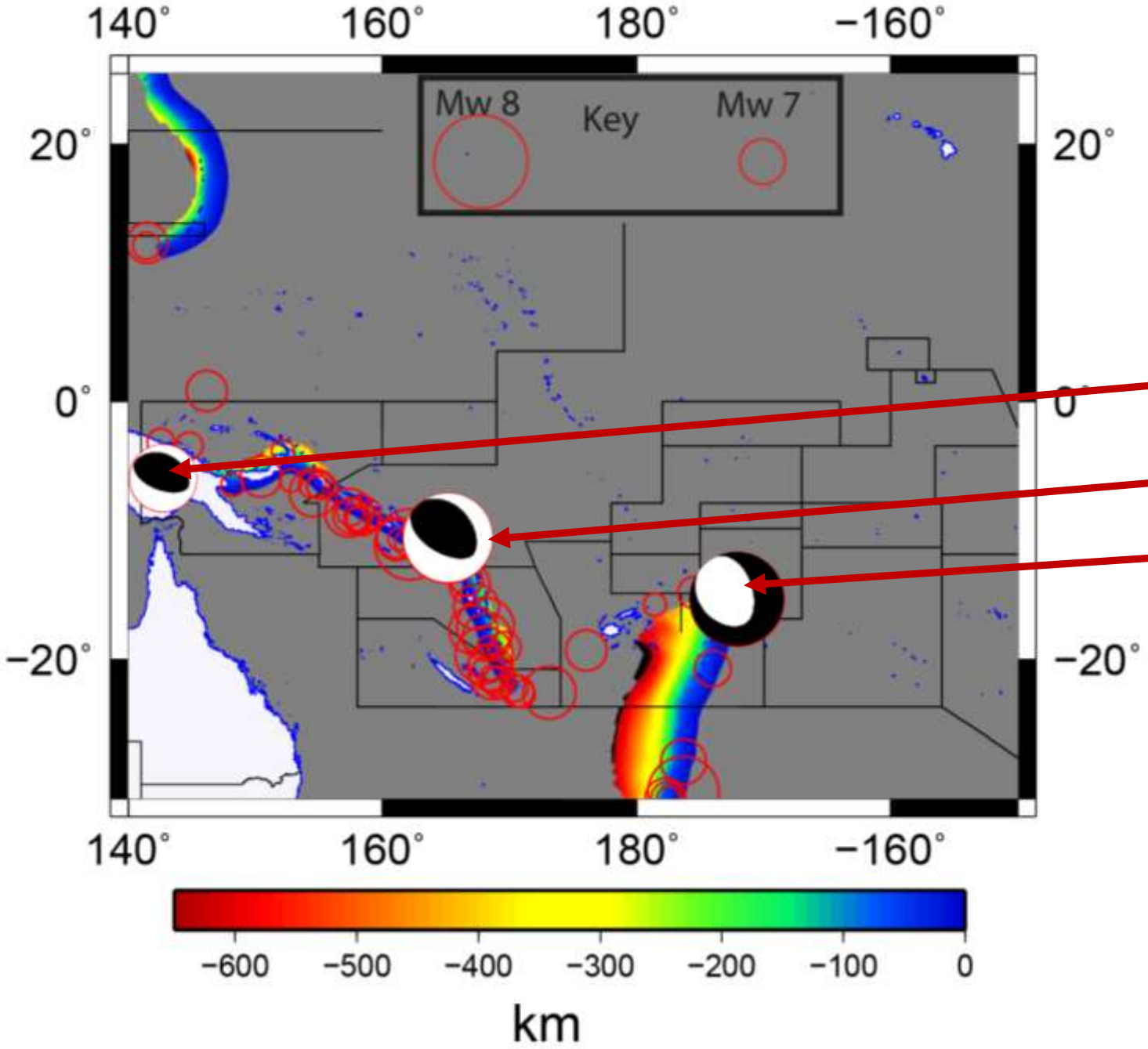
Kreemer C, Blewitt G, Klein EC 2014.
A geodetic plate motion and Global Strain Rate Model.
Geochemistry, Geophysics, Geosystems 15: 3849-3889



