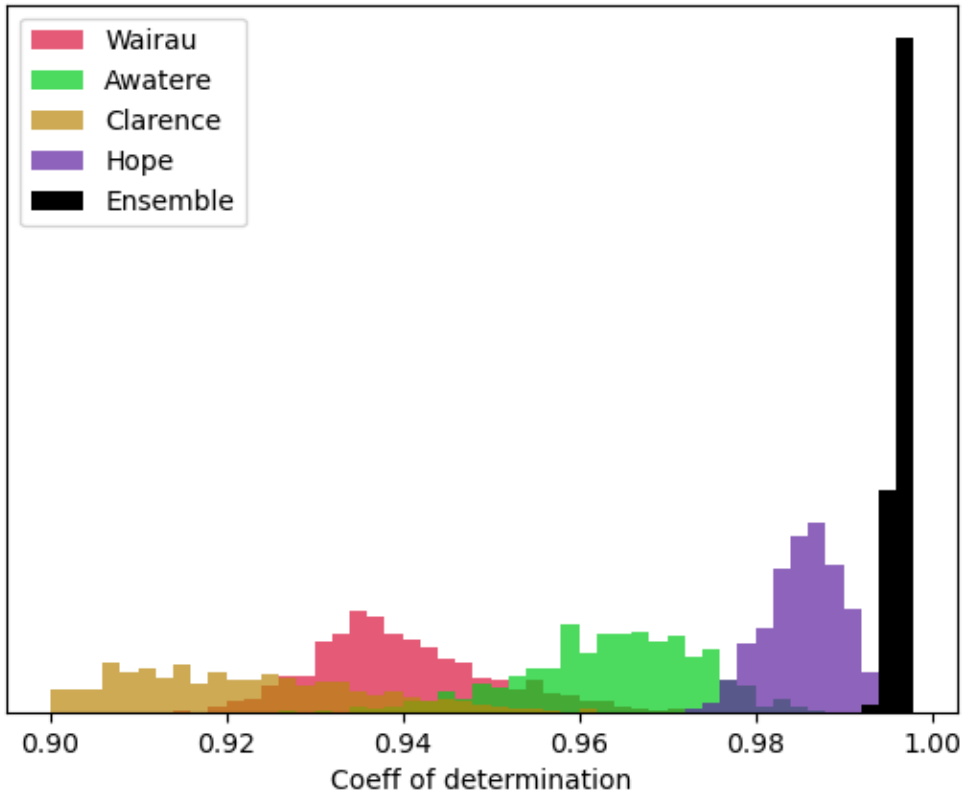

Article:
Dolan, J.F., Van Dissen, R.J., Rhodes, E.J. orcid.org/0000-0002-0361-8637 et al. (5 more authors) (2024) One tune, many tempos: faults trade off slip in time and space to accommodate relative plate motions. Earth and Planetary Science Letters, 625. 118484. ISSN 0012-821X

https://doi.org/10.1016/j.epsl.2023.118484

Supplementary Information 2 – Statistical tests of the relative variability of the incremental slip rate records for each of the four main Marlborough system faults relative to the variability for the ensemble, system-level rate

We test whether the displacement-time (*d*-*t*) history of the ensemble of all four faults is more constant in time than that of any individual fault. To do this, we compute the coefficient of determination (R^2 statistic) for each of 1,000 randomly sampled *d*-*t* paths shown in main text Figure 5. The R^2 value is a measure of how well a series of observations are predicted by a model, which in this case is a linear model in *d*-*t* space indicating a constant slip rate. Higher R^2 values indicate less deviation from a straight line fit, and therefore a more constant slip rate.

The results, categorized by individual fault and ensemble, are illustrated below. Each histogram shows the R^2 values for the set of samples indicated. The ensemble of all four fault histories is significantly more linear in time and is therefore described by a more constant rate than any individual fault.



Histograms of the coefficient of determination (R^2 value) for 1,000 sampled displacement-time paths of each fault (red, green, umber, purple), and the summed ensemble history (black). The R^2 value is a measure of how well a series of observations are predicted by a linear model. Values closer to 1.0 indicate a more linear relationship between displacement and time, i.e., a more regular slip rate. The R^2 values for the displacement-time realizations shown above indicate that, for nearly all plausible displacement-time paths, the ensemble history is significantly more linear in time, and therefore had a more constant slip rate than any of the constituent faults.