Secular velocities

- Secular velocity measurements available from Kreemer et al 2014
- APREF
- Campaign measurements by GNS Science and national states

Earthquake patches

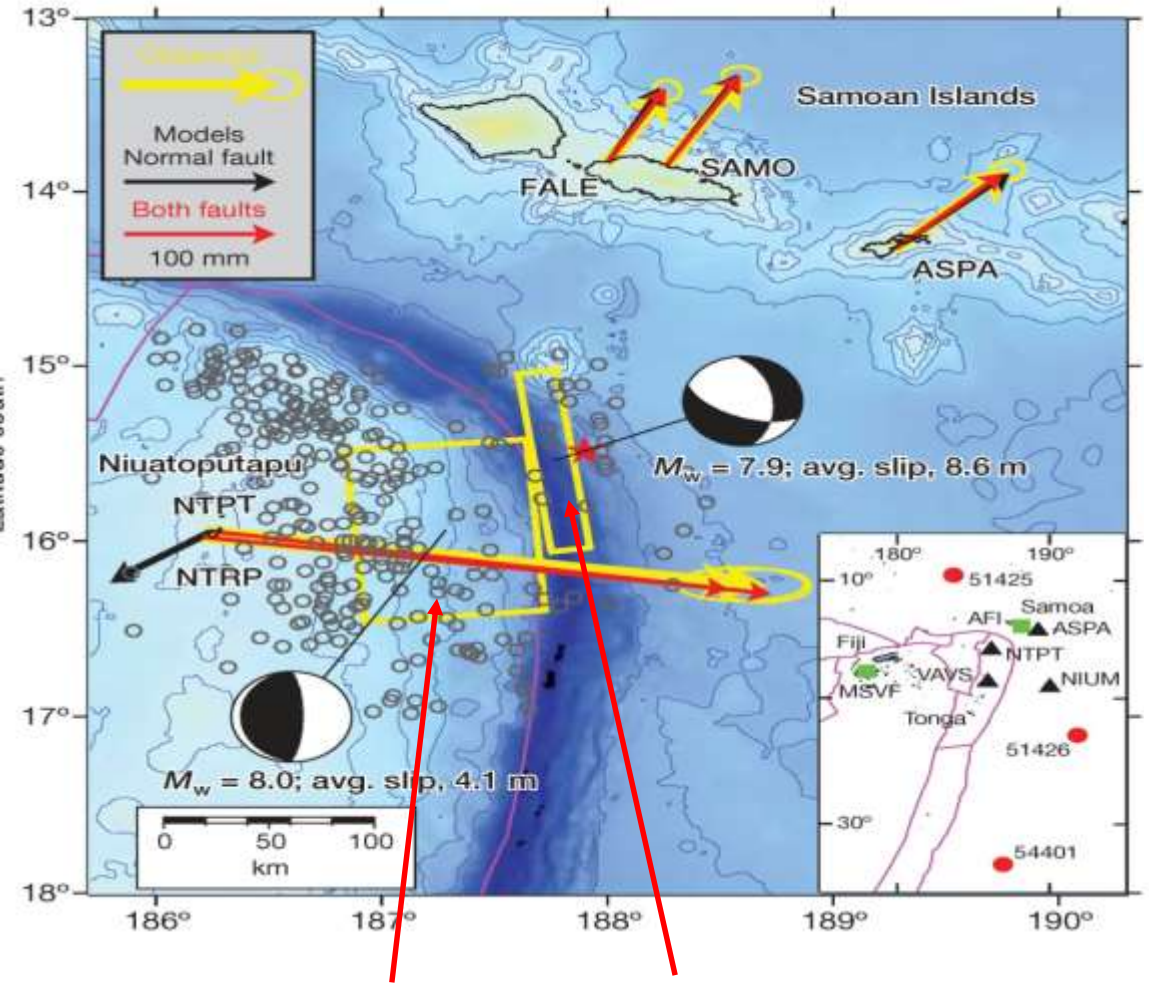


PNG earthquake of
2018 Ml 7.5

93km SSE of Kirakira, Solomon Islands
2014 Ml 7.6

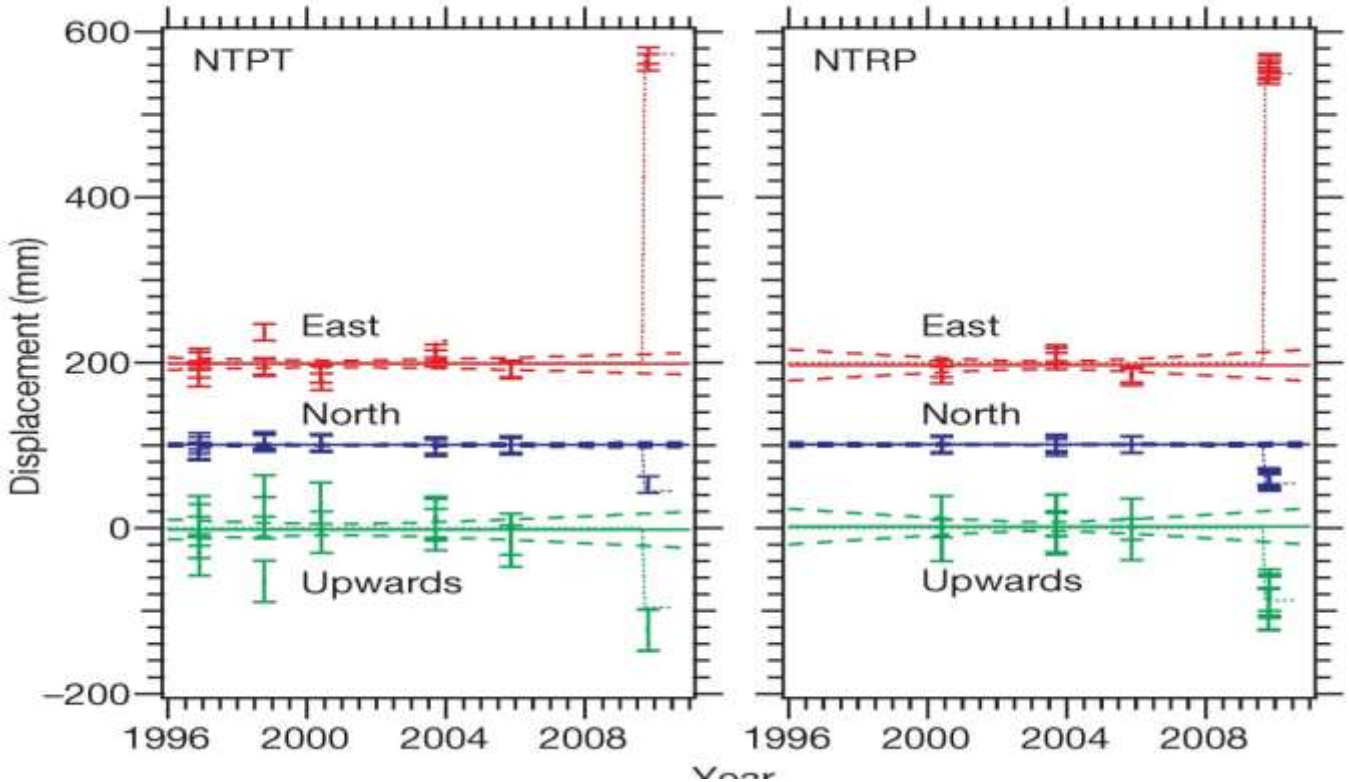
Tongan earthquake
of 2009 Ml 8.0

Tongan Earthquake of September 2009



Thrust EQ

Normal EQ



J. Beavan et al Near-simultaneous great earthquakes at Tongan megathrust and outer rise in September 2009 Nature volume 466, pages 959–963
doi:10.1038/nature09292

Conclusions

- Developing a deformation model for the South Pacific area appears to be feasible
- The velocity grid produced by Kreemer et al's 2014 global strain project makes a good starting point for the secular velocity component but it requires further densification in Tonga, Fiji the Solomon Islands and PNG.
- There are dislocation models for the two most significant earthquakes (2018 PNG and 2009 Tonga earthquakes) which can be developed into patches.